AMETOCTRADIN (260)

First draft prepared by K. Mahieu and Ms T. van der Velde-Koerts, Centre for Substances and Integrated Risk Assessment, National Institute of Public Health and the Environment, The Netherlands

EXPLANATION

Residue and analytical aspects of ametoctradin were considered for the first time by the present Meeting. Ametoctradin was scheduled for the evaluation as a new compound by 2012 JMPR at the 43rd Session of the CCPR (2011).

Ametoctradin is a novel fungicide of triazolopyrimidine class for the control of late blight and downy mildew on potatoes and other crops including vines. Ametoctradin strongly inhibits zoospore differentiation within the zoosporangium, the release of zoospores from the zoosporangium, the motility of any released zoospores and the germination of encysted zoospores. The inhibition caused by ametoctradin reduces the ATP content in these stages of development by binding to and inhibiting complex III of the respiratory chain in mitochondria of Oomycetes.

The Meeting received information from the manufacturer on identity, metabolism, storage stability, residue analysis, use pattern, residues resulting from supervised trials on grapes, bulb vegetables, Brassica vegetables, fruiting vegetables, leafy vegetables, celery, potatoes and hops, fate of residue during processing, and livestock feeding studies.

IDENTITY

ISO common name: ametoctradin (provisionally approved)

Chemical name

IUPAC: 5-ethyl-6-octyl[1,2,4]triazolo[1,5-a]pyrimidin-7-amine

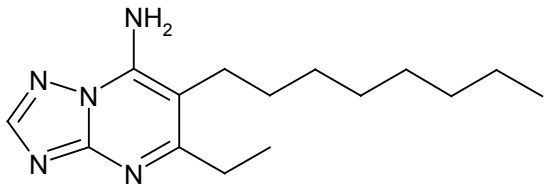
CA: [1,2,4]Triazolo[1,5-a]pyrimidin-7-amine, 5-ethyl-6-octyl-

CAS Registry No: 865318-97-4

CIPAC No: 818

Synonyms and trade names: BAS 650 F; Reg. No. 4993353; LS 0115, Initium ®

Structural formula: All spectra were consistent with the structure of ametoctradin (purity 99.8%): UV/VIS, IR with KBr pellet, ^{1}H-NMR, ^{13}C-NMR, EI-MS [Daum, 2005b, 2005/1014831]



Molecular formula: $C_{15}H_{25}N_5$

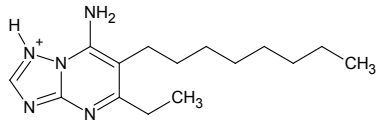
Molecular weight: 275.40

PHYSICAL AND CHEMICAL PROPERTIES

Pure active ingredient

Parameter	Result	References	Guidelines/method
Purity	PAI, purity 99.8% batch L71-30	[Kirstgen, 2005a, 2005/1037638]	
Appearance:	white odourless crystalline solid; at room temperature L71-30, purity 99.8%	[Daum, 2005a, 2005/1025629]	visual assessment; organoleptic assessment
Vapour pressure:	2.1E-10 Pa at 20 °C 6.0E-10 Pa at 25 °C Results extrapolated from measurements at 160–190 °C at 0.148–2.32 Pa; L71-30, purity 99.8% A temperature range of 120 to 150 °C is recommended in the OECD guideline. Due to the very low vapour pressure higher test temperatures were required to get detectable weight loss in an acceptable time period. Temperatures between 160 and 190 °C are below the melting point or decomposition point of ametoctradin and acceptable weight loss curves were obtained with a linear trace from which the slope for further analysis could be extracted [BASF, 2012c]. An upper limit of 1 Pa is recommended in the OECD guideline. Pressures above 1 Pa because of higher test temperatures are not regarded to affect the integrity of the study [BASF, 2012c].	[Kroehl, 2006, 2006/1038320]	EEC A.4, OECD 104 effusion method: isothermal thermogravimetry
Melting point:	197.7–198.7 °C L71-30, purity 99.8%	[Daum, 2005a, 2005/1025629]	OECD 102, Capillary method in a metal block according to Siwoloboff and differential scanning calorimetry (DSC)
Octanol/water partition coefficient (log Kow):	4.40 at neutral pH 4.24 in pH 4 buffer 4.18 in pH 9 buffer	[Daum, 2005e, 2005/1014072]	OECD 117 HPLC method

Parameter	Result	References	Guidelines/method
	at 20 °C, L71-30, purity 99.8%		
	Ametoctradin can be considered lipophilic. No significant effect of pH has been observed. At pH values tested ametoctradin is in its non-ionised form (R-NH2 form)		
Solubility in water:	0.14 mg/L in deionized water 0.23 mg/L in pH 4 buffer 0.15 mg/L in pH 7 buffer 0.20 mg/L in pH 9 buffer at 20 °C, L71-30, purity 99.8%	[Daum, 2005c, 2005/1014832]	EEC A6; OECD 105 column elution method
	The solubility in water is low and independent of pH. At pH values tested ametoctradin is in its non-ionised form (R-NH2 form).		
	The pH of a saturated solution in pure water was 5.9; at room temperature, TGAI purity 99.3%.	[Kroehl T, 2007a, 2006/1038321]	CIPAC MT 75.3
Solubility in organic solvents:	0.72%w/v in methanol 0.01%w/v in toluene; < 0.001%w/v in n-heptane 0.08%w/v in ethyl acetate 0.30%w/v in dichloromethane 0.19%w/v in acetone; 0.05%w/v in acetonitrile; 1.07%w/v in dimethyl sulfoxide at 20 °C, L71-30, purity 99.8%	[Daum, 2005d, 2005/1023925]	EEC A.6; OECD 105 Shake flask method
Relative density:	D420 1.117 L71-30, purity 99.8%	[Kroehl, 2006, 2006/1038320]	OECD 109; EEC A3.1.4.3 gas pycnometer
Hydrolysis:	Hydrolytically stable in sterile aqueous buffer solutions at pH 4, 5, 7 and 9 for at least 7 days at 50 °C in the dark (estimated DT50 > 1 yr at 25 ºC). 2,7-14C-labelled ametoctradin, radiochemical purity 98.3%, concentration 7.1 mg ai/L	[Adam, 2006, 2006/1009971]	EEC C.7; OECD 111; US-EPA Subdivision N § 161-2

Parameter	Result	References	Guidelines/method
	Parent was recovered at 93.6%–98.2% TAR at all pH values. Remaining radioactivity was ascribed to 6 impurities and background. Since there was < 10% degradation over the 7 day period at elevated temperature, there was no need for a main test.		
Photolysis:	Moderate decline to 69% TAR in 15 days in sterile water at pH 7 at 22 ± 1 ºC using Xenon lamp at 3 mW/cm2 continuously, DT50 = 38.4 d (single first order). 2,7-14C-labelled ametoctradin, radiochemical purity > 97% Three unknown photolysis products of 6%, 9% and 12% TAR were formed a.	[Hassink, 2008a, 2008/1013105]	EPA Subdivision N, § 161-2
Dissociation constant (pKa)	2.78 (estimated with modelling software and representing dissociation of R-NH+ to R-N) 	[Fischer, 2006, 2006/1018110]	The titration method of OECD 112 was not suitable due to low water solubility of ametoctradin. The spectrometric method of OECD 112 could not be used, since the neutral species of ametoctradin could not be identified in the pH range 6.6–7.6. For this reason, the pKa value was estimated by the ACD/Labs modelling software from Advanced Chemistry Development Inc.

a Photolysis products did not co-chromatograph with reference standards for:
5-ethyl-6-nonyl[1,2,4]triazolo[1,5-a]pyrimidin-7-amine
5-ethyl-6-hexyl[1,2,4]triazolo[1,5-a]pyrimidin-7-amine
4-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)butanoic acid (M650F01)
3-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)propanoic acid (M650F02)
(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)acetic acid (M650F03)
7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidine-6-carboxylic acid (M650F04)
3-amino-1,2,4-triazole (amitrole)

Technical material

Parameter	*Result*	*References*	*Guidelines*
Purity	TGAI, purity 99.3% batch COD-000748	[Bitterlich, 2007, 2007/1002121]	–
Appearance:	white odourless crystalline solid at room temperature, COD-000748, purity 99.3%	[Kroehl, 2007a, 2006/1038321]	visual assessment; organoleptic assessment
Relative density:	D_4^{20} 1.122 COD-000748, purity 99.3%	[Kroehl, 2007a, 2006/1038321]	OECD 109; EEC A3.1.4.3 gas pycnometer
Melting range:	197–202 °C; COD-000748, purity 99.3%	[Kroehl, 2007a, 2006/1038321]	OECD 102 capillary method and DSC/Thermogravimetry
Thermal stability	At 230 °C decomposition started indicated by an exothermic effect; COD-000748, purity 99.3%	[Kroehl, 2007a, 2006/1038321]	OECD 102, DSC/Thermogravimetry
	At 220 °C decomposition started indicated by an exothermic effect with a peak at 269 °C. COD-000748, purity 99.3%	[Bitterlich, 2007, 2007/1002121]	OECD 113 DSC
Stability:	Chemically stable. Content is 99% after accelerated storage at 54 °C for 14 days in a sealed glass container. COD-000748, purity 99.3%	[Kroehl, 2007a, 2006/1038321]	CIPAC MT 46.3

Degradation products

In rotational crops, animal commodities and soil several metabolites/degradation products of ametoctradin are found, which are of potential toxicological relevance. Metabolite M650F01 is found in animal commodities and in soil, metabolite M650F02 is found in soil and metabolites M650F03 and M650F04 are found in soil and in rotational crops. The physico-chemical characteristics of these potentially toxicological relevant degradation products/metabolites are summarized below.

Metabolite M650F01

IUPAC name: 4-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)butanoic acid

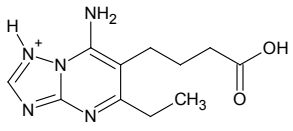
Molecular formula: $C_{11}H_{15}N_5O_2$ or $C_{11}H_{15}N_5O_2$.HCl (as hydrochloride)

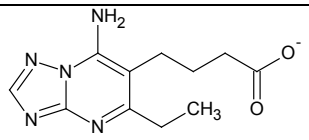
Molecular mass: 249.27 g/mol or 285.0 g/mol as hydrochloride

Purified metabolite M650F01 is only available in the hydrochloride form.

Parameter	*Result*	*References*	*Guidelines*
Octanol/water partition	0.69 at pH 3	[Class, 2006a, 2006/1028688]	OECD 117; EEC A.8

Parameter	*Result*	*References*	*Guidelines*
coefficient (log K_{ow}):	at 20 °C, L71-60 purity 93.6% (HCl form) Attempts to obtain consistent HPLC-UV chromatograms at neutral pH failed. M650F01 can be considered as amphoteric compound. Since M650F01 will be in the ionised form at any pH, OECD 117 is not suitable to determine the log K_{ow}. Alternatively as value for log K_{ow} of M650F01 the calculated data can be used from LogD Software from Advanced Chemistry Development, Inc., (ACD/Labs) resulted in a pH dependent log Kow of 0.06 in its neutral form [BASF, 2012c]		HPLC method
Solubility:	3.8 g/L (± 0.1 g/L) in pure water. at 20 °C, L71-60 purity 93.6% (HCl form) The pH of the saturated solution in pure water was 2.5. Solubility in buffered solutions at pH 4, 7, 9 was not investigated.	[Class, 2006a, 2006/1028688]	OECD 105; EEC A.6; Flask Method
Dissociation constant (pKa)	4.3 at 20 ± 1 ºC [BASF, 2012c] L71-60 purity 93.6% (HCl form) M650F01 can be considered as amphoteric compound. For M650F01 two dissociation steps are possible, but only one equivalence point was observed, leading to the same pKa value for both dissociation steps. This means that M650F01 is in the ionised form at all pHs. At pH < 4.3 it will be in the NH^+/COOH form, at pH > 4.3 it will be in the N/COO^- form.	[Class, 2006a, 2006/1028688]	OECD 112, titration method with 0.002 M NaOH



Parameter	*Result*	*References*	*Guidelines*
			
	M650F01 was provided as the HCl form. The test item used and dissolved for the pKs titration experiment is M650F01 × HCl and it is assumed that one of the two Ns in the triazole-ring is protonated in the HCl form/salt. Thus the M650F01 × HCl is a weak bi-acid [BASF, 2012c]		

Metabolite M650F02

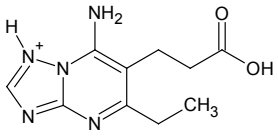
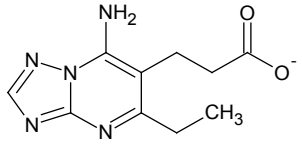
IUPAC name: 3-(7-amino-5-ethyl-[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)propanoic acid.

Molecular formula: $C_{10}H_{13}N_5O_2$ or $C_{10}H_{13}N_5O_2$.HCl (as hydrochloride)

Molecular mass: 235.25 g/mol or 271 g/mol (as hydrochloride)

Purified metabolite M650F02 is only available in the hydrochloride form.

Parameter	*Result*	*References*	*Guidelines*
Octanol/water partition coefficient (log K_{ow}):	0.33 at pH 3 1.0 at pH 6 at 20 °C L71-56, purity 87.4% (HCl form) M650F02 can be considered as amphoteric compound. Since M650F02 will be in the ionised form at any pH, OECD 117 is not suitable to determine the log K_{ow}. Alternatively as value for log K_{ow} of M650F02 the calculated data can be used from LogD Software from Advanced Chemistry Development, Inc., (ACD/Labs) resulted in a pH dependent log K_{ow} of –0.52 in its neutral form [BASF, May 2012]	[Class, 2006 b, 2006/1028689]	OECD 117; EEC A.8 HPLC method
Solubility:	79 g/L (± 2 g/L) in pure water. at 20 °C, L71-56, purity 87.4% (HCl form) The pH of the saturated solution in pure	[Class, 2006 b, 2006/1028689]	OECD 105; EEC A.6; Flask Method

Parameter	*Result*	*References*	*Guidelines*
	water was 0.5. Solubility in buffered solutions at pH 4, 7, 9 was not investigated.		
Dissociation constant (pKa)	4.0 at 20 ± 1 ºC [BASF, 2012c] L71-56, purity 87.4% (HCl form) For M650F02 two dissociation steps are possible, but only one equivalence point was observed, leading to the same pKa value for both dissociation steps. This means that M650F02 is in the ionised form at all pHs. At pH < 4.0 it will be in the NH^+/COOH form, at pH > 4.0 it will be in the N/COO^- form.   M650F02 was provided as the HCl form. The test item used and dissolved for the pKs titration experiment is M650F02 × HCl and it is assumed that one of the two Ns in the triazole-ring is protonated in the HCl form/salt. Thus the M650F02 × HCl is a weak bi-acid [BASF, May 2012]	[Class, 2006 b, 2006/1028689]	OECD 112, titration method with 0.01 M NaOH

Metabolite M650F03

IUPAC name: (7-amino-5-ethyl [1,2,4]triazolo [1,5-a]pyrimidin-6-yl) acetic acid

Molecular formula: $C_9H_{11}N_5O_2$ or $C_9H_{11}N_5O_2$.HCl (as hydrochloride)

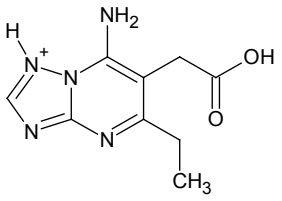
Molecular mass: 221.22 g/mol or 257 g/mol as hydrochloride

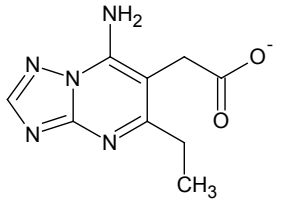
Purified metabolite M650F03 is only available in the hydrochloride form.

Parameter	*Result*	*References*	*Guidelines*
Octanol/water partition coefficient	0.16 at pH 3 at 20 °C	[Class, 2006c, 2006/1028690]	OECD 117; EEC A.8

Parameter	*Result*	*References*	*Guidelines*
(log K_{ow}):	L71-55, purity 98.1% (HCl form) Attempts to obtain consistent HPLC-UV chromatograms at neutral pH failed. M650F03 can be considered as amphoteric compound. Since M650F03 will be in the ionised form at any pH, OECD 117 is not suitable to determine the log K_{ow}. Alternatively as value for log K_{ow} of M650F03 the calculated data can be used from LogD Software from Advanced Chemistry Development, Inc., (ACD/Labs) resulted in a pH dependent log Kow of –0.86 in its neutral form [BASF, 2012c]		HPLC method
Solubility:	pure water 2.9 g/L (± 0.1 g/L). at 20 °C, L71-55, purity 98.1% (HCl form) The pH of the saturated solution in pure water was 2.0. Solubility in buffered solutions at pH 4, 7, 9 was not investigated.	[Class, 2006c, 2006/1028690]	OECD 105; EEC A.6; Flask Method
Photolysis:	Degradation to 19% TAR in 15 days in sterile buffer at pH 7 at 22 ± 1 ºC using Xenon lamp (cut-off < 290 nm) at 3 mW/cm^2 continuously, DT_{50} = < 13 d (graphical estimation). pyrimidine-5-^{14}C-labelled M650F03, radiochemical purity > 98% In sterile buffer at least 13 photolysis products were found: M650F04 (2.7% TAR), and 12 unknowns ranging from < 2% TAR to 20.8% TAR. In natural water several degradates could be identified (M650F32, M650F39, M650F51 and/or M650F48, M650F50), but no attempts were made to match these with the degradates found in sterile buffer [BASF, 2012d].	[Ebert, 2008a, 2008/1000121]	-
Dissociation constant (pKa)	3.8 at 20 ± 1 ºC [BASF, 2012c]	[Class, 2006c, 2006/1028690]	OECD 112, titration with 0.002 M NaOH

Parameter	*Result*	*References*	*Guidelines*
	L71-55, purity 98.1% (HCl form)		
	M650F03 can be considered as amphoteric compound. For M650F03 two dissociation steps are possible, but only one equivalence point was observed, leading to the same pKa value for both dissociation steps. This means that M650F03 is in the ionised form at all pHs. At pH < 3.8 it will be in the NH^+/COOH form, at pH > 3.8 it will be in the N/COO^- form.		





M650F03 was provided as the HCl form. The test item used and dissolved for the pKs titration experiment is M650F03 × HCl and it is assumed that one of the two Ns in the triazole-ring is protonated in the HCl form/salt. Thus the M650F03 × HCl is a weak bi-acid [BASF, 2012c]

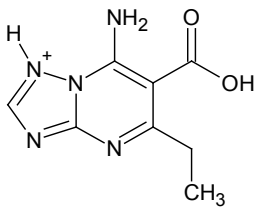
Metabolite M650F04

IUPAC: 7-amino-5-ethyl-[1,2,4]triazolo[1,5-a]pyrimidin-6-carboxylic acid

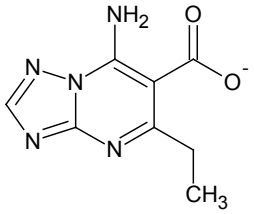
Molecular formula: $C_8H_9N_5O_2$

Molecular mass: 207.19 g/mol

Parameter	*Result*	*References*	*Guidelines*
Octanol/water partition coefficient	0.87 at pH 3 (i.e.,, for the non-ionised form of M650F04)	[Class, 2006d, 2006/1028691]	OECD 117; EEC A.8
(log K_{ow}):	at 20 °C		HPLC method
	L74-106, purity 99.2%		

Parameter	*Result*	*References*	*Guidelines*
	Attempts to obtain consistent HPLC-UV chromatograms at neutral pH failed. M650F04 can be considered as amphoteric compound. Since M650F03 will be in the ionised form at any pH, OECD 117 is not suitable to determine the log K_{ow}. Alternatively as value for log K_{ow} of M650F04 the calculated data can be used from LogD Software from Advanced Chemistry Development, Inc., (ACD/Labs) resulted in a pH dependent log Kow of 0.55 in its neutral form [BASF, 2012c]		
Solubility:	0.35 g/L (± 0.01 g/L) in pure water, at 20 °C, L74-106, purity 99.2% The pH of the saturated solution was 3.5. Solubility in buffered solutions at pH 4, 7, 9 was not investigated.	[Class, 2006d, 2006/1028691]	OECD 105; EEC A.6; Flask Method
Dissociation constant (pKa)	4.0 at 20 ± 1 ºC [BASF, 2012c] L74-106, purity 99.2% For M650F04 two dissociation steps are possible, but only one equivalence point was observed, leading to the same pKa value for both dissociation steps. This means that M650F04 is in the ionised form at all pHs. At pH < 4.0 it will be in the NH^+/COOH form, at pH > 4.0 it will be in the N/COO^- form. 	[Class, 2006d, 2006/1028691]	OECD 112, titration with 0.002 M NaOH

Parameter	*Result*	*References*	*Guidelines*

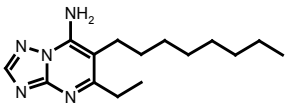
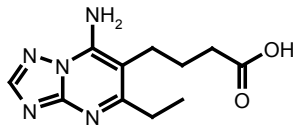
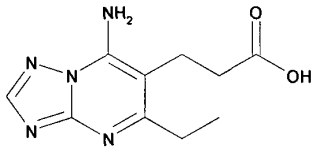
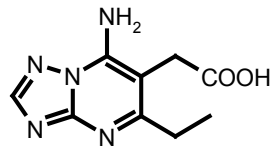


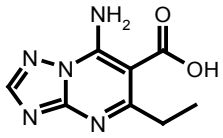
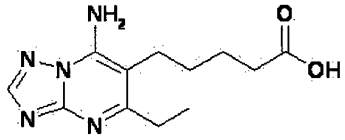
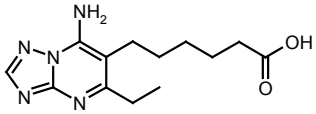
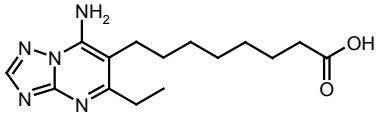
Formulations

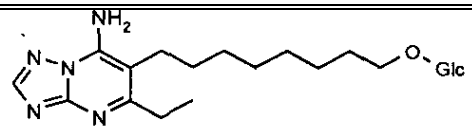
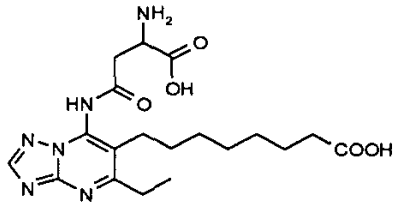
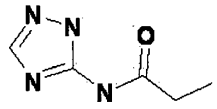
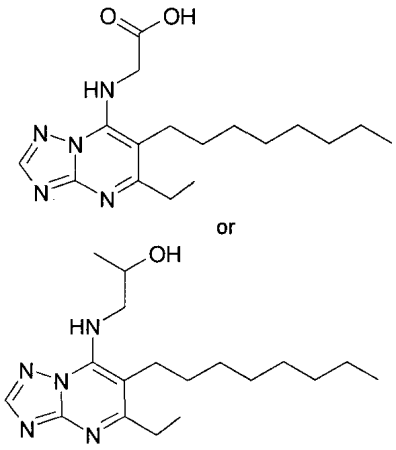
Formulations: SC formulations (200 g/L ametoctradin); SC formulations with ametoctradin and dimethomorph (300 g/L and 225 g/L, resp.); WG formulations with ametoctradin and metiram (120 g/kg and 440 g/kg, resp.); WG formulations with ametoctradin and mancozeb (80 g/kg and 480 g/kg, resp.).

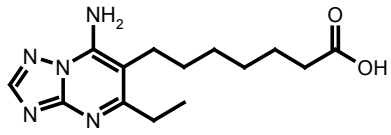
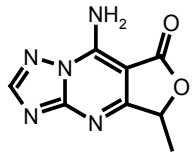
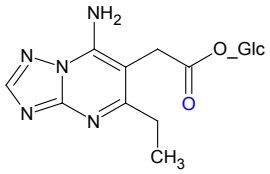
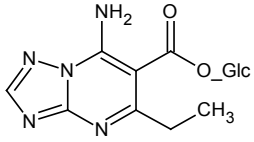
Ametoctradin has not been evaluated by JMPS and therefore no FAO specifications for technical and formulated ametoctradin have been published.

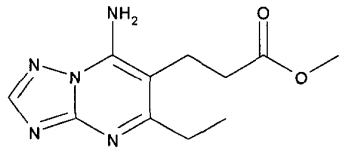
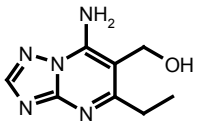
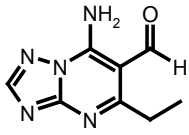
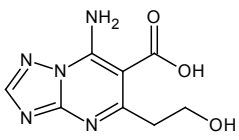
Table 1 List of reference compounds used in various study reports

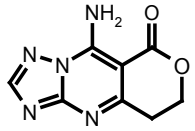
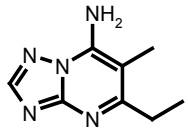
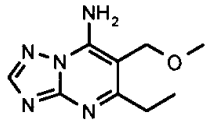
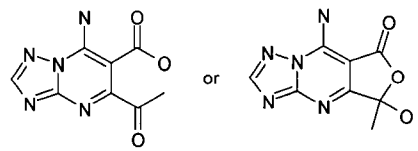
Abbreviation	Trivial and systematic chemical names Other abbreviations used in study reports	Found as or in
parent MW = 275	ametoctradin 5-ethyl-6-octyl [1,2,4]triazolo [1,5-a]pyrimidin-7-amine 	rat, hen eggs and fat; lettuce, potato tubers, potato leaves, tomatoes soil rotational crops: lettuce leaves, wheat (forage, straw)
M650F01 MW = 249	4-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)butanoic acid or ω-hetarylbutanoic acid [BASF, 2012d] 	rat, goat milk and tissues, hen tissues, potato leaves, soil
M650F02 MW = 235	3-(7-amino-5-ethyl-[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)propanoic acid. or ω-hetarylpropanoic acid [BASF, 2012d] 	soil
M650F03 or conjugates MW = 221	(7-amino-5-ethyl [1,2,4]triazolo [1,5-a]pyrimidin-6-yl) acetic acid or hetarylacetic acid [BASF, 2012d] 	potato tubers, potato leaves, soil rotational crops: lettuce leaves, radish (roots, tops), wheat (forage, straw, grain)
M650F04	7-amino-5-ethyl [1,2,4]triazolo [1,5-a]pyrimidine-6-carboxylic	potato tubers.

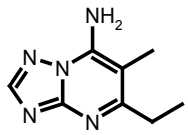
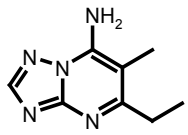
Abbreviation	Trivial and systematic chemical names Other abbreviations used in study reports	Found as or in
or conjugates MW = 207	acid or hetarylcarboxylic acid or hetarylformic acid 	potato leaves, soil rotational crops: lettuce leaves, radish (roots, tops), wheat (forage, straw, grain) M650F03 photolysis in water
M650F05 MW = 263	5-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)pentanoic acid or ω-hetarylpentanoic acid [BASF, 2012d] 	potato leaves (trace amounts)
M650F06 MW = 277	6-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)hexanoic acid or ω-hetarylhexanoic acid [BASF, 2012d] 	rat goat milk and tissues, hen tissues, potato leaves (trace amounts)
M650F09	8-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)octanoic acid or ω-hetaryloctanoic acid [BASF, 2012d] 	rat goat milk and tissues
M650F13 (or isomer) MW = 453	6-O-[8-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)octyl]-D-glucose or glucoside of ω-hetaryloctanol [BASF, 2012d]	potato leaves

Abbreviation	Trivial and systematic chemical names Other abbreviations used in study reports	Found as or in
		
M650F14 (or isomer) MW = 420	8-[7-(b-aspartylamino)-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl]octanoic acid or ω-hetaryloctanoic acid conjugated to aspartic acid [BASF, 2012d] 	potato leaves
M650F16 (or isomer) MW = 140	N-(1H-1,2,4-triazol-5-yl)propanamide or hydrolytic pyrimidine ring cleavage product [BASF, 2012d] 	potato leaves (trace amounts)
M650F17 (or isomer) MW = 333	N-(5-ethyl-6-octyl[1,2,4]triazolo[1,5-a]pyrimidin-7-yl)glycine or ametoctradin substituted with acetic acid or 2-hydroxypropane [BASF, 2012d] 	potato leaves (trace amounts)
M650F18 (or isomer)	7-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)heptanoic acid or ω-hetarylheptanoic acid	potato leaves (but possibly coming from application solution)

Abbreviation	Trivial and systematic chemical names Other abbreviations used in study reports	Found as or in
MW = 291	[BASF, 2012d] 	
M650F28 (or isomer) MW = 205	8-amino-5-methyl-5H,7H-furo[3,4-d][1,2,4]triazolo[1,5-a]pyrimidin-7-one or a five-membered ring lactone or condensed lactone [BASF, 2012d] 	potato leaves
M650F29 or conjugates or isomers	7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)acetyl]glucose or glucosyl conjugate of hetarylacetic acid [BASF, 2012d]  (or N-glucoside)	rotational crops: lettuce leaves, radish tops, wheat (forage, straw)
M650F30 or conjugates	[(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)carbonyl]glucose or glucosyl conjugate of hetarylformic acid [BASF, 2012d]  (or N-glucoside)	rotational crops: lettuce leaves, radish tops, wheat (forage, straw)

Abbreviation	Trivial and systematic chemical names Other abbreviations used in study reports	Found as or in
M650F31	methyl 3-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)propanoate or methylester of M650F02 [BASF, 2012d] 	soil
M650F32 or conjugates MW 193	(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidine-6-yl)methanol or hetarylmethanol [BASF, 2012d] 	rotational crops: lettuce leaves, radish (tops, roots), wheat (forage, straw) M650F03 photolysis in water
M650F33 or conjugate MW 191	7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidine-6-carbaldehyde or hetarylformaldehyde or aldehyde of M650F04 [BASF, 2012d] 	soil rotational crops: lettuce leaves, radish roots, wheat (forage, straw; grain)
M650F37 or conjugate MW 223	7-amino-5-(2-hydroxyethyl)[1,2,4]triazolo[1,5-a]pyrimidine-6-carboxylic acid or hetarylformic acid hydroxylated at the terminal carbon atom of the ethyl substituent [BASF, 2012d] 	rotational crops: lettuce leaves, radish (tops, roots), wheat (forage, straw, grain)

Abbreviation	Trivial and systematic chemical names Other abbreviations used in study reports	Found as or in
M650F38 or conjugate MW 205	9-amino-5,6-dihydro-8H-pyrano[4,3-d][1,2,4]triazolo[1,5-a]pyrimidin-8-one or hetaryl-annellated six membered ring lactone [BASF, 2012d] 	rotational crops: lettuce leaves, radish (tops, roots), wheat (forage, straw, grain)
M650F39 or conjugate MW 177	5-ethyl-6-methyl[1,2,4]triazolo[1,5-a]pyrimidine-7-amine or hetarylmethane or isomer of M650F50 and M650F51 [BASF, 2012d] 	rotational crops: lettuce, radish (tops, roots), wheat (forage, straw) M650F03 photolysis in water
M650F40 or conjugate	5-ethyl-6-(methoxymethyl)[1,2,4]triazolo[1,5-a]pyrimidin-7-amine or methoxy-hetarylmethane [BASF, 2012d] 	rotational crops: lettuce leaves, radish (tops, roots), wheat (forage, straw)
M650F48 or isomer MW 221	5-acetyl-7-amino[1,2,4]triazolo[1,5-a]pyrimidine-6-carboxylic acid [BASF, 2012d] 	M650F03 photolysis in water
M650F50	5-ethyl-6-methyl[1,2,4]triazolo[1,5-a]pyrimidine-7-amine	M650F03 photolysis in

Abbreviation	Trivial and systematic chemical names Other abbreviations used in study reports	Found as or in
MW 177	or hetarylmethane or isomer of M650F39 and M650F51 [BASF, 2012d] 	water
M650F51 MW 177	5-ethyl-6-methyl[1,2,4]triazolo[1,5-a]pyrimidine-7-amine or hetarylmethane or isomer of M650F39 and M650F50 [BASF, 2012d] 	M650F03 photolysis in water

MTABOLISM AND ENVIRONMENTAL FATE

The Meeting received information on the fate of ametoctradin in livestock, plant commodities, soil and rotational crops. In all these studies [2,7-^{14}C]-ametoctradin was used with the ^{14}C label in the thiazolopyridine ring (Figure 1). In some studies ametoctradin labelled as (2,5,7-^{13}C, Figure 2) was mixed with the [2,7-^{14}C]-ametoctradin to facilitate identification with MS techniques.

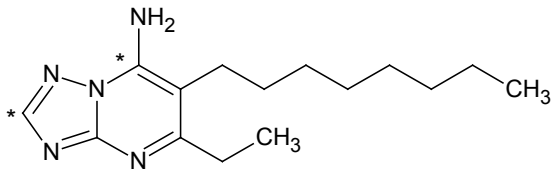


Figure 1 Position of the ^{14}C radiolabel in ametoctradin

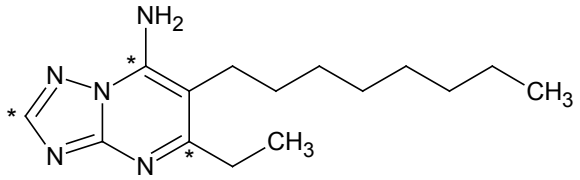


Figure 2 Position of the ^{13}C stable isotope label in ametoctradin

Animal metabolism

The Meeting received information on the fate of ametoctradin in ruminants (lactating goat) and poultry (laying hens) orally dosed with [2,7-^{14}C]-ametoctradin with the ^{14}C label in the thiazolopyridine ring (see Figure 1).

The metabolism in laboratory animals was summarized and evaluated by the WHO panel of the JMPR in 2012. Following oral administration, ^{14}C-ametoctradin underwent limited and saturable absorption from the gastrointestinal tract but was quite widely distributed. Maximum plasma concentrations were observed within 1–2 hours after administration and initial half-lives ranged from 2–3 hours. The AUC values indicate that internal exposure did not differ in males and females and that internal exposure did not increase proportionally with increasing dose. Excretion of ametoctradin occurred rapidly and sex independently. Most of administered dose (91–110%) was recovered within 168 hours after a single low and high dose and repeated high doses, with faeces as the main elimination route. Based on the amount of radioactivity excreted via bile and urine, the bioavailability of ametoctradin in rats was calculated to be about 40% of the administered dose at 50 mg/kg bw and about 20% of the applied dose at 500 mg/kg bw. In liver, kidneys, plasma and bile, several metabolites of ametoctradin were found, with metabolite M650F06 being the most abundant. The parent compound is metabolised by terminal oxidation of the octyl side chain to the respective carboxylic acid (M650F09), with subsequent degradation of the carboxylic side chain to give M650F06 and M650F01. In addition, conjugation of the respective oxidised side chain with taurine and/or glucuronic acid occurs, leading to metabolites M650F10 (taurine conjugate of M650F09), M650F11 (glucuronic acid conjugate of M650F06), and M650F12 (taurine conjugate of M650F06), respectively. Also a minor metabolic step leads to the formation of M650F05 (ω-hetarylpentanoic acid).

Lactating goats

Study 1

Radiolabelled [2,7-^{14}C]-ametoctradin was administered orally by gavage to two lactating goats (Deutsche Bunte Edelziege) for 10 consecutive days at a nominal dose of 12 mg ai/kg feed [Fabian and Landsiedel, 2007b, 2006/1037726]. The mean actual concentrations were 12.69 and 11.99 mg ai/kg dry feed for goat 1 and goat 2, respectively, corresponding to daily means of 16.90 and 17.47 mg ai/animal or 0.51 and 0.49 mg ai/kg body weight. Goats were about 2 years of age. Body weights were 33.3 and 35.4 kg at the start of the study and 33.6 and 39.9 kg at the end of the study for goat 1 and goat 2, respectively. Average feed consumption during application was 1.336 and 1.457 kg for goat 1 and goat 2, respectively. Average milk production during application was 1.006 and 1.216 kg/day for goat 1 and goat 2, respectively. Milk, urine and faeces were collected twice daily and a cage wash was performed at study termination. The goats were sacrificed 23 hours after administration of the last dose. Blood, liver, bile, gastrointestinal tract and contents, bladder contents, kidney, intraperitoneal fat and muscle were collected. In case of edible tissues the samples from both animals were combined. Sample storage conditions were not stated.

Radioactivity in homogenised samples was quantified by LSC or combustion/LSC. Total recovered radioactivity amounted to 64.17% TAR in goat 1 and 87.94% TAR in goat 2. Radioactivity recovered from urine, faeces and cage wash amounted to 60.67% TAR in goat 1 (24.22% in urine; 36.10% TAR in faeces) and 84.45% TAR in goat 2 (26.04% in urine, 57.84% in faeces). In both animals, radioactivity amounted to 0.15–0.19% TAR in milk, 0.05% TAR in edible tissues and organs, 0.96–2.71% TAR in blood and 0.59–2.29% TAR in the GI-tract.

The total radioactive residues (TRR) in tissues and milk were 0.100 mg/kg residues expressed as ametoctradin equivalents (eq) in liver, 0.036 mg/kg eq in kidney, 0.016 mg/kg eq in intraperitoneal fat, 0.010 mg/kg eq in muscle, 0.028 mg/kg eq in pooled milk. TRR levels in afternoon milk (0.007–0.097 mg/kg eq) were higher than residue levels in morning milk (0.004–0.029 mg/kg eq). Average TRR levels in PM/AM milk did not reach a clear plateau by day 10, although a flattening of the curve

started by day 5–8 (0.026–0.048 mg/kg eq in pooled AM/PM milk). No separation of the milk in skimmed milk and cream was performed.

The identification of radioactivity in samples of edible products was investigated in Study 2.

Study 2

This study [Bross and Glässgen, 2008, 2008/1004313] investigated the metabolism of ametoctradin by extraction and analysis of samples of milk (pooled day 4–9 sample), muscle, liver, kidney and fat, generated in Study 1 [Fabian and Landsiedel, 2007b, 2006/1037726]. Samples were stored at –18 °C and extracted within 62–78 days after sampling and analysed within 21–89 days after extraction (total 35–202 days from sampling to analysis).

Milk was extracted three times with MeOH. Tissues were extracted three times with MeOH and twice with water. The extracts were combined per solvent. Radioactivity in extracts and remaining solids was quantified by LSC or combustion/LSC. Extractability is shown in Table 2. The extractable radioactive residues (ERR) amounted to 98.2% of the TRR for milk, 52.9% TRR for liver, 63.0% TRR for kidney, 71.9% TRR for muscle and 81.5% TRR for fat.

For characterisation, the MeOH extracts from milk and liver were concentrated, taken up in water and partitioned between EtOAc and water. The solids remaining after initial solvent extraction of liver and kidney were subjected to treatment with protease (pH 7, overnight, 37 °C). In case of liver, the protease residue was re-dissolved in ACN and treated with microwave for 30 min at 150 °C. Fractions containing sufficient radioactivity were analysed by HPLC (2 methods). Identification in extracts was based on co-chromatography of reference standards (M650F01, M650F02, M650F03) or of radioactive metabolites isolated during metabolism studies in rat (M650F06), goat urine (M650F01, M650F06, M650F09) or water-sediment studies (M650F01, M650F02, M650F03).

Results are shown in Table 2 and Table 3. The parent was not found in any of the animal commodities. Three degradation products were identified in the different goat matrices. In milk, liver, kidney and fat, the metabolite M650F06 was the most abundant component of the residues (22–47% TRR or 0.006–0.021 mg/kg eq), followed by the metabolite M650F01 (14–26% TRR or 0.003–0.014 mg/kg eq) and the metabolite M650F09 (7.7–9.4% TRR or 0.002–0.003 mg/kg eq; not detected in liver). No metabolites were detected in muscle (total characterized extractable residues: 0.002 mg/kg eq). The solids remaining after initial extraction in liver and kidney were treated with protease and microwave, resulting in a release of most of the radioactivity (38% TRR in liver and 30% TRR in kidney). This radioactivity could not be attributed to any of the known metabolites.

Storage stability of residues in goat liver was determined by extraction after 49, 75 and 178 days of storage. A comparison of the extractability and the HPLC chromatograms of the metabolite patterns at the beginning and the end of the investigation period showed that there was not relevant change in the nature of radioactive residues during sample storage over a period of 178 days.

Table 2 Extractability of the radioactive residue in tissues of lactating goat

	Liver mg/kg eq (% TRR)	Kidney mg/kg eq (% TRR)	Muscle mg/kg eq (% TRR)	Fat mg/kg eq (% TRR)	Milk mg/kg eq (% TRR)
TRR (combustion)	0.100	0.036	0.002	0.016	0.028 a
TRR (ERR + PES)	0.095 (100%)	0.034 (100%)	0.003 (100%)	0.017 (100%)	0.028 (100%)
ERR	0.050 (52.9%)	0.022 (63.0%)	0.002 (71.9%)	0.014 (81.5%)	0.028 (98.2%)
MeOH extract	0.045 (47.3%)	0.019 (56.1%)	0.0016 (58.6%)	0.012 (73.5%)	0.028 (98.2%)
aqueous extract	0.005 (5.7%)	0.002 (6.9%)	0.0004 (13.4%)	0.001 (8.0%)	na
PES	0.045 (47.1%)	0.013 (37.0%)	0.0008 (28.1%)	0.003 (18.5%)	0.001 (1.8%)
protease solubilisate	0.033 (34.6%)	0.011 (31.2%)	–	–	–

	Liver mg/kg eq (% TRR)	Kidney mg/kg eq (% TRR)	Muscle mg/kg eq (% TRR)	Fat mg/kg eq (% TRR)	Milk mg/kg eq (% TRR)
protease residue	0.014 (14.5%)	0.003 (7.3%)	–	–	–
microwave solubilisate	0.007 (7.3%)	–	–	–	–
microwave residue	0.009 (9.1%)	–	–	–	–
final PES	0.009 (9.1%)	0.003 (7.3%)	–	–	–

TRR: total recovered residue; ERR = extractable radioactive residues; PES = post extracted solids.

a Pooled day 4–9 samples, AM/PM

Table 3 Identification and characterisation of metabolites in goats; values are given in mg/kg eq (%TRR)

Tissue	Extractable Radioactive Residues (ERR)						PES	Total
	Parent	M650F01	M650F06	M650F09	Unknowns	aqueous extract		
Milk	nd	0.007 (26.3%)	0.013 (47.0%)	0.002 (7.7%)	0.004 (12.8%)e	na	0.001 (1.8%)	0.027 (95.5%)
Liver	nd	0.014 (14.3%)	0.021 (21.6%)	nd	0.005 (5.6%)	0.005 (5.7%)	0.045 (47.1%)a	0.093 (98.2%)
Kidney	nd	0.005 (13.9%)	0.008 (22.9%)	0.003 (9.4%)	0.001 (2.9%)	0.002 (6.9%)	0.013 (37.0%)b	0.032 (94.4%)
Muscle	na c	na c	na c	na c	0.002 (58.6%)d	0.0004 (13.4%)	0.001 (28.1%)	0.003 (100.0%)
Fat	nd	0.003 (15.2%)	0.006 (33.0%)	0.002 (9.2%)	na	0.001 (8.0%)	0.003 (18.5%)	0.014 (83.9%)

TRR: total recovered residue; ERR = extractable radioactive residues; PES = post extracted solids;

nd = not detected; na = not analysed

parent: ametoctradin; M650F01 = ω-hetarylbutanoic acid; M650F06= ω-hetarylhexanoic acid; M650F09 = ω-hetaryloctanoic acid

a PES in liver was further characterized as protease solubilisate (34.6% TRR) and microwave extract (7.3% TRR), resulting in a final PES of 0.009 mg/kg eq (9.1% TRR).

b PES in kidney was further characterized as protease solubilisate (0.011 mg/kg eq, 31.2%TRR), leaving a final PES of 0.003 mg/kg eq (7.3% TRR).

c. No HPLC analysis was performed due to low residue levels.

d. Characterized from ERR by extractability (MeOH extract)

eHPLC chromatogram shows two peaks, each < 10.3% TRR

Laying hens

Study 1

Nine laying hens (*Gallus domesticus*, brown leghorn variety) were orally dosed by gavage once daily with [2,7-^{14}C]-ametoctradin at an actual dose rate of 11.5 mg ai/kg dry feed (range 10.7–13.9 mg ai/kg dry feed) for 10 consecutive days [Fabian and Landsiedel, 2007a, 2007/1016301]. The dose rate is equivalent to 0.81 mg ai/kg bw/day. Average body weights were 1.913 and 1.977 kg at the start and the end of the application period (range 1.592–2.489 kg). Average feed consumption ranged from 128–145 g/animal. The eggs were collected twice daily (except for weekends) and excreta were collected daily during the treatment period. Eggs were separated in egg yolks and egg whites. Approximately 23 hours after the last dose, the hens were sacrificed and the tissues (liver, kidney, muscle, fat), contents of gastrointestinal tract, bile and blood were collected. Samples were stored frozen at -18 °C.

The collected samples were analysed by combustion LSC. The total recovery of radioactivity was found to be 93.2%. Radioactivity from the excreta and cage wash amounted to 92.4% of the total

radioactivity administered, while 0.44% was found in the gastrointestinal tract, 0.01% in blood, 0.03% in liver, 0.06% in muscle, 0.00% in fat and 0.09% in eggs. Concentrations in eggs increased within the first 6 application days (0.011–0.037 mg/kg eq) and reached a plateau from day 6 onwards (0.037–0.040 mg/kg eq). The highest radioactivity concentrations in edible tissues were found in the liver (0.11 mg/kg eq), followed by muscle (0.026 mg/kg eq) and fat (0.014 mg/kg eq). The identification of radioactivity in tissue samples was investigated in Study 2.

Study 2

This study [Kemper and Glässgen, 2008, 2008/1009285] investigated the metabolism of ametoctradin by extraction and analysis of samples of eggs (pooled 6–10 samples), muscle, liver, and fat, generated in study 1 [Fabian and Landsiedel, 2007a, 2007/1016301]. The storage intervals from sampling to extraction varied from 28 days (eggs, liver and muscle) for first extraction to 705 days for second extraction (re-work up to determine storage stability in muscle matrix). Time interval between sampling and analyses ranged from 98–747 days.

A variety of extraction and clean-up methods were employed to analyse residues in the edible tissues and eggs. Subsamples of eggs and homogenized subsamples of tissues and organs (combined samples of nine animals) were generally extracted with MeOH and water (fat with MeOH only). Due to inhomogeneity of the samples, the total radioactive residues (TRR) were determined by summing the extractable radioactive residue and the residues radioactive residue after solvent extraction. The TRR accounted for 0.037 mg/kg eq in eggs, 0.10 mg/kg eq for liver, 0.024 mg/kg eq for muscle and 0008 mg/kg eq for fat, respectively. TRR in kidney tissue was not investigated.

The extractable residues amounted to 81.6% TRR for eggs, 52% TRR for liver, 44.5% TRR for muscle, and 66.2% TRR for fat. Most of the radioactive residues of egg, liver and muscle were extracted with MeOH and minor portions (up to 2.1% TRR) were subsequently extracted with water. The remaining solids accounted for 18.4% TRR in egg, 48%TRR in liver, 55.5% TRR in muscle and 33.8% TRR in fat. The extractability is shown in Table 4.

The MeOH extracts from egg, liver and fat were partitioned between isohexane and MeOH. The MeOH phases of egg, liver and fat were concentrated and taken up in water. The concentrated water phases of egg and liver were partitioned between EtOAc and water. Subsamples of the EtOAc phase of eggs were treated with ß-glucuronidase/arylsulfatase (overnight, 37 °C) and partitioned between isohexane and EtOAc. A subsample of the concentrated water phase of eggs was mixed with acetone and allowed to stand in a refrigerator for several days to precipitate proteins. The acetone mixture was centrifuged and the acetone supernatant was decanted and concentrated to the aqueous phase. The protein precipitate was treated with protease (pH 7, 24 hrs, 37 °C).

The solids remaining after initial extraction from eggs, liver, muscle and fat were subjected to sequential solubilisation procedures: protease treatment (pH 7, 24 hours, 37 °C), artificial gastric juice treatment (overnight, 37 °C), and 1 M HCl treatment. The protease solubilisates from eggs, liver, and muscle were partitioned between EtOAc and water, while the water phase was fractionated by SPE. In case of liver, the eluates from the SPE column were treated with ß-glucuronidase/arylsulfatase (overnight, 37 °C), followed by a second SPE fractionation. The gastric juice solubilisates from liver and muscle were partitioned between EtOAc and water.

All fractions were analysed by LSC. The identification and quantification of metabolites in the various fractions was accomplished by HPLC (at least two methods). Identification in extracts was based on co-chromatography of reference standards or of radioactive metabolites isolated from goat urine (M650F01, M650F06, M650F09) or rat urine (M650F01) or fish tissue (M650F06, M650F09) or commercially supplied radioactive metabolites (M650F03 and M650F04).

The results are shown in Table 5. In eggs the parent compound ametoctradin was the only identified compound (22% TRR, 0.008 mg/kg). In liver and muscle M650F01 (8.7% TRR and 1.9% TRR, 0.009 and 0.000 mg/kg) and M650F06 (1.3% TRR and 1.1% TRR, 0.001 and 0.000 mg/kg) were identified, respectively. In fat, the parent compound ametoctradin (10.7% TRR, 0.001 mg/kg) and M650F01 (28.1% TRR, 0.002 mg/kg) were identified.

Muscle and fat were extracted with MeOH and water for the first time 28 and 42 days after sampling and were re-extracted after 705 and 649 days of storage. A comparison of the extractabilities and the metabolite patterns (HPLC chromatograms) obtained at the beginning and at the end of the investigation period showed that there was no relevant change in the nature of radioactive residues during sample storage over a period of 20 months.

Table 4 Extractability of the radioactive residue in hen tissue in mg/kg eq (%TRR)

Tissue	Liver	Fat	Muscle	Egg
TRR (combustion)	0.112	0.008	0.026	0.040
TRR (ERR+PES)	0.101 (100%)	0.008 (100%)	0.024 (100%)	0.037 (100%)
ERR	0.053 (52.0%)	0.005 (66.2%)	0.011 (44.5%)	0.030 (81.6%)
MeOH extract	0.051 (49.9%)	0.005 (66.2%)	0.010 (43.2%)	0.030 (80.1%)
aqueous extract	0.002 (2.1%)	–	0.0003 (1.4%)	0.0006 (1.5%)
PES	0.049 (48.0%)	0.003 (33.8%)	0.013 (55.5%)	0.007 (18.4%)
protease solubilisate	0.027 (27.1%)[a]	< 0.0005 (5.6%)	0.009 (38.9%)[c]	0.002 (4.8%)[e]
gastric juice solubilisate	0.013 (13%)[b]	0.001 (6.7%)	0.003 (13.8%)[d]	0.002 (5.5%)
1 M HCl extract	0.001 (1.0%)	0.001 (8.0%)	< 0.0005 (1.2%)	0.001 (2.1%)
final PES	0.001 (0.7%)	0.003 (33.1%)	< 0.0005 (0.4%)	0.001 (2.8%)

TRR: total recovered residue; ERR = extractable radioactive residues; PES = post extracted solids;

a Four different HPLC samples showed 2–16 peaks, total 0.001–0.003 mg/kg eq (0.8–2.8%TRR) and application solvent sample 11 peaks none exceeding 2.5% TRR or 0.0025 mg/kg eq (total 0.11 mg/kg eq or 11.3%TRR) and the acetylacetate phase 0.002 mg/kg eq (2.3% TRR).

b Gastric juice solubilisate showed radioactive residue levels in HPLC samples of 0.001–0.005 mg/kg eq or 1.4–5.1%TRR, with no pattern to 7 peaks. The EtOAc phase contained 0.002 mg/kg eq (1.6%TRR).

c Four different HPLC samples showed up to 12 unknown peaks, total < 0.0005-0.004 mg/kg eq (0.2–14.6%TRR). Each of the peaks in the HPLC sample 1–3 was below 0.001 mg/kg or 4% TRR. Sample application solvent 0.002 mg/kg eq (7.7% TRR).

d Gastric juice solubilisate showed radioactive residue levels in HPLC samples of < 0.0005–0.002 mg/kg eq or 1.5–6.7%TRR, with no pattern to four peaks. The EtOAc phase contained < 0.0005 mg/kg eq (1.5%TRR).

e The protease solubilisate consisted of an EtOAc phase with < 0.0005 mg/kg eq (1.0%TRR) and a water phase with 0.001 (2.7%TRR).

Table 5 Identification and characterisation of metabolites in laying hen tissues, eggs (in mg/kg eq (%TRR)

Tissue	TRR (calc.)	Extractable Radioactive Residue (ERR)				PES		Total
		Parent	M650F01	M650F06	unknown residues	Characterised [e]	final residue	
Liver	0.101 (100%)	–	0.009 (8.7%)	0.001 (1.3%)	0.039 (38.7%) [a]	0.041 (41%)	0.001 (0.7%)	0.091 (90.4%)
Fat	0.008 (100%)	0.001 (10.7%)	0.002 (28.1%)	–	0.002 (28.2%) [b]	0.002 (20.4%)	0.003 (33.1%)	0.010 (120.5%)
Muscle	0.024 (100%)	–	0.000 (1.9%)	0.000 (1.1%)	0.010 (42.8%) [c]	0.013 (53.9%)	0.0001 (0.4%)	0.024 (100.2%)
Egg	0.037 (100%)	0.008 (21.8%)	–	–	0.022 (58.7%) [d]	0.005 (12.4%)	0.001 (2.8%)	0.036 (95.8%)

parent: ametoctradin; M650F01 = ω-hetarylbutanoic acid; M650F06= ω-hetarylhexanoic acid; M650F09 = ω-hetaryloctanoic acid

PES = Post extracted solids

a Polar region 0.026 mg kg eq (25.8%), with nine peaks none exceeding 6.7% TRR (0.0068 mg/kg eq) in the concentrated water phase; medium polar region 0.007 mg/kg eq (6.7%TRR) with seven peaks and none exceeding 1.3% TRR or

0.0013 mg/kg eq in the concentrated EtOAc phase; four peaks none exceeding 1.6% TRR or 0.0016 mg/kg eq in the concentrated water phase; volatiles lost during evaporation < 0.0005 mg/kg eq (0.1%TRR).

b. Polar region 0.001 mg kg eq (10.8%), with three peaks none exceeding 7.4% TRR (0.0006 mg/kg eq); medium polar region 0.001 mg/kg eq (11.9%TRR) with six peaks and none exceeding 2.4% TRR or 0.0002 mg/kg eq; volatiles lost during evaporation < 0.0005 mg/kg eq (0.1%TRR).

c. Polar region 0.008 mg kg eq (31.9%), with one highly polar peak 10.9%TRR (0.0026 mg/kg eq) and eight other peaks none exceeding 8.2% TRR or 0.0020 mg/kg eq in concentrate of combined MeOH extract; medium polar region 0.002 mg/kg eq (7.0%TRR) with seven peaks and none exceeding 1.4% TRR or 0.0003 mg/kg eq in combined MeOH extract; non polar region 0.001 mg/kg eq (2.5%TRR) with two peaks none exceeding 1.4% TRR or 0.0003 mg/kg eq in combined MeOH extract; volatiles lost during evaporation < 0.0005 mg/kg eq or 0.01%TRR.

d Polar region 0.008 mg kg eq (22.7%), with one peak 0.65% TRR (0.0002 mg/kg eq) in concentrated EtOAc phase; one peak 22.2% TRR (0.0083 mg/kg eq) in concentrated water phase; medium polar region 0.010 mg/kg eq (25.8%TRR) with eight peaks and none exceeding 4.4% TRR or 0.0016 mg/kg eq in the EtOAc phase; ten peaks none exceeding 1.8% TRR or 0.0007 mg/kg eq in the concentrated water phase; non polar region one peak of < 0.0005 mg/kg eq (0.9%TRR); volatiles lost during evaporation < 0.0005 mg/kg eq or 0.2%TRR.

e PES was subjected to protease solubilisation (with a liquid/liquid partition of egg, liver and muscle) followed by gastric juice treatment (with liquid/liquid partition of liver and muscle tissue) and finally egg, liver, muscle and fat PES samples were extracted with 1 M HCl.

Overview metabolic pathway in livestock

Ametoctradin was transformed to a number of metabolites after administration to ruminants and poultry. The proposed metabolic pathway of ametoctradin in livestock involves a terminal oxidation of the octyl side chain to the carboxylic acid metabolite M650F09 (ω-hetaryloctanoic acid, analogous to the omega-oxidation of fatty acids). Subsequent stepwise shortening of the aliphatic side chain by 2 C-units at a time (analogous to the beta-oxidation of fatty acids) led to metabolite M650F06 (ω-hetarylhexanoic acid) and metabolite M650F01 (ω-hetarylbutanoic acid). The pathway is shown schematically in Figure 3.

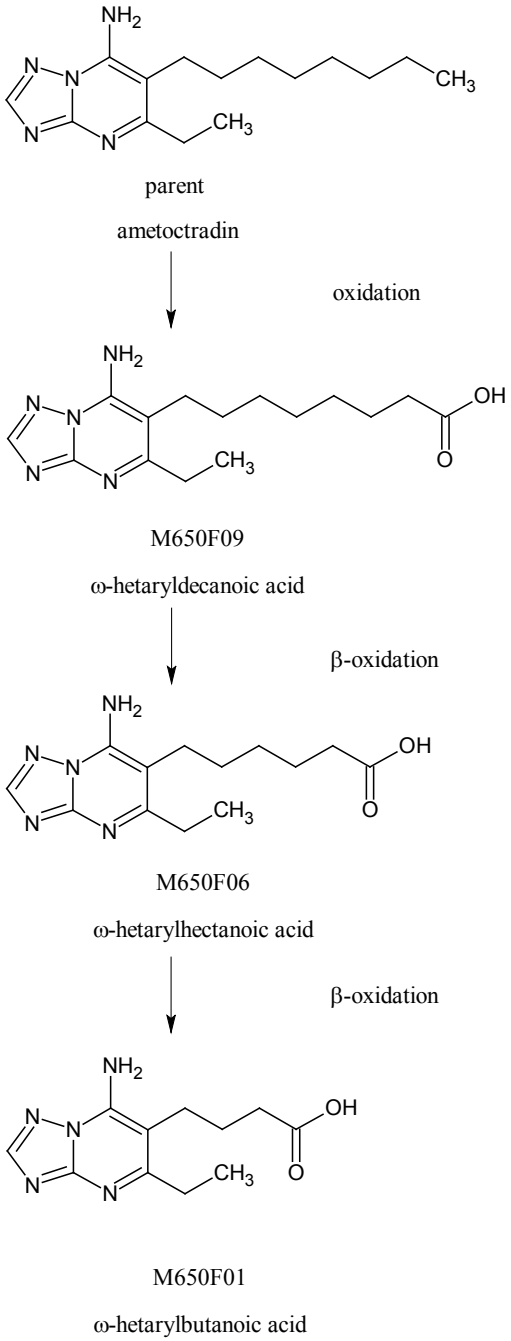


Figure 3 Proposed metabolic pathway of ametoctradin in livestock

Plant metabolism

The Meeting received information on the uptake and translocation of ametoctradin and its soil metabolites in tomato plants. Further, the Meeting received information on the metabolic fate of ametoctradin in fruits (tomatoes), leafy crops (lettuce) and root and tuber vegetables (potatoes). The test items used were (2,7-^{14}C) radiolabeled and (2,5,7-^{13}C) isotope labelled ametoctradin in a ratio of 2:1.

Uptake and translocation studies in/on tomato plants

Study 1

A study was conducted to determine the uptake and translocation of ^{14}C-labelled ametoctradin in potted 4 week old tomato plants (variety "Goldene Konigin") of developmental stage 15 [Schiffer, 2011, 2011/1040790]. Ametoctradin was formulated as BAS 650 AB F in a final concentration of 100 mg/L; the position of the ^{14}C label was not indicated. The formulation was applied with an Eppendorf pipette as small droplets of 0.5 to 1.0 µL to the leaf surface of intact tomato plants. After application the applied compound was allowed to dry (22 °C). The plants were incubated in a growth chamber, 14 hr day (20 °C} 10 hr night (18 °C} at 60% relative humidity. After 1, 3, 7 and 9 days the site of application was covered with cellulose-acetate (CA) solution and allowed to dry (22 °C} The wax layer of the leaves was removed by peeling it from the leaves together with the cellulose acetate film. The CA fraction was redissolved in acetone, diluted into scintillation cocktail and the radioactivity was determined by LSC. The remaining leaf was exposed in a radio-imager for 24 hr to analyse uptake and distribution of ^{14}C-labelled compound.

Uptake of ^{14}C labelled material into the leaves was about 5% of the applied compound, while approximately 90 to 95% stays on the leaf surface attached to the epicuticular wax layer which can be removed by cellulose acetate stripping. The majority of uptake took place within the first day after application. The applied ^{14}C-labelled ametoctradin stayed at the site of application within the leaves showing only local penetration in the leaf cuticle at the point of contact.

Uptake and translocation studies with ametoctradin on leaves from tomato showed low uptake (5%) and essentially no translocation of ^{14}C-labelled ametoctradin.

Study 2

Another study was conducted to determine the uptake and translocation of ^{14}C-M650F03 and ^{14}C-M650F04 by tomato plants via the root system [Ebert, 2008b, 2008/1037072]. Commercially available tomato plants (growth stage 50–60; flowering with development of first small fruits) were prepared by carefully removing the soil substrate from the root system. Individual plants were transferred to aqueous nutrient solutions, containing either 30 µg/L pyrimidine-5-^{14}C-M650F03 or 30 µg/L pyrimidine-5-^{14}C-M650F04. For each test substance five replicates were prepared. The setup was placed in a greenhouse at an ambient temperature between 20 and 25 °C. After 8 days, the tomato plants were carefully removed and the nutrient solutions were measured for by LSC and HPLC. The plants were cut into two parts (root system and green part) and stored frozen until further workup.

Tomato plants took up considerable amounts of water via the root systems. For the flasks filled with ^{14}C-M650F03 solution, the volumes were reduced from 1000 mL at the beginning of the experiment to 611–773 mL after 8 days. For the flasks filled with ^{14}C-M650F04 solution, the volumes were reduced to 460–681 mL. Although the water volumes in the Erlenmayer flasks were decreased considerably by the tomato plants, no significant differences between start and end of incubation were shown in total radioactivity. For M650F03, the average concentration was 28.5 µg/L at the beginning, and 29.8 µg/L after 8 days of tomato cultivation. The respective numbers for M650F04 were 28.3 µg/L at the beginning, and 29.7 µg/L at the end. HPLC analysis of the nutrient solutions after plant removal showed no degradation or metabolisation of M650F03 or M650F04 during 8 days of incubation.

The individual plant samples (green plant and root system separately) were homogenized in frozen condition. Combustion with LSC of the tomato plant parts showed that the radioactivity was rather equally distributed over the whole plants.

From these results it can be concluded that the soil metabolites M650F03 and M650F04 are taken up by tomato plants via the root systems concurrently with the stream of water. The soil metabolites are equally distributed over the whole plants. Tomato roots did not induce metabolisation of these metabolites in the nutrient solution.

Metabolic fate in/on tomato leaves and fruits

The metabolic fate of ametoctradin was studied in green-house grown tomatoes (variety Goldene Königin) after a foliar spray application to the plants at an actual rate of approximately 3× 0.300 kg ai/ha [Rabe and Labib, 2008c, 2008/1006293]. The total rate applied was 0.900 kg ai/ha. The test items used were (2,7-^{14}C) labelled ametoctradin and non-radiolabeled (2,5,7-^{13}C) ametoctradin in a ratio of 2:1. See Figures 1 and 2 for the positions of the labels. Plants were grown on sandy loam soil. The active ingredient was applied at 47, 54 and 61 days after planting as SC formulation using an automatic spray track system. Tomato plants were sampled at maturity 1 day after the last application and separated into leaves and fruits. As tomato leaves are neither a food nor a feed item, they were only used as a source for metabolite isolation and identification. Samples (leaves: 7.4 kg and fruit: 0.86 kg) were stored frozen at -18 °C (for 137 day until extraction and for 141 days until analysis).

Homogenised samples were analysed by combustion/LSC. Subsamples were extracted three times with MeOH followed by two extractions with water. The extracts were combined per solvent. Extracts and remaining solids were analysed by LSC or combustion/LSC. The combined MeOH and (leaves only) water extract were concentrated and analysed by HPLC using parent as only reference substance. The identity of parent ametoctradin in peak isolates from the MeOH extract was confirmed by HPLC-ESI-MS and HPLC-ESI-MS-MS.

The total radioactive residue (TRR) in tomato leaf and fruit (sum of extractable and unextractable radioactivity) was 9.16 and 0.36 mg/kg eq, respectively (TRR by combustion was 12.3 and 0.365 mg/kg eq, respectively). Extractability was 99.3–99.4% TRR. Results are shown in Table 6. The parent compound was the only compound found in leaves (9.035 mg/kg eq or 98.6% TRR) and in fruit (0.357 mg/kg eq or 99.1% TRR).

Storage stability analysis was not conducted, since all analyses were completed within 6 months after sampling.

Table 6 Extractability of radioactivity in tomato leaves and fruit after treatment with 3× 0.300 kg ai/ha

Matrix	DAT	TRR [a]	Distribution of radioactive residues							
			Methanol extract		Water extract		Extractable residue [b]		PES [c]	
		mg/kg	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR
Tomato leaves	1	9.159	9.035	98.6 [d]	0.069	0.8	9.104	99.4	0.055	0.6
Tomato fruits	1	0.360	0.357	99.1 [d]	0.001	0.2	0.358	99.3	0.002	0.7

a TRR = sum of extractable and unextractable radioactivity (PES)

b Methanol extract and water extract combined

c PES = post extracted solids (solids remaining after extraction)

d Identified as parent compound

Metabolic fate in/on lettuce leaves

The metabolic fate of ametoctradin was studied in indoor-grown lettuce (variety Mathilda) after a foliar spray application to the plants at an actual rate of 3× 0.223 kg ai/ha [Rabe and Labib, 2008a, 2007/1043389]. The total amount applied was 0.669 kg ai/ha. The test items used were (2,7-^{14}C) radiolabelled ametoctradin and (2,5,7-^{13}C) stable isotope labelled ametoctradin in a ratio of 2:1. See

Figures 1 and 2 for the positions of the labels. The soil was characterized as gardener soil (Floragard special mixture). The active ingredient was applied on day 21, 31 and 39 days after planting as SC formulation using an automatic spray track system. Mature lettuce leaves were sampled (2.6 kg) seven days after the last treatment (7 DAT). Samples were stored frozen at –18 °C (for 16 days until extraction and for 28 days until analysis).

Homogenised samples were analysed by combustion LSC. Subsamples were extracted three times with MeOH followed by two extractions with water. The extracts were combined per solvent. Extracts and remaining solids were quantified by LSC or combustion LSC. The combined MeOH extract was analysed by HPLC using parent as the only reference substance. The identity of the parent ametoctradin in peak isolates from the MeOH extract was confirmed by HPLC-ESI-MS and HPLC-ESI-MS-MS.

The total radioactive residues in lettuce leaves sampled at DAT 7 accounted for 8.49 mg/kg eq based on extracts (TRR by combustion was 8.14 mg/kg eq). The calculated TRR values were used as 100% TRR for all further calculations. Extractability was 99.3% TRR, predominantly using MeOH (98.9% TRR). Water released only a minor portion (0.4% of the TRR, 0.038 mg/kg eq). The results are shown in Table 7. The parent ametoctradin was the only compound present in the MeOH extract (8.39 mg/kg, 98.9% TRR). No further characterisation was carried out on the combined water extracts (0.4% TRR) nor the remaining solids (0.7% of the TRR).

The initial MeOH extract was obtained 16 days after sampling and analysed 28 days after sampling. Storage stability was addressed by re-analysis of this MeOH extract after 203 days storage at –18 °C (16 days from sampling to extraction and 219 days from sampling to analysis). In addition storage stability was addressed by MeOH re-extraction and HPLC analysis of lettuce leaves after 219 days storage at –18 °C. The HPLC elution profiles of the stored MeOH extract and the fresh MeOH extract of the stored lettuce leaves were similar to those obtained for the initial MeOH extract. TRR were 8.39 and 9.68 mg/kg eq, respectively for the initial extract (28 days sampling to analysis) and the fresh extract from stored lettuce leaves (219 days sampling to analysis). Since ametoctradin was the only compound found in the initial extract and the HPLC profiles were similar for the initial and the stored extracts and freshly extracted stored lettuce samples, it can be concluded that ametoctradin is stable for at least 219 days in homogenised lettuce samples and at least 203 days in MeOH extracts.

Table 7 Extractability of 2,7-^{14}C-ametoctradin (1:2) in lettuce leaves at an actual dose rate of 3× 0.223 kg ai/ha

RAC	DAT	TRR [a]	Distribution of radioactive residues							
			Methanol extract		Water extract		Extractable radioactivity [b]		PES [c]	
		mg/kg	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR
Lettuce leaves	7	8.49	8.39	98.9 [d]	0.038	0.4	8.43	99.3	0.056	0.7

a TRR = sum of extractable and unextractable radioactivity (PES)

b Methanol extract and water extract combined

c PES = post extracted solids (solids remaining after extraction)

d Identified as parent only.

Metabolic fate in/on potato tubers and leaves

The metabolic fate of ametoctradin was studied in indoor-grown potatoes (variety Quarta) after a foliar spray application to the plants at an actual rate of 3× 0.441 kg ai/ha [Rabe and Labib, 2008b, 2007/1048105, Rabe and Labib, 2009a, 2009/1122278]. The total applied rated was 1.32 kg ai/ha. The test items used were [2,7-^{14}C]-ametoctradin and [2,5,7-^{13}C]-ametoctradin in a ratio of 2:1. See Figures 1 and 2 for the positions of the labels. Plants were grown on silty sand soil. The active ingredient was applied at 35, 21 and 7 days prior to harvest as SC formulation using an automatic spray track system. Potato plants at BBCH growth stage 43/44 were sampled 14 days prior to the last treatment (-14 DAT). Mature potatoes at growth stage 93 were harvested 7 days after the last treatment (7 DAT). In

both cases the plant samples were separated into leaves and tubers. As potato leaves are neither a food nor a feed item, they were only used as a source for metabolite isolation and identification. Samples (leaves: 0.24–1.3 kg and tubers: 0.70–4.1 kg) were stored frozen at –18 °C (for 60–61 days until extraction and 78–91 days until analysis).

Homogenised samples were analysed by combustion LSC. Subsamples were extracted three times with MeOH followed by two extractions with water. Extracts and remaining solids were quantified by LSC or combustion LSC. The combined MeOH and (leaves only) water extract were concentrated and analysed by radio HPLC using two different methods. The identity of parent ametoctradin in peak isolates from the MeOH extract was confirmed by HPLC-ESI-MS and HPLC-ESI-MS/MS. The isolate from an unknown polar peak suspected to represent sugars was fermented with yeast and the gases evolving during fermentation were trapped in 0.5 M NaOH. The fermented broth was distilled, radioactivity in all fractions was quantified by LSC and the distillate was analysed by HPLC. Reference compounds used were: parent compound, radio-labelled M650F03 and M650F04 as well as unlabelled reference items M650F01, M650F03 and M650F04. In addition, several metabolites of the parent (M650F01, M650F03, M650F04, M650F13 (or isomer) and M650F14 (or isomer), M65018 (or isomer) and M650F28 (or isomer) were isolated from the MeOH extract of potato leaves and identified by HPLC-MS-MS analysis were also used as reference items.

The total (sum of extractable and unextractable radioactivity) radioactive residues (TRR) in immature potato leaves at (–14 DAT) accounted for 22 mg/kg eq and in mature potato leaves at (7 DAT) the TRR were 45 mg/kg eq. In both mature and immature leaves the extractability was 99% TRR, with the MeOH extract accounting for 98% of TRR (see Table 8). The TRR in the remaining solids was < 1% TRR. The residues in potato leaves were identified primarily as unchanged parent compound ametoctradin (94.5% or 84.3% TRR at BBCH growth stage 43/44 or 93). Metabolites identified and confirmed in a quantitative analysis were: M650F01 and/or M650F04 (0.3%; 0.5%); M650F03 (0.5%; 0.7%), M650F13 (or isomer) and/or M650F14 (or isomer) (< 0.2%; 0.4%), M650F18 (or isomer) (1.9%; 1.8%), and M650F28 (or isomer) (< 0.2; 0.2%). Metabolites M650F05, M650F06, M650F16 and M650F17 were identified, but could not be detected in the quantitative analysis because of their very low concentration (thus < 0.2% TRR). They were found in the very sensitive electrospray triple-quadrupole analysis of sub-fractions of the MeOH extract used for structure identification [BASF, 2012d]. All metabolites detected and/or quantified were each ≤ 0.81 mg/kg eq (≤ 1.9% TRR). In total the identified metabolites in potato leaves were 3.3% TRR (BBCH 43/44) and 4.4% TRR (BBCH 93) and thus of minor importance.

Since the application solution contained two peaks corresponding to the retention times of ametoctradin and M650F18, it is likely that M650F18 originated from the application solution, rather than that it was formed in the potato leaves. M650F18 is not a known impurity from the manufacturing process, but the presence in small amounts in the application formulation could be explained by microbial transformation of the parent compound [BASF, 2012d].

The TRR levels in potato tubers were significantly lower, accounting for 0.025 mg/kg eq in immature tubers (–14 DAT) and 0.041 mg/kg eq in mature tubers (7 DAT). The extractability was high for potato tubers (92% and 89% TRR, respectively for immature and mature tubers) with the MeOH extract accounting for 88% and 81% TRR (see Table 9). The radioactive residues in the remaining solids were 7.6% and 11% TRR. Ametoctradin was the main compound in immature tubers (67% TRR), but represented only 3.6% TRR in mature tubers. Identified metabolites are M650F03 (13% and 40% TRR in immature and mature tubers, respectively) and M650F04 (in mature tubers only, 27% TRR). An overview of the metabolites identified in tubers is given in Table 9.

The initial MeOH extract of mature potato leaves and tubers (BBCH 93) was obtained 60–61 days after sampling and analysed 78–91 days after sampling. Storage stability was addressed by re-analysis of the MeOH extracts of leaves stored for 539–540 days at –18 °C (599–600 days sampling to analysis). In addition storage stability was addressed by MeOH re-extraction and HPLC analysis of mature potato tubers and leaves (BBCH 93) stored for 592–599 days at –18 °C (sampling to analysis). The HPLC elution profiles of the stored MeOH extract and the fresh MeOH extract of the stored potato leaves and tubers were similar to those obtained for the initial MeOH extracts. Methanol

extractabilities for stored potato leave and tuber samples were similar to those of the initial extracts. Since the initial sample analyses were performed 3 months after harvest, no conclusion can be drawn on overall storage stability.

Table 8 Extractability of radioactivity in potato leaves and tubers treated with 3× 0.441kg ai/ha

RAC	DAT	TRR [a]	Distribution of radioactive residues							
			Methanol extract		Water extract		Extractable radioactivity [b]		PES [c]	
		mg/kg	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR
Potato leaves	–14	22.1	21.8	98.3	0.140	0.6	21.89	99.0	0.227	1.0
Potato tubers	–14	0.025	0.022	88.3	0.001	4.1	0.023	92.4	0.002	7.6
Potato leaves	7	44.7	44.0	98.2	0.396	0.9	44.35	99.1	0.387	0.9
Potato tubers	7	0.041	0.034	81.0	0.003	7.7	0.037	88.7	0.005	11.3

a TRR = sum of extractable and unextractable radioactivity (PES)

b Methanol extract and water extract combined

c PES = post extracted solids (solids remaining after extraction)

Table 9 Summary of identified, characterized and final radioactivity extracted from immature and mature potato tubers

Metabolite/Designation	Potato tubers			
	(–14 DAT, immature)		(7 DAT, mature)	
	mg/kg eq	% TRR	mg/kg eq	% TRR
Parent compound	0.017	67.3	0.001	3.6
M650F03	0.003	13.1	0.016	39.5
M650F04	nd	nd	0.011	27.3
Total identified extractable radioactivity [a]	0.020	80.4	0.029	70.3
HPLC polar region in MeOH extract	0.003	12.0	0.004	8.9
Water extract	0.001	4.1	0.003	7.7
Total characterized extractable radioactivity	0.004	16.1	0.007	16.6
Remaining solids (PES)	0.002	7.6	0.005	11.3
Total	0.026	104.1	0.041	98.3

a Identified in MeOH extract

nd = not detected

Overview of metabolic pathway in plants

A translocation study investigating the uptake and translocation of ametoctradin in tomato leaves showed a low uptake of ametoctradin (5%) and essentially no translocation of ametoctradin. The parent compound is the only compound found (98–99% TRR) in tomato fruits, tomato leaves and lettuce leaves after three foliar pre-harvest treatments with ametoctradin over a time span of 15 and 25 days (first application to harvest). It is therefore concluded that parent ametoctradin is hardly taken up by the leaves and fruits, is not translocated and is not metabolised by plants after foliar treatment.

The situation is slightly different for potatoes. After two or three foliar pre-harvest treatments with ametoctradin on potatoes over a time span of 21 or 35 days, parent compound is the major compound found in/on leaves (85–95% TRR), while varying amounts of parent compound were found in the tubers (67% in immature tubers at BBCH 43/44 and 3.6% TRR in mature tubers at BBCH 93,). In potato tubers only two metabolites were identified: M650F03 (13% and 40% TRR, respectively in immature and mature tubers) and M650F04 (27% TRR in mature tubers only). In leaves several metabolites were identified at low levels (< 2% TRR, each): M650F01 and/or

M650F04; M650F03, M650F05, M650F06, M650F13 (or isomer) and/or M650F14 (or isomer), M650F16 (or isomer), M650F17, M650F18 (or isomer) and M650F28 (or isomer)).

From these data it is concluded that ametoctradin is hardly taken up, is not translocated via the leaves or fruits of plants and is not metabolised when sprayed on the leaves of fruits of plants. Since parent compound is found in potato tubers, parent compound is taken up and translocated via the roots of the plants. The presence of metabolites M650F13 and M650F14 in potato leaves indicates that once the parent is inside the plant the parent compound can be metabolised. Since metabolites M650F03 and M650F04 are also identified in soil degradation studies of ametoctradin, and since these metabolites are the only metabolites taken up by rotational crops, it is most likely that these metabolites are the result of uptake from soil via the roots and translocation within the plant, although small amounts may be formed by degradation of the parent compound within the plant. However, since the contribution of the total identified metabolites in leaves is very low (total 3.3–4.4% TRR) and identified residue levels in potato tubers are very low (0.020–0.026 mg/kg eq), uptake from soil and subsequent metabolisation within the plant is considered of minor importance in primary crops.

For parent ametoctradin taken up by the roots and translocated to the leaves, the proposed metabolic pathway of ametoctradin involves a terminal oxidation of the octyl side chain to the respective hydroxy compound and carboxylic acid compound (analogous to the omega-oxidation of fatty acids). Subsequent transformation of the hydroxy compound or carboxylic acid compound via conjugation reactions led to the formation of metabolites M650F13 (or isomer) and/or M650F14 (or isomer). Further degradation of the carboxylic acid compound leads to the formation of M650F06 and M650F01 (loss of subsequent C2-units, analogous to beta-oxidation of fatty acids). Metabolite M650F28 is formed by formation of the ring lactone from metabolite M650F04.

Although metabolite M650F18 (or isomer) could be formed in the plant by degradation of the carboxylic side chain of the parent compound (loss of a C1-unit, analogous to alpha-oxidation of fatty acids), it is more likely that it was present in the application solution. M650F18 is not a known impurity from the manufacturing process, but the presence in small amounts in the application formulation could be explained by microbial transformation of the parent compound. Trace amounts of M650F05 could then be formed by degradation of M650F18 (loss of a C2-unit. analogous to beta-oxidation of fatty acids).

The formation of trace amounts of M650F16 and M650F17 is difficult to explain. The hydrolytic pyrimidine ring cleavage product M650F16 suggests that it has been broken down as a result of vigorous extraction procedures. The conjugation of parent with either acetic acid or 2-hydroxypropane at the CH_3-site as for M650F17 cannot be explained, as such conjugation is rare.

The metabolism scheme is shown in Figure 5 together with the scheme for rotational crops, since the metabolisation scheme is only relevant for compounds taken up from the soil.

Environmental fate in soil

The Meeting received information on photolysis on soil, aerobic and anaerobic degradation in soil, field dissipation studies and confined and field rotational crop studies. In conformance with the JMPR manual 2009, only studies on aerobic degradation in soil and soil photolysis, as well as confined and field rotational crops studies were considered for the current evaluation. The fate and behaviour of ametoctradin in the environment was investigated using the 2,7-^{14}C-labelled compound (see Figure 1).

Aerobic degradation in soil—laboratory studies

Study 1

The rate of aerobic degradation of ametoctradin in three soils at a temperature of 20 °C and in soil at 10 °C was investigated [Janz and Bayer, 2008b, 2008/1012601]. Soil characteristics are reported in Table 10. Soil was 2 mm sieved and adjusted to approximately 40% maximum water holding capacity (MWHC). Soils were stored aerobically at the test facility for less than three months at 4 °C. Batches of 2.1–4.2 kg of soil were incubated in the dark at room temperature for four days to stimulate microbial activity. The surface of a sample of 1.5–3 kg soil dry weight of the pre-incubated soil was

then treated with [2,7-^{14}C] ametoctradin at a nominal rate of 1.067 mg ai/kg dry soil, corresponding with a field application rate of 0.40 kg ai/ha. After mixing, aliquots of 50 g dry weight portions were incubated under a continuous humid air supply in the dark at 20 ± 2 °C (one soil type (Li10) also at 10 °C) for up to 120 days at soil moisture of about 40% MWHC. Volatiles in effluent air were trapped in successively 0.5M NaOH, 0.5M H_2SO_4 and ethylene glycol.

Samples were taken at 0, 1, 2, 3, 6, 10, 15, 30, 62, 93, and 120 days after treatment (DAT). Trapping solutions were sampled and replaced on the same days. All samples generated during the study were analysed as soon as possible, within a few days after generation. The concentrated extracts were kept in a freezer and the extracted and dried soil samples were kept in a refrigerator at 4 °C. Stability of the stored extracts during time of storage was proved. At sampling times 0, 62 and 120 DAT soil samples were worked up in duplicate.

The soil samples were extracted five times with water/ACN (1/1) followed by rinsing the soil once with acetone. Radioactivity in extracts, liquid traps and remaining solids was determined by LSC or combustion LSC. Soil extracts were concentrated and analysed by reversed phase HPLC. Compound identification was by co-chromatography with radio-labelled reference standards of parent and four major metabolites (M650F01, M650F02, M650F03, and M650F04). The identity of ametoctradin and the four major metabolites was confirmed by HPLC-MS-MS. The identity of the two minor metabolites M650F31 and M650F33 was established by MS-MS analysis.

Table 10 Soil characteristics

Soil designation	Lufa 5M (07/1651/03)	Li10 (07/1680/03)	Lufa 2.2 (07/736/03)
Origin	Mechtersheim, RP, Germany	Limburgerhof, RP, Germany	Hanhofen, RP, Germany
Soil type (USDA)	sandy loam	loamy sand	loamy sand
Particle distribution (USDA) [%]			
sand (0.050–2 mm)	61.7	83.3	86.2
silt (0.002–0.050 mm)	28.2	12.2	9.8
clay (< 0.002 mm)	10.1	4.6	4.0
organic C [%]	1.69	0.66	1.88
om [%] [a]	2.91	1.14	3.24
pH (water)	8.0	7.0	6.2
pH (0.01M $CaCl_2$)	7.3	6.3	5.6
CEC (cmol + /kg)	12.2	5.0	6.3
MWHC (g/100 g dry soil)	30.8	23.3	35.3
Microbial biomass (mg C/100 g dry soil):			
—before start of study			
—during study (62 DAT)	30.1	11.2 (20 °C + 10 °C)	27.7
—after end of the study (366 DAT)	24.7	10.8 (20 °C)/10.0 (10 °C)	21.2
	24.9	13.5 (20 °C)/11.3 (10 °C)	20.3

a om = organic carbon × 1.724

Results for the extraction, distribution and identification of radioactivity are given in Table 11 to Table 15. Mass balances ranged between 94 and 105%. Radioactivity in acetone extracts represented ≤ 0.8%TAR in any sample. No radioactivity was detected in 0.5 M H_2SO_4 and ethylene glycol; radioactivity in selected NaOH traps was confirmed to be CO_2 by precipitation using $BaCl_2$. For soils incubated at 20 °C the following results were obtained. The amount of extractable residue decreased from 100% TAR on day 0 to 53–65% TAR on day 120. CO_2 was evolved from the soil to 3.6–6.9% TAR on day 93–120, whilst solids reached maximum values of 30–44% TAR.

Ametoctradin degraded to < 10% TAR within 10–15 days. Metabolites M650F01 (up to 53.9% TAR), M650F02 (up to 11.0% TAR), M650F03 (up to 50.9% TAR) and M650F04 (up to 54.9% TAR) accounted for > 10% TAR at any time. No other metabolites were detected at > 5% TAR during at least two successive samplings. M650F33 and M650F31 were identified at levels < 5% TAR. The levels of unidentified fractions were always ≤ 6.1% TAR (no individual compound exceeded 5% TAR).

In soil Li10 incubated at 10 °C, the rate of degradation of parent ametoctradin was slower, and the formation of non-extractable residues and CO_2 reduced, compared to Li10 soil incubated at 20 °C.

Table 11 Distribution of radioactivity (% TAR) after aerobic incubation at 10 °C or 20 °C of three soils treated with [2,7-^{14}C] ametoctradin (nominal 1.067 mg ai/kg dry soil)

	LUFA 5M 20 °C actual 1.077 mg ai/kg soil			LUFA 2.2 20 °C actual 1.086 mg ai/kg soil			Li10 10 °C actual 1.040 mg ai/kg soil			Li10 20 °C actual 1.040 mg ai/kg soil		
Day [a]	extractable	solids	CO_2	extractable	solids	CO_2	extractable	solids	CO_2	extractable	solids	CO_2
0 (mean)	99.7	0.3	–	99.7	0.3	–	99.7	0.3	–	99.7	0.3	–
1	98.2	2.9	0.0	97.0	3.9	0.1	100.2	0.7	0.0	101.4	1.8	0.0
2	94.2	5.6	0.1	91.2	7.4	0.1	98.9	1.4	0.0	99.9	3.7	0.1
3	89.4	8.3	0.1	88.0	10.3	0.2	99.8	1.9	0.0	99.5	5.7	0.1
6	86.3	13.1	0.2	83.4	17.1	0.3	95.2	3.9	0.0	92.1	10.7	0.1
10	84.8	16.8	0.3	79.0	21.4	0.5	95.9	6.5	0.0	89.0	14.1	0.2
15	76.8	19.4	0.5	74.4	24.1	0.8	93.1	9.1	0.1	85.4	16.3	0.3
30	75.3	28.6	1.1	67.0	27.4	1.7	90.4	13.4	0.1	79.9	23.0	0.9
62 (mean)	66.0	31.9	2.3	59.8	36.6	3.6	84.5	18.9	0.4	73.7	26.2	2.4
93	60.7	34.6	3.7	53.5	44.4	3.6	80.5	20.8	0.7	62.3	29.8	3.6
120 (mean)	61.3	36.5	5.1	53.0	38.8	6.9	76.9	19.8	1.1	64.7	29.9	4.6

a Mean results on day 0, 62 and 120 represent results from replicate flasks.

Table 12 Identification of radioactivity (%TAR) in combined soil extracts of LUFA 5 M soil

Day [a]	parent	M650F01	M650F02	M650F03	M650F04	M650F31	M650F33	sum others	Total extracts
0 (mean)	99.7	–	–	–	–	–	–	–	99.7
1	65.3	16.9	5.1	5.8	–	1.6	–	3.6	98.2
2	39.9	26.3	10.5	11.8	1.3	2.0	2.3	–	94.2
3	24.2	26.0	11.0	20.5	2.8	1.2	2.4	1.4	89.4
6	14.5	7.8	9.1	39.0	7.7	1.0	3.8	3.4	86.3
10	11.5	2.6	5.2	39.4	14.1	2.2	4.4	5.5	84.8
15	4.6	–	1.1	40.8	23.2	1.5	4.1	1.6	76.8
30	2.1	–	1.5	34.9	34.9	–	1.4	0.5	75.3
62 (mean)	1.2	–	0.2	12.1	46.4	2.4	1.7	2.1	66.0
93	0.6	–	–	7.5	50.7	0.5	–	1.4	60.7
120 (mean)	0.7	0.2	0.3	4.3	54.9	–	–	0.9	61.3

= not detected

a Mean results on day 0, 62 and 120 represent results from replicate flasks.

Table 13 Identification of radioactivity (% TAR) in combined soil extracts of LUFA 2.2

Day [a]	parent	M650F01	M650F02	M650F03	M650F04	M650F31	M650F33	sum others	Total extracts
0 (mean)	99.7	–	–	–	–	–	–	–	99.7
1	71.0	17.2	1.2	3.4	–	1.5	–	2.7	97.0
2	47.4	28.4	3.2	7.5	–	2.2	–	2.4	91.2
3	28.0	36.0	3.6	13.2	–	2.6	1.2	3.5	88.0
6	16.4	28.7	4.3	21.0	2.6	3.6	3.2	3.7	83.4
10	9.5	16.4	5.5	34.4	2.6	4.4	1.9	4.2	79.0
15	4.1	7.5	4.7	39.7	4.9	3.3	4.7	5.5b	74.4
30	2.3	1.5	3.3	37.0	9.9	3.0	4.0	6.1c	67.0
62 (mean)	3.0	0.5	0.2	29.4	22.0	2.3	1.6	0.9	59.8

Day [a]	parent	M650F01	M650F02	M650F03	M650F04	M650F31	M650F33	sum others	Total extracts
93	2.2	–	–	19.0	26.8	1.6	–	3.9	53.5
120 (mean)	0.9	0.6	0.4	12.8	30.1	1.7	1.0	5.5	53.0

– = not detected

a Mean results on day 0, 62 and 120 represent results from replicate flasks.

b Several compounds each ≤ 3.0% TAR.

c Several compounds each ≤ 1.8% TAR.

d Several compounds each ≤ 1.7% TAR

Table 14 Identification of radioactivity (% TAR) in combined soil extracts Li10 soil treated at 20 °C

Day [a]	parent	M650F01	M650F02	M650F03	M650F04	M650F31	M650F33	sum others	Total extracts
0 (mean)	99.7	–	–	–	–	–	–	–	99.7
1	86.5	11.4	–	–	–	0.8	–	2.6	101.4
2	69.8	25.0	1.4	1.5	–	1.2	–	0.9	99.9
3	51.8	37.3	2.3	4.0	–	1.6	–	2.6	99.5
6	24.6	52.0	3.6	8.5	0.9	1.2	1.3	–	92.1
10	14.6	53.9	2.4	13.4	2.9	–	–	1.8	89.0
15	8.9	48.3	1.7	21.4	3.6	–	0.7	0.8	85.4
30	5.4	9.4	–	50.9	10.7	–	2.4	1.1	79.9
62 (mean)	5.8	0.5	–	44.9	18.8	1.1	1.1	1.6	73.7
93	3.1	0.3	–	34.8	22.2	0.6	–	1.3	62.3
120 (mean)	3.4	–	–	27.6	30.3	0.6	0.9	1.9	64.7

– = not detected

a Mean results on day 0, 62 and 120 represent results from replicate flasks.

Table 15 Identification of radioactivity (% TAR) of combined soil extracts of Li10 soil treated at 10 °C

Day [a]	parent	M650F01	M650F02	M650F03	M650F04	M650F31	M650F33	sum others	Total extracts
0 (mean)	99.7	–	–	–	–	–	–	–	99.7
1	94.0	5.0	–	–	–	–	–	1.1	100.2
2	84.4	9.2	1.4	1.0	–	0.4	–	2.6	98.9
3	76.6	18.5	1.0	1.3	–	–	–	2.4	99.8
6	54.5	32.7	2.5	3.3	–	–	–	2.2	95.2
10	36.7	51.9	2.7	4.6	–	–	–	–	95.9
15	13.7	66.5	3.7	6.7	0.4	2.0	–	–	93.1
30	8.1	62.5	3.1	12.4	2.4	1.8	–	–	90.4
62 (mean)	7.6	23.9	0.7	41.2	6.2	1.0	1.0	3.0	84.5
93	5.8	2.6	–	57.9	10.4	1.6	–	2.1	80.5
120 (mean)	4.2	1.5	–	52.0	12.3	1.6	1.2	4.0	76.9

– = not detected

a Mean results on day 0, 62 and 120 represent results from replicate flasks

The degradation behaviour of ametoctradin in the individual soils was calculated according to single first-order (SFO), first order multiple compartments (FOMC) and double first-order in parallel (DFOP) kinetics. The estimated best fit dissipation times of ametoctradin are summarized in Table 16. Although SFO kinetics generally resulted in a good fit, the best fits to the analytical data points was in all cases obtained applying DFOP kinetics. Microbial biomass was in the viable range for each soil

and therefore experimentally obtained half-lives reflect standard laboratory conditions. The estimated best fit DT_{50} values of ametoctradin obtained with DFOP kinetics ranged from 1.5 to 3.2 days at 20 °C and was 6.3 days at 10 °C. The DT_{90} values ranged from 7.6 to 12.8 days at 20 °C and 24.8 days at 10 °C.

Table 16 Dissipation times of ametoctradin calculated with the different kinetics

	Temp (8 ºC)	Kinetics [a]	DT_{50} (days)	DT_{90} (days)
LUFA 5M	20	SFO	1.6	5.4
		FOMC	1.4	8.1
		DFOP	1.5	8.4
LUFA 2.2	20	SFO	1.9	6.4
		FOMC	1.8	8.3
		DFOP	1.8	7.6
Li10	20	SFO	3.4	11.2
		FOMC	3.3	12.2
		DFOP	3.2	12.8
Li10	10	SFO	6.6	21.8
		FOMC	6.4	26.1
		DFOP	6.3	24.8

a SFO = single first order; FOMC = first order multiple compartments; DFOP = double first-order in parallel.

Study 2

The aerobic degradation of ametoctradin in test soil collected from a site untreated with pesticides during the previous 5 years was investigated [Janz and Bayer, 2008a, 2008/1012599]. The soil characteristics are reported in Table 17. Following field collection and sieving (2 mm) test soils were stored aerobically at the test facility for less than three months at 4 °C. A batch of 5 kg of soil was adjusted to 40% MWHC and incubated in the dark at room temperature for eight days to stimulate microbial activity. A sample of 1.8 kg soil dry weight of the pre-incubated soil was re-adjusted to 40% MWHC and the soil surface was treated with [2,7-^{14}C] ametoctradin at a target rate of 1.92 mg/kg dry soil (actual rate 1.860 mg ai/kg dry soil), with an equivalent field application rate of 0.72 kg ai/ha. After mixing aliquots of 50 g dry weight portions were incubated under a continuous humid air supply in the dark at 20 ± 2 °C for up to 360 days at soil moisture of 40% of the MWHC. Volatiles in effluent air were trapped in successively 0.5 M NaOH, 0.5 M H_2SO_4 and ethylene glycol.

Table 17 Soil characteristics

Soil	Bruch West (Limburgerhof, RP, Germany)
Soil type (USDA)	sandy loam
Particle distribution (USDA) (%) sand (0.050–2 mm) silt (0.002–0.050 mm) clay (< 0.002 mm)	 64 25 12
organic C (%)	2.62
om (%) [a]	4.52
pH (water)	7.8
pH (0.01 M $CaCl_2$)	7.3
CEC (cmol + /kg)	12.1
MWHC (g/100 g)	40.24
Microbial biomass (start) [b]	31.4 mg C/100 g
Microbial biomass (121 d) [b]	29.0 mg C/100 g
Microbial biomass (366 d) [b]	20.7 mg C/100 g

a om = organic carbon × 1.724

b Determined in samples treated with acetone only using the substrate induced respiration method.

Duplicate soil samples were analysed immediately after treatment and on days 1 and 360 and single samples 2, 3, 6, 10, 15, 30, 62, 90, 119, 181 and 269 days post-treatment. Trapping solutions were sampled and replaced on the same days. All samples generated during the study were analysed

as soon as possible, within a few days after generation. The concentrated extracts were kept in a freezer and the extracted and dried soil samples were kept in a refrigerator at 4 °C. Stability of soil and stored extracts during time of storage was proved to be stable in soil for at least 9 months.

Soil samples collected up to day 15 (except day 10) were extracted three times with ACN, three times with water/MeOH (3/1) and once with acetone. Soil samples from other samplings were extracted twice with ACN, four times with water/MeOH (3/1) and once with acetone. Remaining solids were further characterized by NaOH extraction and subsequent fractionation into fulvic acid, humic acid and humin. The fulvic fraction was further characterised by partitioning with EtOAc followed by LSC of both phases and HPLC of the organic phase. Radioactivity in extracts, liquid traps and remaining solids was determined by LSC or combustion/LSC. Soil extracts were concentrated and analysed by reversed phase HPLC. Compound identification was by co-chromatography with labelled reference standards (M650F03 and M650F04) and unlabelled reference standards (M650F01, M650F02, M650F03, M650F04). The identity of ametoctradin and the four major metabolites was confirmed by HPLC-MS-MS and ^{1}H-NMR in extracts from an incubation performed at an exaggerated dose of 10 mg/kg.

Results for the extraction, distribution and identification of radioactivity are given in Table 18. The amount of extractable decreased from 98% TAR on day 0 to 18% TAR on day 360. CO_2 was evolved from the soil to 14–20% TAR on day 90–119 and a maximum of 42% TAR on day 360. Remaining solids increased to 28–30% TAR on day 90–119, reached a maximum of 31% TAR on day 269 and remained at a comparable level (29% TAR) until study end.

Identification results are presented in Table 19. Ametoctradin degraded to < 10% TAR after 10 days. Metabolites M650F01 (max. 31.2% TAR on day 2), M650F02 (max. 13.0% TAR on day 3), M650F03 (max. 57.0% TAR on day 10) and M650F04 (max. 25.2% TAR on day 119) accounted for > 10% TAR at any time. No other metabolites were detected at > 5% TAR during at least two successive samplings. The levels of unidentified fractions were always ≤ 2.9% TAR. Remaining solids were shown to consist of humic acids (1–2% TAR), humin (2–18% TAR) and fulvic acids (3–13% TAR). Only a small portion (0.2–2% TAR) of the radioactivity in fulvic acids partitioned into EtOAc, and these low amounts mainly consisted of ametoctradin in early samples (day 1-6) or M650F04 in later samples.

Table 18 Distribution of radioactivity (% TAR) after aerobic incubation at 20°C of soil Bruch West treated with [2,7-^{14}C] ametoctradin (actual 1.86 mg ai/kg dry soil)

	extractable						
Day [a]	ACN	H_2O/ MeOH	acetone	total extracted	solids	CO_2 [b]	Total Recovered
0 (mean)	90	6.9	0.8	98	2.3	–	100
1 (mean)	57	37	0.9	95	7.0	0.0	102
2	34	57	1.1	92	8.6	0.1	101
3	23	62	1.0	86	11	0.2	97
6	14	68	0.9	83	13	0.4	96
10	8.8	74	1.1	84	14	0.7	99
15	6.9	72	0.9	80	18	1.2	99
30	3.9	70	0.7	74	21	3.3	99
62	2.2	61	0.5	63	28	8.5	99
90	2.0	49	0.3	51	28	14	94
119	1.8	44	0.7	46	30	20	96
181	1.7	35	0.3	37	29	29	95
269	1.5	25	0.2	27	31	40	97
360 (mean)	1.5	16	0.2	18	29	42	88

a Results on day 0, 1 and 360 represent results from replicate flasks.

b No radioactivity was detected in 0.5 M H_2SO_4 and ethylene glycol; radioactivity in selected NaOH traps was confirmed to be CO_2 by precipitation using $BaCl_2$.

Table 19 Identification of radioactivity (%TAR) in soil extracts of soil Bruch West

Day [a]	parent	M650F01	M650F02	M650F03	M650F04	UK-1 [b]	UK-2 [c]	sum others	Total extracts
0 (mean)	96.1	1.1	–	0.1	–	–	0.1	0.4	97.8
1 (mean)	56.2	21.9	6.8	5.7	–	–	2.9	1.5	95.0
2	37.2	31.2	11.0	13.0	–	–	–	–	92.4
3	20.9	30.9	13.0	17.9	-	2.5	0.5	–	85.8
6	13.2	17.5	12.7	34.2	1.5	1.4	–	2.1	82.6
10	7.8	–	11.4	57.0	6.2	1.5	–	0.2	84.1
15	6.8	–	0.7	55.8	15.8	1.0	–	–	80.1
30	3.9	–	–	48.8	21.5	–	–	–	74.3
62	2.2	–	–	39.2	19.4	–	–	2.4	63.3
90	1.7	–	–	25.0	22.5	–	–	2.2	51.4
119	1.8	–	–	18.9	25.2	–	–	0.4	46.3
181	1.1	–	–	11.9	22.3	–	–	1.5	36.8
269	0.6	–	–	4.4	19.9	–	–	1.8	26.7
360 (mean)	0.8	–	–	1.8	13.4	–	–	1.4	17.5

a Results on day 0, 1 and 360 represent results from replicate flasks.

b Based on the results from study 1 of this section, UK-1 was assumed to consist of the methyl ester of M650F02 (M650F31) and/or the aldehyde of M650F04 (M650F33).

c Based on the results from an anaerobic soil degradation study, UK-2 was assumed to represent a short-lived intermediate compound formed by oxidation of the n-octyl side chain of parent ametoctradin.

An overview of the dissipation times of ametoctradin with different kinetic models is given in Table 20. Microbial biomass for Bruch West soil was in the viable range (14.7–73.4 mg C/100 g soil) and therefore experimentally obtained half-lives reflect standard laboratory conditions. The estimated best fit DT_{50} and DT_{90} values for the degradation of ametoctradin in soil Bruch West were obtained with DFOP kinetics and are 1.3 and 7.2 days, respectively.

Table 20 Reported DT_{50} and DT_{90} for ametoctradin according to different kinetic models

Model	DT_{50} (days)	DT_{90} (days)
Single first-order (SFO) [a]	1.4	4.7
First-order multi-compartment (FOMC)	1.2	7.9
Double first-order in parallel (DFOP)	1.3	7.2

a Appropriate for the description of the observed kinetics until day 10.

Studies 3 and 4

Two kinetic evaluations of the metabolic pathway of ametoctradin in soil for derivation of modelling endpoints for the parent compound and its metabolites M650F01, M650F02, M650F03 and M650F04 were performed [Horn, 2008, 2008/1046565 and Horn 2009b, 2009/1072454]. The aim of the evaluations was to derive DT_{50} values as well as metabolite formation fractions for ametoctradin and its four metabolites in soil.

The evaluations are based on the residue data of ametoctradin and its metabolites in four soils obtained from Study 1 (three soils, 120 days study duration) and Study 2 (one soil, 360 days study duration). In the first evaluation single first order kinetics (SFO) was assumed for all compounds and in the second evaluation a biphasic approach for the parent was assumed (DFOP) with SFO for the metabolites. The DT_{50} values estimated are summarized in Table 21. The metabolite formation fractions, expressed in percentages, estimated from the soil degradation studies in both kinetic evaluations are summarized in Table 22.

The estimated DT_{50} values are very similar for all compounds using both statistical approaches for kinetic modelling showing very similar statistical and visual goodness of fit. The

biphasic approach included an additional form from the parent to the sink compartment, which affected mainly the formation of M650F01 from parent (lower formation fraction than in first assessment) and consequently the subsequent formation of M650F03 (higher formation fraction than in SFO approach). This behaviour is expected due to the change in the setup of a dynamic system.

Table 21 Estimated DT_{50} values of ametoctradin ($p< 0.05$, unless indicated otherwise)

Soil	Soil type (USDA)	Model	parent	M650F01	M650F02	M650F03	M650F04
			DT_{50} days	DT_{50} days	DT_{50} days	DT_{50} days	DT_{50} days
Bruch West (360 days)	sandy loam	SFO	1.49	1.94	7.92	72.61	226.2
		biphasic	1.31 [a]	2.39	8.16	65.68	243.4
Li10 (120 days)	loamy sand	SFO	3.53	10.03	6.86	88.14	1000 [b]
		biphasic	3.23 [a]	10.84	7.28 [c]	84.19	1000 [b]
LUFA 2.2 (120 days)	loamy sand	SFO	2.12	2.61	19.65	67.56	1000 [b]
		biphasic	1.80 [a]	3.87	21.63	55.89	1000 [b]
LUFA 5M (120 days)	sandy loam	SFO	1.65	1.21	5.23	32.22	1000 [b]
		biphasic	1.47 [a]	1.62	5.28	28.31	1000 [b]
Geometric mean		SFO	2.07	2.80	8.64	61.09	nc
		biphasic	1.83	3.57	9.08	54.39	nc

nc = not calculated

a Estimated with DFOP. All other DT_{50} are estimated using single first order kinetics (SFO)

b Parameter fixed during estimation as no significant decline of the compound was observed during the study phase and estimation of reliable parameters was not feasible.

c p-value < 0.1.

Table 22 Estimated formation percentages from the kinetic analyses for the various pathways ($p< 0.05$ for all formation fractions) after 120 days (Bruch West) and 360 days (other soils)

Soil	Soil type (USDA)	Model	ametoctradin to M650F01	ametoctradin to M650F02	M650F01 to M650F03	M650F02 to M650F04	M650F03 to M650F04
Bruch West	sandy loam	SFO	80.21	19.79	80.62	100 (fixed)	29.01
		biphasic	67.10	18.61	100 (fixed)	100 (fixed)	28.97
Li10	loamy sand	SFO	94.07	5.93	66.56	100 (fixed)	73.21
		biphasic	92.78	7.22	71.73	100 (fixed)	66.59
LUFA 2.2	loamy sand	SFO	92.17	7.83	52.66	100 (fixed)	74.95
		biphasic	67.07	6.42	79.88	100 (fixed)	64.99
LUFA 5M	sandy loam	SFO	82.65	17.35	62.57	100 (fixed)	85.53
		biphasic	66.51	17.49	85.27	100 (fixed)	74.02
arrhythmic mean		2008	SFO	12.72	65.60	100 (fixed)	65.68
		2009	biphasic	12.44	84.22	100 (fixed)	58.64

Study 5

The rate of aerobic degradation of M650F03 (soil metabolite of ametoctradin) in soil was investigated [Hassink, 2008b, 2008/1010539] in four different agricultural soils at 20 °C. The soils were taken freshly from the field, 2 mm sieved and characterised. The soil characteristics are summarized in Table 23. Batches of approximately 2400 g dry soil were treated at a nominal rate of 0.53 mg [pyrimidine-5-^{14}C]-M650F03 (actual rates 0.51–0.55 mg/kg dry soil), corresponding to a field application rate of 0.200 kg ai/ha. Prior to treatment soils were adjusted to 40% of the maximum water holding capacity and pre-incubated for 2 days at 20 °C. Soil portions of 100 gram (dry weight) were incubated at 20 ± 2 °C in an incubator with an open gas flow system. Volatiles were trapped by a system of flasks containing ethylene glycol and aqueous NaOH for trapping organic volatiles and $^{14}CO_2$, respectively.

Sampling intervals of soil were 0, 2, 14, 28/29/30, 59/61/62, 90/91 and 120 days after treatment (DAT). All samples, extracts and fractions generated during the study were analysed as

soon as possible, usually within a few days after generation. For storage, they were kept in a refrigerator or freezer. Stability of the samples during storage was confirmed in each case.

Soil samples were extracted three times with MeOH, three times with MeOH/water (1:1) and three times with water. The respective extracts were pooled. Extracts, trapping solutions and remaining solids were analysed by LSC or combustion LSC. Each extract was measured by HPLC. The test item ^{14}C-M650F03 was identified by co-chromatography with non-radiolabeled M650F03.

Table 23 Soil characteristics

Soil designation	LUFA 3A	LUFA 2.2	LUFA 2.3	ARI-06-518
Origin	Germany	Germany	Germany	Wisconsin (USA)
Soil type (USDA)	loam	loamy sand	sandy loam	sand
Particle distribution (USDA) (%)				
sand (0.050–2 mm)	33.7	83.3	61.9	89.1
silt (0.002–0.050 mm)	44.1	10.7	29.0	6.5
clay (< 0.002 mm)	22.1	6.0	9.1	4.4
organic C (%)	3.57	1.91	0.97	1.21
om (%) [a]	6.15	3.29	1.67	2.09
pH (water)	7.6	6.5	7.7	6.3
pH (0.01 M $CaCl_2$)	7.3	5.7	6.7	5.4
CEC (cmol + /kg)	22.0	7.9	6.2	4.9
MWHC (g/100 g dry soil)	40.2	43.2	36.3	30.9
Microbial biomass (mg C/100 g dry soil):				
—before start of study	96.1	28.1	16.9	24.0
—after end of the study (120 DAT)	82.3	19.1	17.2	12.7

a om (organic matter) = organic carbon × 1.724

The test item and metabolite M650F04 represented the major radioactive percentage in the extract of all four soils at all time points, with M650F03 decreasing over time and M650F04 increasing over time. The rate of degradation of M650F03 was different in the soils tested; final levels of M650F03 after 120 days ranging between 5.7–33% TAR at the end of incubation (120 days). The amount of metabolite M650F04 continuously increased in the course of the study with 31–44% TAR present at 120 days. A number of degradation products were formed in the various soils, but all in minor amounts (< 5% TAR) with a maximum of 6% TAR in one sample (soil Wisconsin, 91 DAT). The results are presented in Table 24.

Table 24 Radio-HPLC analyses of extracts of soils incubated with ^{14}C M650F03 expressed as%TAR in four different soils at different time points during incubation

Soil	LUFA 3A			LUFA2.2			LUFA 2.3			Wisconsin		
Time (days)	M650F03	M650F04	Others [a]	M650F03	M650F04	Others [a]	M650F03	M650F04	Others [a]	M650F03	M650F04	Others [a]
0 [b]	97.61	nd	nd	94.47	0.38	0.45	99.31	nd	nd	87.20	nd	0.66
2	84.42	2.79	nd	83.05	0.57	0.39	92.11	nd	nd	72.42	0.19	1.03
7	80.42	4.67	nd	73.57	2.64	1.76	77.01	1.02	nd	70.83	6.32	3.97
14	78.14	4.25	4.58	57.41	3.95	0.15	73.85	3.68	nd	66.46	9.56	0.39
28–30	57.43	9.33	8.26	58.50	7.81	1.70	46.52	14.53	nd	49.99	17.50	1.59
59–62 [b]	53.56	15.77	4.24	37.14	19.07	0.77	23.03	30.00	nd	22.81	24.18	16.44
90–91	41.75	21.67	4.26	21.13	28.80	1.76	11.81	29.81	nd	14.98	35.96	6.10
120	33.23	32.00	4.58	9.34	35.50	1.33	5.70	30.69	nd	9.15	44.30	2.99

nd = not detected

a Each peak less than 5% TAR except one single peak, only detected once in the 91 DAT sample of the Wisconsin soil.

b Result is the average of two replicate flasks

An overview of the dissipation times of M650F03 with different kinetic models is given in Table 25. The degradation rates could be well described by single first order (SFO) kinetics. Only for the Lufa 3A soil biphasic kinetics yielded a better fit (DFOP). Microbial biomass was in the viable range (14.7–73.4 mg C/100 g soil) for all soils, except LUFA 3A (82.3–96.1 mg/100 g). For LUFA 3A the microbial biomass does not reflect standard laboratory conditions. Therefore this study is not taken into account for DT_{50} estimation. The estimated best fit DT_{50} values of M650F03 for the other three soils ranged from 28.8 days to 43.2 days. The DT_{90} values for these three soils were in the range of 95.8 days to 143.5 days.

Table 25 Dissipation times of M650F03 calculated with different kinetics

Soil	SFO		FOMC		DFOP	
	DT_{50} (days)	DT_{90} (days)	DT_{50} (days)	DT_{90} (days)	DT_{50} (days)	DT_{90} (days)
LUFA 2.2	43.2	143.5	38.9	188.9	nc	nc
LUFA 2.3	28.8	95.8	27.8	100.2	nc	nc
LUFA 3A [a]	74.8	248.6	66.7	2032.6	68.2	273.7
Wisconsin	34.8	115.6	34.6	116.9	nc	nc

nc = not calculated

a Microbial biomass (82.3–96.1 mg C/100 g soil) outside the viable range (14.7–73.4 mg C/100 g soil)

Study 6

In a kinetic evaluation the formation of M650F04 from its precursor metabolite M650F03 in four soil types was performed [Tilting, 2008c, 2008/1046564] using the data derived from Study 5 [Hassink, 2008b, 2008/1010539], where the aerobic degradation of M650F03 was investigated.

A reliable estimate of the degradation rate constant of metabolite M650F04 was not possible, because the concentrations of M650F04 were steadily increasing during the study period (120 days). This period was considered too short to estimate the degradation of metabolite M650F04. After fixing the degradation rate constant to zero, the formation fractions of M650F04 from precursor M650F03 were in the range of 35–50% ($p< 0.05$). The formation fractions of M650F04 can only be used as indicative values as the degradation rates had been fixed to zero. Reliable estimates of the degradation of M650F04 in four soils are available in Study 7 [Staudenmaier, 2008, 2007/1057457].

Study 7

The rate of aerobic degradation of M650F04 (a soil metabolite of ametoctradin) in soil was investigated [Staudenmaier, 2008, 2007/1057457] in four different agricultural soils at 20 °C. The soils were taken freshly from the field, 2 mm sieved and characterised. The soil characteristics are summarized in Table 26. Batches of approximately 2300 g dry soil were treated at a nominal rate of 0.53 mg [pyrimidine-5-^{14}C]-M650F04 (actual rates not provided), corresponding to a field application rate of 0.200 kg ai/ha. Prior to treatment soils were adjusted to 40% of the MWHC and pre-incubated for 2 days at 20 °C. Soil portions of 100 g (dry weight) were weighed into glass vessels and incubated at 20 ± 2 °C in an incubator with an open gas flow system. Volatiles were trapped by a system of flasks containing ethylene glycol and aqueous NaOH for trapping organic volatiles and $^{14}CO_2$, respectively.

Sampling intervals of soil were 0, 3, 14/15, 28/30, 44, 58/62/63, 90/91 and 119/120 days after treatment (DAT). All samples, extracts, and fractions generated during the study were analysed as soon as possible, usually within a few days after generation. For storage, they were kept in a refrigerator or freezer. A few samples were stored up to 6 months prior to analysis. Work-up and analysis of additional replicate samples after 13 months led to similar results as the original analyses, showing that samples are sufficiently stable under storage conditions.

Soil samples were extracted three times with MeOH/water (1 + 1 + 0.1% formic acid) and three times with water. The extracts, trapping solutions and remaining solids were analysed by LSC.

Extracts were cleaned-up by SPE, concentrated and subjected to radio-HPLC analysis. Non-labelled M650F04 was used as reference item.

Table 26 Soil characteristics

Soil designation	LUFA 3A	LUFA 2.3	Birkenheide	ARI-06-518
Origin	Germany	Germany	Germany	Wisconsin (USA)
Soil type (USDA)	loam	sandy loam	loamy sand	loamy sand
Particle distribution (USDA) (%)				
sand (0.050–2 mm)	40.2	59.0	78.1	87.2
silt (0.002–0.050 mm)	41.3	31.2	14.9	6.7
clay (< 0.002 mm)	18.5	9.8	6.9	6.1
organic C (%)	3.23	0.89	0.69	0.77
om (%) [a]	5.57	1.53	1.19	1.33
pH (water)	7.8	7.4	7.0	6.6
pH (0.01 M $CaCl_2$)	7.2	6.6	6.1	5.5
CEC (cmol+/kg)	20.4	7.7	4.2	6.8
MWHC (g/100 g dry soil)	41.6	31.8	24.2	31.1
Microbial biomass (mg C/100 g dry soil):				
—before start of study	82.9	13.6	20.2	9.9
—at about 60 DAT	84.1	12.8	18.6	7.7
—after end of the study (120 DAT)	75.9	10.7	17.0	7.4

a om (organic matter) = organic carbon × 1.724

Total mean recoveries for the four soils were in the range from 92.8 to 100.7% of the total applied radioactivity (%TAR). During the course of the study, the amount of extractable radioactivity decreased to 18.8–74.6% TAR after 119/120 days of incubation. Most of the radioactivity could be extracted with MeOH/water, whereas the amount of radioactivity in the water extracts was always below 8% TAR. The remaining solids increased steadily to 20.0–45.9% TAR at the end of the incubation. The extent of mineralization ranged from 5.1%TAR to 29.9% TAR. No other volatile products were detected except low amounts in one soil towards the end of the study.

The test item ^{14}C-M650F04 represented the only major radioactive fraction in the extract of all soils during incubation. The degradation of M650M04 was slow to moderately fast in the tested soils, reaching 9.1–69.1%TAR at the end of incubation. The results are shown in Table 27.

Table 27 Radio HPLC analysis of extracts of soils incubated with ^{14}C-M650F04 under aerobic conditions (%TAR)

	LUFA 3A		LUFA 2.3		Birkenheide		Wisconsin	
Time (days)	M650F04 (%TAR)	sum others [a] (%TAR)	M650F04 (%TAR)	sum others [a] (%TAR)	M650F04 (%TAR)	sum others [a] (%TAR)	M650F04 (%TAR)	sum others [a] (%TAR)
0 [c]	98.6 [b]	–	95.3	0.2	96.4	0.8	93.6	–
3	80.4	3.8	84.4	0.1	92.2	4.2	93.5	3.2
7	69.6	6.2	82.3	0.2	89.9	4.9	89.0	3.1
14–15 [c]	61.2	4.4	76.0	0.5	86.1	7.0	83.8	2.8
28–30 [c]	44.2	5.6	67.7	0.5	86.2	5.5	76.6	0.8
44	40.4	5.1	61.1	1.5	84.1	5.1	76.0	2.6
58–63 [c]	37.0	8.9	59.7	2.1	78.5	4.5	71.2	3.0
90–91 [c]	17.7	6.5	53.2	2.4	76.4	1.6	55.9	5.6
119–120 [c]	9.1	9.8	42.8	2.4	69.1	5.6	48.2	4.5

a Two distinct peaks at 8.4 min and 14.9 min plus others including losses from SPE workup.

b SPE losses disregarded.

c Average of two replicate flasks

The dissipation times of M650F04 were calculated according to single first order kinetics (SFO) as well as according to first-order multiple compartment (FOMC) or double first order in parallel (DFOP) kinetics. Results are shown in Table 28. The best fits were obtained with SFO for two soils (Birkenheide and Wisconsin) and DFOP for two other soils (LUFA 3A and 2.3). Microbial

biomass was inside the viable range (14.7–73.4 mg C/100 g soil) for soil Birkenheide only. For LUFA 2.3, Wisconsin and soil LUFA 3A the microbial biomass does not reflect standard laboratory conditions. These soils are therefore not taken into account for DT_{50} estimation. The best fit DT_{50} and DT_{90} estimates of M650F04 was 268 days and 892 days, respectively, based on Birkenheide soil only.

Table 28 Dissipation times of M650F04 calculated with different kinetics

Soil	SFO		FOMC		DFOP	
	DT_{50} (days)	DT_{90} (days)	DT_{50} (days)	DT_{90} (days)	DT_{50} (days)	DT_{90} (days)
LUFA 3A [a]	37.6	125	26.5	216	27.9 best fit	139 best fit
LUFA 2.3 [a]	105	350	113	8609	102 best fit	420 best fit
Birkenheide	268 best fit	892 best fit	675	223313	nc	nc
Wisconsin [a]	132 best fit	439 best fit	126	253	nc	nc

nc = not calculated

a Microbial biomass was outside the viable range (14.7–73.4 mg C/100 g soil).

Soil photolysis

Sandy loam (Limburgerhof, Bruch West) was collected from a site untreated with pesticides during the previous 5 years [Hassink, 2008c, 2007/1057434]. Soil characteristics are reported in Table 29. Aliquots of soils, sieved through 2 mm and adjusted to 40% of the MWHC, were dispensed into steel dishes and [2,7-^{14}C] ametoctradin was applied to the surface of the soil in each dish (dose 2.7 mg ai/kg dry soil), equivalent to a field application rate of 0.40 kg ai/ha. Treated soil was incubated at 22 ± 1 °C for up to 15 days under continuous irradiation by a Xenon arc lamp (equipped with filter with cut-off at 290 nm) under a continuous humid CO_2 reduced air supply. The light intensity was adjusted to 3 mW/cm^2 simulating a clear summer day at 48 °N. Volatiles in effluent air were trapped in 0.5 M NaOH, 0.5 M H_2SO_4 and ethylene glycol. Dark control samples were prepared in the same way and incubated in the same apparatus, but the apparatus with the samples were stored in a climatic chamber at 22 °C in the dark. Duplicate samples were taken on days 0, 1, 4, 7, 11 and 15 days after treatment (DAT) from both the photolysis test system and the dark control. Trapping solutions were sampled and replaced on the same days.

Table 29 Soil characteristics

soil name	soil Bruch West
soil type (USDA)	sandy loam
particle size (USDA) sand (50–2000 µm) silt (2–50 µm) clay (< 2 µm)	 61.3% 27.6% 11.1%
pH (water)	7.7
pH (0.01 M $CaCl_2$)	6.9
Total organic C	2.69%
CEC (cmol + /kg)	12.1
MWHC (g water/100 g dry soil)	33.1 [BASF, 2012d]
Microbial biomass day 0 (mg microbial C/100 g dry soil)	 35.1

TOC = total organic content

CEC = cation exchange capacity

MWHC = maximum water holding capacity

Each soil sample was extracted three times with acetonitrile and three times with MeOH/water (1:1) immediately after sampling. Remaining solids from day 11 and 15 samples (containing > 10% TAR) underwent three extractions with 0.5 M NaOH. Radioactivity in extracts, trapping solutions and remaining solids was determined by LSC or combustion LSC. Soil extracts were concentrated and analysed by reversed phase HPLC. Compound identification was by co-chromatography with unlabelled references standards (M650F01, M650F02, M650F03 and M650F04).

Identification results are shown in Table 30. Ametoctradin degraded to 68% TAR and 27% TAR in irradiated and dark samples respectively. Metabolites M650F01, M650F02 and M650F03 were identified in irradiated samples but at lower levels than in dark samples. The more rapid degradation in the dark resulted in the additional occurrence of M650F04. Other unidentified metabolite fractions were always < 5% TAR. In dark and irradiated samples, low amounts of remaining solids (14% TAR, containing 3–5% humin) and CO_2 (0.5–2.7% TAR) were formed.

Table 30 Recovery and distribution of radioactivity after application of ametoctradin to soil (%TAR)

Time	CO_2	ERR	PES	Total	parent	M650F01	M650F02	M650F03	M650F04	others
Irradiated										
Material balance and recovery					HPLC analysis of ERR extracts (average of 2 replicates)					
0 d	na	102.6	0.3	103.0	102.64	nd	nd	nd	–	nd
1 d	0.1	97.3	2.7	100.1	95.32	0.28	0.05	nd	–	1.61
4 d	0.7	92.1	5.1	97.9	83.71	1.08	1.08	0.47	–	5.73
7 d	1.3	93.4	5.9	100.6	79.70	1.96	1.36	0.36	–	10.0
11 d	2.0	83.0	10.7	95.7	65.80	5.81	2.22	1.04	–	8.14
15 d	2.7	86.0	13.5	102.2	67.72	6.75	3.32	nd	–	8.18
Non-irradiated, dark condition										
Material balance and recovery					HPLC analysis of ERR extracts (average of 2 replicates)					
0 d	na	102.6	0.3	103.0	102.64	nd	nd	nd	nd	nd
1 d	0.1	99.2	1.7	101.0	95.05	0.05	0.11	0.28	0.17	3.58
4 d	0.2	93.0	5.3	98.5	66.98	1.92	0.26	5.72	2.52	15.63
7 d	0.3	88.1	7.5	95.8	45.36	nd	nd	14.86	4.52	23.34
11 d	0.4	89.5	9.6	99.5	43.43	nd	0.55	19.04	7.18	19.31
15 d	0.5	86.3	14.2	101.0	26.59	nd	nd	36.62	3.06	20.01

ERR = Extractable residue; PES = Post extracted solids; nd = not detected

The half-life of ametoctradin under both irradiated and non-irradiated conditions were calculated using pseudo first order kinetics. The photolytic rate constant was calculated form ln Ct = -kt + ln C0. The half-life was calculated from: DT_{50} = ln 2/k. Reported DT_{50} values are summarized in Table 31. Microbial biomass was inside the viable range (14.7–73.4 mg C/100 g soil) and calculated DT_{50} values are considered reliable.

Table 31 Reported half-life of ametoctradin on soil using first order kinetics

	DT_{50} (days)	DT_{90} (days)
Irradiated	22.6	75.0
non-irradiated	7.4	24.6

The rate of degradation of ametoctradin in sandy loam soil during a 15 day exposure to artificial sunlight was lower than the dark control. This is unexpected as ametoctradin has significant absorption at 295 nm [Daum, 2005b, 2005/1014831] and photolysis studies in sterile water showed a moderate decline with DT_{50} = 38.4 days [Hassink, 2008a, 2008/1013105]. Photolysis therefore has the potential to contribute to the degradation of ametoctradin in the environment. However, the study was performed according to the guideline and showed no study deficiencies. It is concluded that degradation of ametoctradin in soil is very fast and that light has no effect on this degradation rate.

Proposed degradation pathway of ametoctradin in soil

The proposed degradation pathway of ametoctradin in soil is shown in Figure 4. The aerobic degradation in soil proceeds primarily via stepwise oxidative cleavage of the n-octyl side chain. Ametoctradin is transformed to M650F01 (ω-hetarylbutanoic acid), M650F02 (ω-hetarylpropanoic acid) and subsequently to M650F03 (hetarylacetic acid) and M650F04 (hetarylcarboxylic acid) by oxidation. Minor metabolite M650F31 is formed by methylation of carboxylic acid group of M650F2, while minor metabolite M650F33 is the aldehyde formed from M650F04. Metabolites underwent further metabolisation by mineralisation to CO_2 or incorporation in humins, humic acids or fulvic acids. Metabolites M650F03 and M650F04 have very long dissipation times in soil (DT_{90} > 100 days).

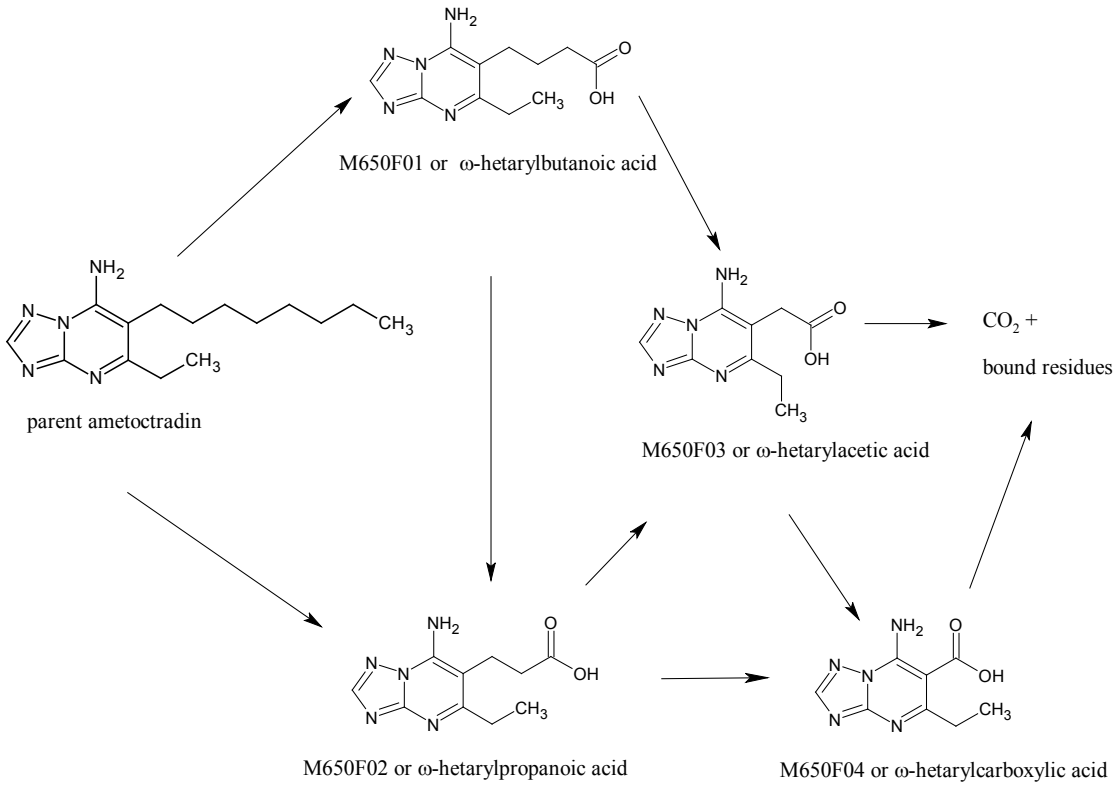


Figure 4 Proposed degradation pathway of ametoctradin in soil.

Confined rotational crop study

The uptake of ametoctradin soil residues by rotational crops was investigated using [2,7-^{14}C] ametoctradin formulated as SC formulation [Rabe and Labib, 2008d, 2008/1013139]. The study was conducted under greenhouse conditions in Limburgerhof, Germany. The test substance was applied by spraying directly on soil in plastic planting containers, 36.5 cm × 56 cm filled up to 25 cm with soil [BASF 2012d], at an application rate of 1× 1.44 kg ai/ha. The soil type USDA loamy sand soil (pH (water) = 7.1, CEC=7.0 cmol + /kg, 1.8% organic carbon). Rotational crops (lettuce, white radish and spring wheat) were sowed or planted at 30, 120 and 365 days after the application of the test substance to the soil (corresponding, respectively to first, second and third rotations). The varieties Nadine (PBI 30 DAT) and Mathilda (PBI 120 DAT and 365 DAT) were used for lettuce, the variety Thasos for spring wheat and the variety April Cross for radish. Immature wheat (forage, hay), mature wheat (grain and straw), immature (28 days after planting) and mature (56 days after planting) lettuce (leaves) and mature radish (roots and tops) were sampled. Soil samples were taken after application, after each plant back interval; and after harvest of the mature crop. After mixing the soil in the plastic containers, the soil samples were taken from different points from the surface [BASF 2012d]. All samples were stored at –18 °C or below for 15 to 728 days (including storage stability monsters) until extraction and 27 to 785 days from sampling to analysis.

Plant and soil samples were analysed by combustion analysis. The homogenized plant samples were successively extracted with MeOH and water. Some remaining solids were extracted with aqueous ammonia and subsequently treated with macerozyme (pectinase, hemicellulase, cellulase) plus cellulase (pH 5, 37 °C, 48 hrs), tyrosinase plus laccase (pH 6.5, 37 °C, 72 hrs), α-amylase plus ß-amylase plus amyloglucosidase (pH 6.1, 37 °C, 72 hrs), followed by a 3 hr reflux with

NaOH solution. All extracts and solids were analysed by LSC, while selected extracts were analysed by HPLC. Identification of the metabolites in the fractions was achieved by LC-MS, LC-MS/MS and NMR on co-chromatography with reference chemicals. Reference compounds used were: parent, M650F03 and M650F04 and radiolabelled fructose, sucrose and glucose, obtained from an external study. In addition, some metabolites were isolated from spring wheat straw and were used as reference items for HPLC peak assignment (MF650F03, M650F04, M650F29, M650F30, M650F32, M650F33, M650F37, M650F38, M650F39 en M650F40).

The distribution of radioactivity in the different soil layers was not determined, as the soil was mixed prior to sampling. Total radioactive residues in soil after aging and ploughing were 8.0, 0.44, 0.28, and 0.095 mg/kg eq at DAT = 0 (after application), 30, 120 and 365, respectively. After harvest of the mature crops the residue concentrations in the soil were lower than prior to planting/sowing (except for lettuce and white radish at 365 DAT), ranging from 0.086–0.211 mg/kg eq. Radioactivity in the soil was not further characterised.

The results in rotational crops are shown in Table 32. All relevant peaks found with radio HPLC in selected extracts were assigned to a structure. Only trace levels of the parent ametoctradin were detectable, whereas the soil metabolites M650F03 and M650F04 are detectable in all crops and matrices. Metabolites M650F01 and M650F02 could not be detected. Taken into account the kinetic of the side chain degradation it is feasible that only the two soil metabolites with the shorter side chain, M650F03 and M650F04, were found [BASF 2012d].

Particularly in wheat matrices, high amounts of the radioactive residues were not extractable with MeOH and water. The effective solubilisation steps were the treatment with aqueous ammonia, macerozyme/cellulase and NaOH reflux. The chromatographic pattern of the aqueous ammonia extracts reflected the metabolite composition also observed in the extractable residue fractions and indicated the release of additional metabolites associated with insoluble plant material (e.g. proteins). These have been indicated as conjugates in Table 32. Treatment with macerozyme-cellulase released sugar compounds which had possibly been associated with or incorporated in insoluble cell wall carbohydrates. The additional portions released with tyrosinase-laccase, amylases-amyloglucosidase and NaOH reflux had possibly been associated with or incorporated in lignin and lignin-carbohydrate complexes and starch.

Samples were stored at approximately -18 °C during the course of the study. Comparison of the extractability at the beginning of the study and at the end of the study showed that there was no relevant change in the nature of the radioactive residues during storage of the samples for a period of at least 14 months.

Table 32 Levels of parent and metabolites in rotational crops after soil treatment with [2,7-^{14}C] ametoctradin

		lettuce leaves [a]	lettuce leaves [b]	radish tops	radish root	wheat forage	wheat straw	wheat chaff	wheat grain
First rotation (sown/planted 30 DAT)									
DAT	days	58	86	119	119	np	140	140	140
DAS	days	28	56	89	89	np	110	110	110
TRR (combustion)	mg/kg	0.080	0.068	2.5	0.62	np	6.0	4.9	1.8
TRR (ERR + PES)	mg/kg	0.073 (100%)	0.060 (100%)	2.4 (100%)	0.66 (100%)	np	6.0 (100%)	5.2 (100%)	1.8 (100%)
parent	%TRR	nd	15.2	nd	nd	–	0.7	nd	nd
sugar compounds [h]	%TRR	14.1	13.1	0.3	2.2	–	0.1	0.1	0.5
sugar compounds-conj.	%TRR	–	–	–	–	–	0.8	1.5	8.0
M650F03	%TRR	41.8	30.2	100	95.8	–	42.9	10.6	10.3
M650F03-conjugate	%TRR	–	–	–	–	–	1.7	0.6	0.5
M650F04	%TRR	9.0	6.5	0.1	1.6	–	25.0	68.9	70.8
M650F04-conjugate	%TRR	–	–	–	–	–	1.3	3.2	2.8
M650F29/M650F30	%TRR	3.2	3.1	0.3	nd	–	2.5	0.4	nd
M650F29/M650F30-conj.	%TRR	–	–	–	–	–	0.1	0.3	0.1
M650F32 [g]	%TRR	1.6	1.5	0.1	nd	–	5.6	2.0	nd

		lettuce leaves [a]	lettuce leaves [b]	radish tops	radish root	wheat forage	wheat straw	wheat chaff	wheat grain
M650F32-conjugate	%TRR	–	–	–	–	–	0.2	nd	nd
M650F33	%TRR	0.7	0.7	nd	nd	–	1.7	nd	1.2
M650F33-conjugate	%TRR	–	–	–	–	–	nd	0.1	0.1
M650F37/M650F38	%TRR	2.1	1.6	nd	nd	–	3.8	0.9	nd
M650F37/M650F38-conjugate	%TRR	–	–	–	–	–	0.1	0.1	nd
M650F39	%TRR	1.0	0.9	2.1	nd	–	4.3	0.7	nd
M650F39-conjugate	%TRR	–	–	–	–	–	0.2	0.1	nd
ERR—polar region [c]	%TRR	1.1	3.7	nd	nd	–	1.4	0.7	nd
ERR—medium polar region [d]	% TRR	7.4	7.1	nd	nd	–	1.2	2.4	0.4
Unknowns in MeOH extract	%TRR	nd	nd	nd	nd	–	nd	nd	nd
Water extract	%TRR	[e]	[e]	—	0.5		[e]	[e]	[e]
aq ammonia solubilisate	%TRR	1.2 [f]	1.4 [f]	np	np	–	0.6	0.3	1.0
macerozyme-cellulase solubilisate	%TRR	np	6.4 [f]	np	np	–	0.6	nd	nd
tyrosinase-laccase solubilisate	%TRR	np	np	np	np	–	0.7 [f]	0.5 [f]	1.0 [f]
amylase-amyloglucosidase solubilisate	%TRR	np	np	np	np	–	0.2 [f]	0.2 [f]	0.4 [f]
NaOH solubilisate	%TRR	np	np	np	np	–	3.0	4.3	np
final residue	%TRR	12.3	4.5	1.2	2.6	–	0.6	0.8	1.7
total	%TRR	95.5	95.9	104	102.7	–	101.3	98.5	98.8
Second rotation (sown/planted 120 DAT)									
DAT	days	150	176	211	211	168	245	245	245
DAS	days	30	56	91	91	48	125	125	125
TRR (combustion)	mg/kg	0.12	0.082	0.30	0.061	2.0	3.9	2.7	1.1
TRR (ERR + PES)	mg/kg	0.097 (100%)	0.064 (100%)	0.28 (100%)	0.062 (100%)	1.7 (100%)	3.8 (100%)	2.7 (100%)	1.2 (100%)
parent	%TRR	nd	nd	nd	nd	0.3	0.8	nd	nd
sugar compounds [h]	%TRR	18.6	18.3	2.4	20.3	nd	0.2	0.2	1.9
sugar compounds-conjugate	%TRR	–	–	–	–	nd	1.1	3.2	11.7
M650F03	%TRR	11.9	8.3	67.1	46.4	19.7	17.1	2.6	1.6
M650F03-conjugate	%TRR	–	–	–	–	0.2	0.5	0.3	0.1
M650F04	%TRR	28.0	30.3	2.7	15.4	50.8	52.3	71.1	69.5
M650F04-conjugate	%TRR	–	–	–	–	0.8	2.2	4.4	3.1
M650F29/M650F30	%TRR	4.6	4.5	3.1	nd	2.4	3.6	0.8	nd
M650F29/M650F30-conjugate	%TRR	–	–	–	–	nd	0.2	0.1	1.4
M650F32 [g]	%TRR	2.5	3.6	nd	nd	4.4	3.9	1.9	nd
M650F32-conjugate	%TRR	–	–	–	–	nd	0.1	0.1	nd
M650F33	%TRR	1.4	0.8	nd	nd	nd	0.8	nd	nd
M650F33-conjugate	%TRR	–	–	–	–	nd	nd	nd	0.1
M650F37/M650F38	%TRR	1.2	1.0	nd	nd	8.4	6.1	1.2	nd
M650F37/M650F38-conjugate	%TRR	–	–	–	–	nd	0.1	0.1	0.3
M650F39	%TRR	3.5	3.9	5.4	nd	0.1	1.9	nd	nd
M650F39-conjugate	%TRR	–	–	–	–	0.1	0.1	nd	nd
ERR—polar region [c]	%TRR	5.2	6.5	6.0	2.7	1.7	0.8	0.8	nd
ERR—medium polar region [d]	%TRR	6.0	4.7	1.1	nd	9.0	2.9	3.8	0.8
Unknowns in MeOH extract	%TRR	nd	nd	nd	2.7	nd	nd	nd	nd
Water extract	%TRR	[e]	[e]	[e]	1.5 [f]	[e]	[e]	[e]	[e]
aq ammonia solubilisate	%TRR	1.6 [f]	2.2 [f]	np	0.7 [f]	0.1	0.1	0.6	0.7
macerozyme-cellulase solubilisate	%TRR	np	8.8 [f]	np	8.8 [f]	1.7	0.1	nd	np

		lettuce leaves [a]	lettuce leaves [b]	radish tops	radish root	wheat forage	wheat straw	wheat chaff	wheat grain
tyrosinase-laccase solubilisate	%TRR	np	np	np	np	0.3 [f]	0.5 [f]	0.4 [f]	np
amylase-amyloglucosidase solubilisate	%TR	np	np	np	np	0.1 [f]	0.2 [f]	0.1 [f]	np
final residue	%TRR	15.4	7.4	9.6	2.6	2.7	5.9	6.4	3.5
total	%TRR	100	100.3	97.4	98.4	104.4	103.1	97.2	98.7
Third rotation (sown/planted 365 DAT)									
DAT	days	400	428	454	454	421	483	483	483
DAS	days	35	63	89	89	56	118	118	118
TRR (combustion)	mg/kg	0.030	0.019	0.069	0.020	0.36	1.3	1.7	0.74
TRR (ERR+PES)	mg/kg	0.025 (100%)	0.016 (100%)	0.062 (100%)	0.018 (100%)	0.36 (100%)	1.2 (100%)	1.7 (100%)	0.84 (100%)
parent	%TRR	nd	nd	nd	nd	nd	nd	nd	nd
sugar compounds [h]	%TRR	8.3	15.2	2.8	18.4	–	0.2	0.4	0.9
sugar compounds-conjugate	%TRR	–	–	–	–	–	nd	nd	6.5
M650F03	%TRR	4.9	4.9	39.1	37.3	11.0	9.8	1.9	0.9
M650F03-conjugate	%TRR	–	–	–	–	–	0.8	0.1	nd
M650F04	%TRR	31.8	26.1	6.2	22.5	60.5	44.2	78.4	79.7
M650F04-conjugate	%TRR	–	–	–	–	–	2.7	4.0	6.4
M650F29/M650F30	%TRR	nd	1.7	6.5	nd	2.2	5.5	1.5	nd
M650F29/M650F30-conjugate	%TRR	–	–	–	–	–	0.1	nd	nd
M650F32 [g]	%TRR	4.3	4.2	nd	1.5	nd	2.4	0.8	nd
M650F32-conjugate	%TRR	–	–	–	–	–	0.1	nd	nd
M650F33	%TRR	nd	nd	nd	0.3	nd	nd	0.4	nd
M650F33-conjugate	%TRR	–	–	–	–	–	nd	nd	nd
M650F37/M650F38	%TRR	0.7	1.1	0.9	1.2	7.6	7.6	0.2	nd
M650F37/M650F38-conjugate	%TRR	–	–	–	–	–	0.4	nd	nd
M650F39	%TRR	2.1	3.5	8.0	1.2	3.5	3.3	0.4	nd
M650F39-conjugate	%TRR	–	–	–	–	–	0.1	0.1	nd
ERR—polar region [c]	%TRR	6.6	8.6	13.5	9.1	2.7	4.3	3.4	nd
ERR—medium polar region [d]	%TRR	6.3	6.7	4.2	1.6	4.7	5.4	2.7	0.2
Unknowns in MeOH extract	%TRR	12.9	15.3	17.7	10.7	7.3	nd	nd	nd
Water extract	%TRR	7.5 [f]	7.6 [f]	10.8 [f]	1.2 [f]	2.6 [f]	[e]	[e]	[e]
aq ammonia solubilisate	%TRR	4.7 [f]	2.3 [f]	np	np	np	0.5	0.3	6.4
macerozyme-cellulase solubilisate	%TRR	np	np	np	np	np	2.0 [f]	1.7 [f]	6.5
tyrosinase-laccase solubilisate	%TRR	np	np	np	np	np	0.7 [f]	0.4 [f]	np
amylase-amyloglucosidase solubilisate	%TRR	np	np	np	np	np	0.2 [f]	0.2 [f]	np
final residue	%TRR	23.6	15.2	9.8	9.7	3.3	6.3	4.6	2.1
total	%TRR	100.7	97.0	101.8	104.1	98.1	97.9	101.3	96.8

DAT = days after treatment of soil

DAS = days after sowing or planting

np = not performed

– = not found, because of experimental set up (no PES characterisation performed, wheat forage not planted at DAT30)

nd = not detected (experimental setup was designed to find this compound/fraction, but no residues detected)

a immature lettuce leaves

b mature lettuce leaves

c ERR (extractable radioactive residues) polar region with retention time < 20 min consists of 1–5 peaks, each < 6.4% TRR (lettuce), each < 9.4% TRR (radish tops or roots), each < 1.4% TRR (wheat forage, straw and chaff), not found in wheat grain

d ERR medium polar region with retention time 20–51 min consists of 1–5 peaks, each < 5.2% TRR (lettuce), < 4.2% TRR (radish tops or roots), each < 8.6% TRR (wheat forage, straw and chaff), each < 0.5% TRR (wheat grain)

e Water extract has been analysed by HPLC, peaks were assigned to known metabolites or to ERR polar or medium polar region

f Extract or solubilisate has not been analysed by HPLC, therefore presence of known metabolites has not been verified.

g Besides M650F32 minor amounts of metabolites M650F39, an isomer of M650F29 and M650F40 could be present. Since the enzymatic formation of the methylether is highly unlikely, M650F40 is not considered a metabolite, but as an artifact, resulting from a non-enzymatic reaction with the extraction solvent MeOH [BASF 2012d].

h Sugar metabolites were identified as fructose, glucose and sucrose.

Proposed metabolism in rotational crops

The proposed degradation pathway of ametoctradin in soil is shown in Figure 4. Based on aerobic soil degradation studies, parent is rapidly degraded in soil (DT_{90} 7.2–12.8 days at 20 °C). After a plant back interval of 30 days or more, it is expected that the parent compound will not be available anymore for plant uptake. Only trace levels of the parent ametoctradin were detectable in lettuce leaves, wheat straw and wheat forage, indicating that parent compound can be taken up by the roots and can be translocated within the plant. From the primary crop studies in potatoes it is clear that parent compound as taken up by the soil, can be metabolised within the plant. However, the metabolites with long carbon side chains as found in the primary crops (M650F06, M650F13 and M650F14) were not found in rotational crops.

Soil degradation products M650F01 and M650F02 were not found in rotational crops. Since the soil degradation products M650F03 and M650F04 have long dissipation times (DT_{90} > 100 days), these compounds will be available for uptake by the plants and further metabolisation within the plant. The proposed metabolic pathway of the soil metabolites M650F03 and M650F04 after uptake via the roots in rotational crops is given Figure 5.

M650F03 can directly be taken up by the soil. Conjugation of M650F03 with glucose led to the formation of metabolite M650F29, while decarboxylation formed metabolite M650F39. Further transformation of metabolite M650F39 generated metabolites M650F32 (hydroxy-compound), M650F33 (aldehyde compound) and M650F40 (methylether compound). Compound M650F40 is not considered as metabolite, but as an artefact resulting from sample work-up in MeOH.

Metabolite M650F04 can directly be taken up from the soil or can be formed by α-oxidation of the carboxylic side chain of M650F03 or by ω-oxidation of metabolite M650F39 (via metabolite M650F32 and M650F033). Hydroxylation of the ethyl side chain of M650F04 followed by an intramolecular esterification produced metabolites M650F37 and M650F38 respectively, while conjugation of M650F04 with glucose formed metabolite M650F30.

In addition, sugar metabolites (probably fructose, glucose and sucrose) were detected, resulting from further degradation of the metabolites mentioned above.

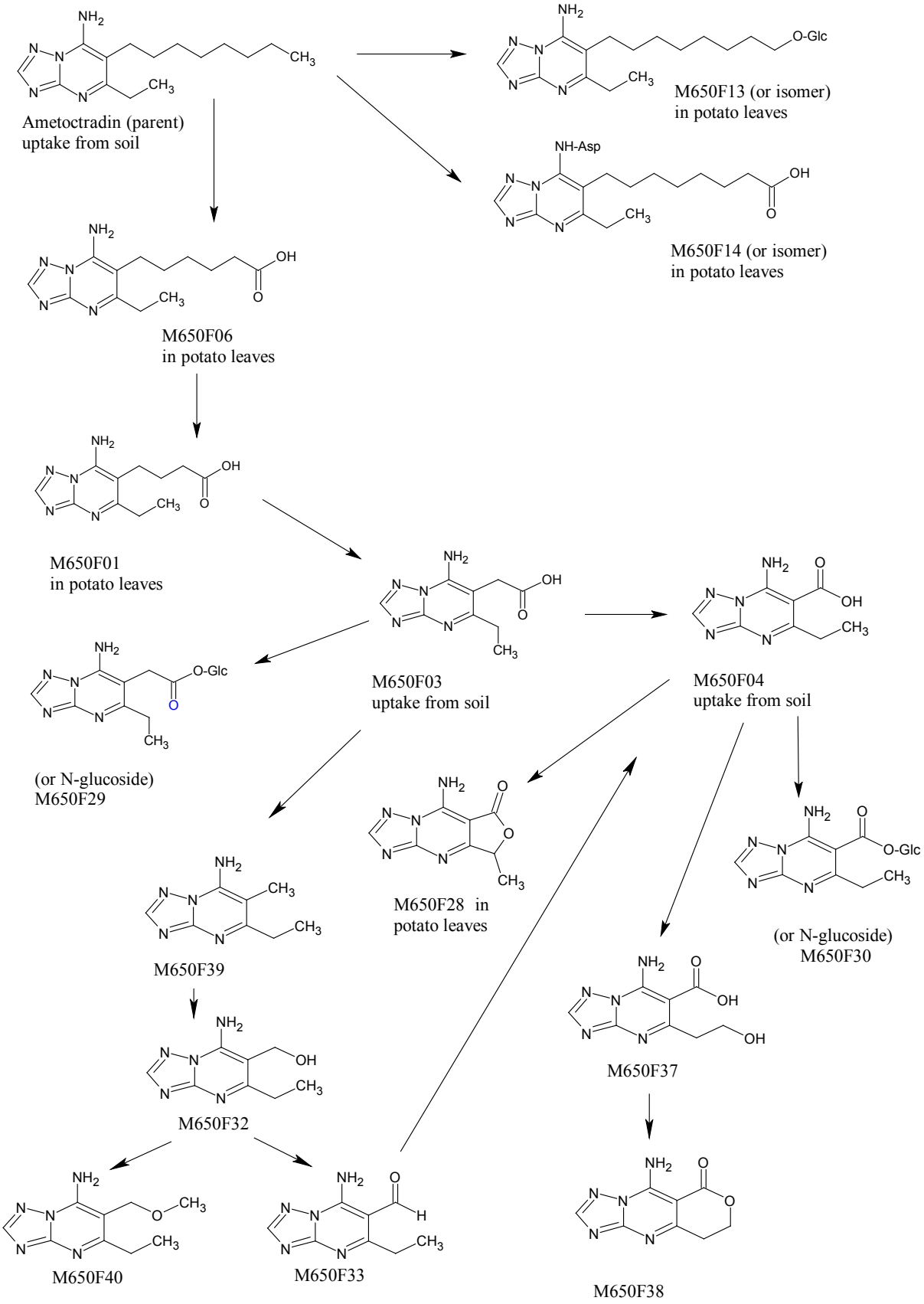


Figure 5 Proposed metabolic pathway of soil metabolites of ametoctradin in primary and rotational crops

Field rotational crop studies

Study 1

Uptake of ametoctradin soil residues by winter wheat was investigated in four field rotational crop studies conducted in Europe (Germany, the Netherlands, Italy and Southern France) during the 2008/2009 growing season. [Klimmek, 2010, 2010/1022763]. Ametoctradin (SC 200 g ai/L) was applied once to bare soil at a rate of 0.960 kg ai/ha using a boom or plot sprayer and 300 L/ha water. Each trial consisted of one control plot and one treated plot (plot size 54–120 m^2), and winter wheat was sown 118–139 days after application. At least 10 soil cores per sample were taken from 0–20 cm depth at treatment, at planting and at harvest. Soil type information was not available (confirmation by manufacturer). Whole wheat plant samples (1 kg, 12 plants) were taken at growth stage BBCH 30–33 and 65–67. Grain and straw from 12 plants were collected at growth stage BBCH 89. Samples were stored at -18 °C for 110–160 days (forage), 64–102 days (grain), 64–115 days (straw) and 70–477 days (soil).

Crop samples were analysed for ametoctradin and its metabolites M650F03 and M650F04 with HPLC-MS-MS method no. L0078/01. Samples were not corrected for mean procedural recoveries at 0.01 and 0.1 mg/kg (79–98% for each analyte) nor for levels in control samples (< 0.01 mg/kg for each analyte).

Soil samples were analysed for ametoctradin and its metabolites M650F03 and M650F04 with HPLC-MS-MS method no. L0110/01. Samples were not corrected for mean procedural recoveries at fortification levels of 0.01, 0.1 and 1.0 mg/kg (82–90% for each analyte). The results were not corrected for control samples (< 0.01 mg/kg parent, M650F03, < 0.01–0.017 mg/kg M650F04).

Based on the results shown in Table 33 and Table 34, the parent compound was not found in any of the soil samples at 120 days after application nor in wheat grown from a plant back interval of 120 days (wheat forage, wheat straw and wheat grain). Metabolites in soil were found at levels of < 0.01–0.040 mg/kg eq for M650F03 and < 0.01–0.057 mg/kg eq for M650F04 at 120 days after application. In wheat grown from a plant back interval of 120 days, metabolites were found at levels of < 0.01–0.092 mg/kg eq for M650F03 and < 0.01–1.0 mg/kg eq for M650F04.

Table 33 Residue levels in rotational crops (winter wheat) from soil treated with ametoctradin

Location, trial no. (Variety)	Soil type	matrix	Date of treatment	DAS	Growth stage	DAT (days)	Residues, expressed as mg/kg parent eq			
							parent	M650F03 [a]	M650F04 [b]	Total [c]
Germany, North Rhine-Westphalia, L080382 (Biscay)	Plant back interval (PBI) 121 days, date of sowing 22.10.2008									
	ns	forage	23.06.08	184	BBCH 31	305	< 0.01	0.044	0.024	0.078
	ns	forage	23.06.08	226	BBCH 65	347	< 0.01	0.017	0.023	0.050
	ns	grain	23.06.08	278	BBCH 89	399	< 0.01	< 0.01	< 0.01	< 0.03
	ns	straw	23.06.08	278	BBCH 89	399	< 0.01	0.038	0.087	0.14
the Netherlands, Limburg, L080383 (Biscay)	Plant back interval (PBI) 121 days, date of sowing 22.10.2008									
	ns	forage	23.06.08	183	BBCH 32	304	< 0.01	< 0.01	0.016	0.036
	ns	forage	23.06.08	226	BBCH 65	347	< 0.01	< 0.01	0.028	0.048
	ns	grain	23.06.08	278	BBCH 89	399	< 0.01	< 0.01	< 0.01	< 0.03
	ns	straw	23.06.08	278	BBCH 89	399	< 0.01	0.016	0.040	0.066
France, Tarn et Garonne, L080384 (Caphorn)	Plant back interval (PBI) 139 days, date of sowing 05.01.2009									
	ns	forage	19.08.08	130	BBCH 30-33	269	< 0.01	0.092	0.21	0.31
	ns	forage	19.08.08	149	BBCH 65	288	< 0.01	0.076	0.27	0.36

Location, trial no. (Variety)	Soil type	matrix	Date of treatment	DAS	Growth stage	DAT (days)	Residues, expressed as mg/kg parent eq			
							parent	M650F03 [a]	M650F04 [b]	Total [c]
	ns	grain	19.08.08	183	BBCH 89	322	< 0.01	0.013	0.30	0.33
	ns	straw	19.08.08	183	BBCH 89	322	< 0.01	0.14	1.0	1.2
Italy, Bologna, L080385 (Mieti)	Plant back interval (PBI) 118 days, date of sowing 30.11.2008									
	ns	forage	04.08.08	137	BBCH 32	255	< 0.01	< 0.01	< 0.01	< 0.03
	ns	forage	04.08.08	176	BBCH 65-67	294	< 0.01	0.017	0.014	0.041
	ns	grain	04.08.08	201	BBCH 89	319	< 0.01	< 0.01	0.033	0.053
	ns	straw	04.08.08	201	BBCH 89	319	< 0.01	0.055	0.10	0.17

DAS = days after sowing; DAP = days after planting; ns = not specified

a Residues are expressed as parent equivalents; factor for converting M650F03 residues in parent equivalents is 1.2449.

b Residues are expressed as parent equivalents; factor for converting M650F04 residues in parent equivalents is 1.3292.

c For calculation purposes "< 0.01" is set as "0.01"

Table 34 Residue levels in soil treated with ametoctradin (in mg/kg in parent equivalents)

Location, trial no. (Variety)	Soil type	Date of treatment	growth stage plant	DAS/ DAP	DAT (days)	Residues			
						parent	M650F03 [a]	M650F04 [b]	Total [c]
Germany, North Rhine-Westphalia, L080382 (Biscay)	Plant back interval (PBI) 121 days, date of sowing 22.10.2008								
	ns	23.06.08	na	na	–0 pre-treat.	< 0.01	< 0.01	0.017[d]	0.037
	ns	23.06.08	na	na	0 post-treat.	0.35	< 0.01	< 0.01	0.371
	ns	23.06.08	np	0	121	< 0.01	0.030	0.057	0.097
	ns	23.06.08	BBCH 30-33	184	305	< 0.01	0.020	0.039	0.069
	ns	23.06.08	BBCH 89	278	399	< 0.01	0.012	0.047	0.069
Netherlands, Limburg, L080383 (Biscay)	Plant back interval (PBI) 121 days, date of sowing 22.10.2008								
	ns	23.06.08	na	na	–0 pre-treat.	< 0.01	< 0.01	< 0.01	< 0.03
	ns	23.06.08	na	n	0 post-treat.	0.25	< 0.01	< 0.01	0.27
	ns	23.06.08	np	0	121	< 0.01	< 0.01	0.049	0.069
	ns	23.06.08	BBCH 30-33	183	304	< 0.01	< 0.01	< 0.01	< 0.03
	ns	23.06.08	BBCH 89	278	399	< 0.01	< 0.01	< 0.01	< 0.03
France, Tarn et Garonne, L080384 (Caphorn)	Plant back interval (PBI) 139 days, date of sowing 05.01.2009								
	ns	19.08.08	na	na	–0 Pre-treat.	< 0.01	< 0.01	< 0.01	< 0.03
	ns	19.08.08	na	na	0 post-treat.	0.11	< 0.01	< 0.01	0.13
	ns	19.08.08	np	0	139	< 0.01	0.035	0.027	0.072
	ns	19.08.08	BBCH 30-33	130	269	< 0.01	< 0.01	0.027	0.047
	ns	19.08.08	BBCH 89	183	322	< 0.01	< 0.01	0.020	0.040
Italy, Bologna, L080385 (Mieti)	Plant back interval (PBI) 118 days, date of sowing 30.11.2008								
	ns	04.08.08	na	na	–0 Pre-treat.	< 0.01	< 0.01	< 0.01	< 0.03
	ns	04.08.08	na	na	0	0.50	< 0.01	< 0.01	0.52

Location, trial no. (Variety)	Soil type	Date of treatment	growth stage plant	DAS/ DAP	DAT (days)	Residues			
						parent	M650F03 [a]	M650F04 [b]	Total [c]
					post-treat.				
	ns	04.08.08	np	0	118	< 0.01	0.040	< 0.01	0.060
	ns	04.08.08	BBCH 30-33	137	255	< 0.01	0.016	< 0.01	0.036
	ns	04.08.08	BBCH 89	211	399	< 0.01	< 0.01	< 0.01	< 0.03

DAS = days after sowing; DAP = days after planting; na = not applicable; np = not provided; ns = not specified;

a Residues are expressed as parent equivalents; factor for converting M650F03 residues to parent equivalents is 1.2449.

b Residues are expressed as parent equivalents; factor for converting M650F04 residues to parent equivalents is 1.3292

c For calculation purposes "< 0.01" is set as "0.01"

d Mean of four replicate analyses

Study 2

Uptake of ametoctradin soil residues was investigated in a field rotational crop study conducted in Europe during the 2007/2008 growing season [Klimmek, 2009, 2009/1110621]. Four crop groups were investigated; root and tuber vegetables (carrot), leafy vegetables (lettuce), cereal grains (wheat) and Brassica vegetables (cauliflower). Ametoctradin (200 g/L, SC) was applied once with a boom sprayer or a plot sprayer to bare soil in the early spring at a rate of 0.94–0.98 kg ai/ha with 300 L/ha water. The crops were planted at three plant back intervals (PBI) after treatment: 30 ± 1 days, 120 ± 1 days, and 365 ± 1 days. Each trial consisted of one control plot and three treated plots (plot size 80–160 m^2, one plot for each plant back interval). Soil types were sandy loam in trial L070458 (pH 6.2, 2.2% om), sand in trial L070459 (pH 6.1, 1.9% om), silty clay in trial L070460 (pH 7.7, 2.6% om) and silty clay in trial L070461 (pH 6.1, 1.5% om) [BASF, 2012e]. At least 10 soil cores per sample were taken from 0–20 cm depth at treatment, at planting and at harvest. Wheat was harvested at growth stage BBCH 30-33 and 65 (12 plants per sample) and BBCH 89 (1 kg grain and 0.5 kg straw samples). Whole plant samples (12 plants, 1 kg) of all other crops were collected at growth stage BBCH 41. At growth stage 49, carrot root and tops (12 units), cauliflower inflorescence (12 units) and lettuce heads (12 units) were collected. Samples were stored at –18 ºC for a maximum 454 days until analysis for plant commodities and 875 days for soil samples.

Crop samples were analysed for ametoctradin and its metabolites M650F03 and M650F04 with HPLC-MS-MS method no. L0078/01. Samples were not corrected for mean procedural recoveries at 0.01 and 0.1 mg/kg (93–100% for each analyte) nor for levels in control samples (< 0.01 mg/kg for each analyte). Results are shown in Table 35.

Soil samples were analysed for ametoctradin and its metabolites M650F03 and M650F04 with HPLC-MS-MS method no. L0110/01. Samples were not corrected for mean procedural recoveries at fortification levels of 0.01, 0.1 and 1.0 mg/kg (88–94% for each analyte). The results were not corrected for control samples (< 0.01 mg/kg parent, M650F03, < 0.01–0.017 mg/kg M650F04). The results of the soil samples from the treated plots (plots 2, 4 and 6) are shown in Table 36.

The parent compound and metabolite M650F03 were not found in soil at a plant back interval of 120–365 days and 365 days, respectively (< 0.01 mg/kg), while metabolite M650F04 was still found at a plant back interval of 365 days in soil (< 0.01–0.019 mg/kg eq). The parent compound was not found in rotational crops at any plant back interval, except in two samples at a plant back interval of 35 days: wheat straw 0.038 mg/kg and cauliflower inflorescence 0.020 mg/kg. Metabolites M650F03 and M650F04 were found in rotational crops at a plant back interval of 365 days ranging from < 0.01–0.037 mg/kg eq and < 0.01–0.056 mg/kg eq. Total residues in rotational crops at a plant back interval of 365 days ranged from < 0.03–0.10 mg/kg eq.

Table 35 Residue levels in rotational crops after one broadcast application to bare soil at 0.94–0.98 kg ai/ha.

Location (trial no.)	Rotational crop (variety)	Portion analysed	PBI (days)	DAS/ DAP (days)	DAT (days)	Residues (mg/kg eq) [a]			
						parent	M650 F03	M650 F04	Total
Goch-Nierswalde, North Rhine Westphalia, Germany, 2007, (trial 1: L070458)	Wheat (Thasos)	whole plant w/o roots BBCH 31-32	29	43	72	< 0.01	0.21	0.020	0.24
			120	36	156	< 0.01	0.033	0.017	0.060
			365	47	412	< 0.01	< 0.01	< 0.01	< 0.03
		whole plant w/o roots BBCH 65	29	71	100	< 0.01	0.10	0.023	0.13
			120	86	206	< 0.01	< 0.01	< 0.01	< 0.03
			365	76	441	< 0.01	< 0.01	< 0.01	< 0.03
		whole plant with roots BBCH 71-73	120	139	259	< 0.01	< 0.01	< 0.01	< 0.03
		grain BBCH 89	29	119	148	< 0.01	< 0.01	0.011	0.031
			365	126	491	< 0.01	< 0.01	< 0.01	< 0.03
		straw BBCH 89	29	119	148	< 0.01	0.20	0.066	0.27
			365	126	491	< 0.01	< 0.01	0.014	0.034
Ottersum, Nether lands, 2007, (trial 2: L070459)	Wheat (Thasos)	whole plant w/o roots BBCH 32	29	42	71	< 0.01	0.33	0.020	0.36
			119	36	155	< 0.01	0.053	0.029	0.092
			364	77	411	< 0.01	< 0.01	< 0.01	< 0.03
		whole plant w/o roots BBCH 65	29	70	99	< 0.01	0.22	0.025	0.25
			119	72	191	< 0.01	0.018	0.016	0.044
			364	76	440	< 0.01	< 0.01	< 0.01	< 0.03
		whole plant with roots BBCH 71-73	119	139	258	< 0.01	< 0.01	0.012	0.032
		grain BBCH 89	29	118	147	< 0.01	< 0.01	0.019	0.039
			364	127	491	< 0.01	< 0.01	0.010	0.030
		straw BBCH 89	29	118	147	< 0.01	0.066	0.035	0.11
			364	127	491	< 0.01	< 0.01	0.016	0.036
Meauzac, Tarn et Garonne, Southern France, 2007 (trial 3: L070460)	Wheat (Florence aurora)	whole plant w/o roots BBCH 31-33	35	42	77	< 0.01	0.55	0.15	0.71
			119	34	153	< 0.01	0.035	0.059	0.10
			366	55	421	< 0.01	0.010	0.027	0.047
		whole plant w/o roots BBCH 65	35	63	98	< 0.01	0.29	0.125	0.43
			119	63	182	< 0.01	< 0.01	0.029	0.049
			366	77	443	< 0.01	< 0.01	0.027	0.047
		grain BBCH 89	35	118	153	< 0.01	0.017	0.100	0.13
			366	122	488	< 0.01	< 0.01	0.010	0.030
		ears BBCH 89	119	141	260	< 0.01	< 0.01	0.018	0.038
		straw BBCH 89	35	118	153	0.038	0.68	0.35	1.1
			119	141	260	< 0.01	< 0.01	0.023	0.043
			366	122	488	< 0.01	< 0.01	0.029	0.049
Budrio, Emilia Romagna, Italy, 2007, (trial 4: L070461)	Wheat (Palesio)	whole plant w/o roots BBCH 19-59	30	48	78	< 0.01	0.90	0.29	1.2
			133	85	218	< 0.01	0.054	0.025	0.089
			366	110	476	< 0.01	0.037	0.056	0.10
		whole plant w/o roots BBCH 65	133	266	399	< 0.01	< 0.01	< 0.01	< 0.03
		grain BBCH 89	30	91	121	< 0.01	0.056	0.12	0.18
			133	317	450	< 0.01	< 0.01	< 0.01	< 0.03
			366	147	513	< 0.01	< 0.01	0.010	0.030
		straw BBCH 89	30	91	121	< 0.01	0.92	0.32	1.3
			133	317	450	< 0.01	< 0.01	0.010	0.030
			366	147	513	< 0.01	0.013	0.010	0.033
Goch-Niers walde, North Rhine West phalia, Germany, 2007, (trial 1:	Carrots (Solo)	whole plant with roots BBCH 41	29	58	87	< 0.01	0.13	< 0.01	0.15
	Carrots (Jubila)		120	72	192	< 0.01	0.011	< 0.01	0.031
			365	76	441	< 0.01	< 0.01	< 0.01	< 0.03
	Carrots (Solo)	tops BBCH 49	29	119	148	< 0.01	0.12	< 0.01	0.14
	Carrots		120	112	232	< 0.01	< 0.01	< 0.01	< 0.03

Location (trial no.)	Rotational crop (variety)	Portion analysed	PBI (days)	DAS/ DAP (days)	DAT (days)	Residues (mg/kg eq) [a]			
						parent	M650 F03	M650 F04	Total
L070458)	(Jubila)		365	102	467	< 0.01	< 0.01	< 0.01	< 0.03
	Carrots (Solo)	roots BBCH 49	29	119	148	< 0.01	0.034	< 0.01	0.054
	Carrots (Jubila)		120	112	232	< 0.01	< 0.01	< 0.01	< 0.03
			365	102	467	< 0.01	< 0.01	< 0.01	< 0.03
Ottersum, Nether lands, 2007, (trial 2: L070459)	Carrots (Jubila)	whole plant with roots BBCH 41	29	57	86	< 0.01	0.11	0.012	0.13
			119	72	191	< 0.01	< 0.01	< 0.01	< 0.03
			364	76	440	< 0.01	< 0.01	< 0.01	< 0.03
		tops BBCH 49	29	118	147	< 0.01	0.12	< 0.01	0.14
			119	111	230	< 0.01	< 0.01	< 0.01	< 0.03
			364	102	466	< 0.01	< 0.01	< 0.01	< 0.03
		roots BBCH 49	29	118	147	< 0.01	0.031	0.017	0.058
			119	111	230	< 0.01	< 0.01	< 0.01	< 0.03
			364	102	466	< 0.01	< 0.01	< 0.01	< 0.03
Meauzac, Tarn et Garonne, Southern France, 2007 (trial 3: L070460)	Carrots (Maestro F1)	whole plant with roots BBCH 41	35	63	98	< 0.01	0.16	0.028	0.19
			119	63	182	< 0.01	< 0.01	< 0.01	< 0.03
			366	87	453	< 0.01	< 0.01	< 0.01	< 0.03
		tops BBCH 49	35	131	166	< 0.01	0.086	< 0.01	0.11
			119	141	260	< 0.01	< 0.01	< 0.01	< 0.03
			366	111	477	< 0.01	< 0.01	< 0.01	< 0.03
		roots BBCH 49	35	131	166	< 0.01	0.022	< 0.01	0.042
			119	141	260	< 0.01	< 0.01	< 0.01	< 0.03
			366	111	477	< 0.01	< 0.01	< 0.01	< 0.03
Budrio, Emilia Romagna, Italy, 2007, (trial 4: L070461)	Carrots (Nantes)	whole plant with roots BBCH 41-43	30	86	116	< 0.01	0.13	0.010	0.15
			133	160	283	< 0.01	< 0.01	< 0.01	< 0.03
			366	118	484	< 0.01	0.015	< 0.01	0.035
		tops BBCH 49	30	117	147	< 0.01	0.11	< 0.01	0.13
			133	199	332	< 0.01	0.010	< 0.01	0.030
			366	125	491	< 0.01	0.038	< 0.01	0.058
		roots BBCH 49	30	117	147	< 0.01	0.032	< 0.01	0.052
			133	199	332	< 0.01	< 0.01	< 0.01	< 0.03
			366	125	491	< 0.01	0.010	< 0.01	0.030
Goch-Niers walde, North Rhine West phalia, Germany, 2007, (trial 1: L070458)	Cauliflower (Floriade)	whole plant w/o roots BBCH 41	29	50	79	< 0.01	< 0.01	< 0.01	< 0.03
			120	58	178	< 0.01	< 0.01	< 0.01	< 0.03
	Cauliflower (Fremont)		365	55	420	< 0.01	< 0.01	< 0.01	< 0.03
	Cauliflower (Floriade)	inflorescence BBCH 49	29	77	106	< 0.01	< 0.01	< 0.01	< 0.03
			120	89	209	< 0.01	< 0.01	< 0.01	< 0.03
	Cauliflower (Fre mont)		365	73	438	< 0.01	< 0.01	< 0.01	< 0.03
Ottersum, Nether lands, 2007, (trial 2: L070459)	Cauliflower (Floriade)	whole plant w/o roots BBCH 41	29	49	78	< 0.01	< 0.01	< 0.01	< 0.03
			119	58	177	< 0.01	< 0.01	< 0.01	< 0.03
	Cauliflower (Fremont)		364	55	419	< 0.01	< 0.01	< 0.01	< 0.03
	Cauliflower (Floriade)	inflorescence BBCH 49	29	76	105	< 0.01	< 0.01	< 0.01	< 0.03
			119	90	209	< 0.01	< 0.01	< 0.01	< 0.03
	Cauliflower (Fremont)		364	73	437	< 0.01	0.015	< 0.01	0.035
Meauzac, Tarn et Garonne, Southern France, 2007 (trial 3: L070460)	Cauliflower (Nautilus)	whole plant w/o roots BBCH 41	35	84	119	< 0.01	0.031	< 0.01	0.051
			119	118	237	< 0.01	< 0.01	< 0.01	< 0.03
			366	111	477	< 0.01	< 0.01	0.010	0.030
		inflorescence BBCH 47-49	35	100	135	0.020	< 0.01	< 0.01	0.040
			119	163	282	< 0.01	< 0.01	< 0.01	< 0.03
			366	122	488	< 0.01	< 0.01	0.010	0.030
Budrio, Emilia Romagna, Italy, 2007,	Cauliflower (Wendy)	whole plant w/o roots BBCH 41	30	86	116	< 0.01	0.094	0.010	0.11
			133	170	303	< 0.01	< 0.01	< 0.01	< 0.03
			366	103	469	< 0.01	0.010	< 0.01	0.030
		inflorescence BBCH 49	30	91	121	< 0.01	0.028	0.022	0.060
			133	191	324	< 0.01	< 0.01	< 0.01	< 0.03

Location (trial no.)	Rotational crop (variety)	Portion analysed	PBI (days)	DAS/ DAP (days)	DAT (days)	Residues (mg/kg eq) [a]			
						parent	M650 F03	M650 F04	Total
(trial 4: L070461)			366	148	514	< 0.01	0.010	0.016	0.036
Goch-Niers walde, North Rhine West phalia, Germany, 2007, (trial 1: L070458)	Head lettuce (Estelle)	whole plant w/o roots BBCH 41	29	26	55	< 0.01	< 0.01	< 0.01	< 0.03
			120	30	150	< 0.01	< 0.01	< 0.01	< 0.03
			365	34	399	< 0.01	< 0.01	< 0.01	< 0.03
		head BBCH 49	29	39	68	< 0.01	< 0.01	< 0.01	< 0.03
			120	47	167	< 0.01	< 0.01	< 0.01	< 0.03
			365	47	412	< 0.01	< 0.01	< 0.01	< 0.03
Ottersum, Nether lands, 2007, (trial 2: L070459)	Head lettuce (Estelle)	whole plant w/o roots BBCH 33-41	29	25	54	< 0.01	0.011	< 0.01	0.031
			119	30	149	< 0.01	< 0.01	< 0.01	< 0.03
			364	34	398	< 0.01	< 0.01	< 0.01	< 0.03
		head BBCH 49	29	38	67	< 0.01	< 0.01	< 0.01	< 0.03
			119	47	166	< 0.01	< 0.01	< 0.01	< 0.03
			364	47	411	< 0.01	< 0.01	< 0.01	< 0.03
Meauzac, Tarn et Garonne, Southern France, 2007 (trial 3: L070460)	Head lettuce (Batavia)	whole plant w/o roots BBCH 41	35	42	77	< 0.01	0.015	< 0.01	0.035
	Head lettuce (Rouge)		119	34	153	< 0.01	< 0.01	< 0.01	< 0.03
	Head lettuce (Grenobloise)		366	49	415	< 0.01	< 0.01	< 0.01	< 0.03
	Head lettuce (Batavia)	head BBCH 49	35	63	98	< 0.01	0.011	< 0.01	0.031
	Head lettuce (Rouge)		119	63	182	< 0.01	< 0.01	< 0.01	< 0.03
	Head lettuce (Grenobloise)		366	67	433	< 0.01	< 0.01	< 0.01	< 0.03
Budrio, Emilia Romagna, Italy, 2007, (tiral 4: L070461)	Head lettuce (Gentilina)	whole plant w/o roots BBCH 41	30	48	78	< 0.01	0.031	< 0.01	0.051
			133	88	221	< 0.01	< 0.01	< 0.01	< 0.03
			366	91	457	< 0.01	< 0.01	< 0.01	< 0.03
		head BBCH 47-49	30	62	92	< 0.01	0.017	< 0.01	0.037
			133	98	231	< 0.01	< 0.01	< 0.01	< 0.03
			366	96	462	< 0.01	< 0.01	< 0.01	< 0.03

PBI = plant back interval; DAS = days after sowing; DAP = days after planting; DAT = days after treatment

a Residues for M650F03, M650F04 and total are expressed as ametoctradin equivalents. The factor for converting M650F03 residues to parent equivalents is 1.2449 and for M650F04 residues to parent equivalents is 1.3929. Total is the sum of parent, M650F03 and M650F04. For calculation purposes "< 0.01" is set at "0.01".

Table 36 Residue levels in soil after one broadcast application to bare soil at 0.94–0.96 kg ai/ha

Plant Back Interval (days)	Crop	Sampling event	DAT (days)	Range of residues [a] (mg/kg eq in dry soil)			
				parent	M650F03	M650F04	Total
29–35	wheat	pre Treatment	0	< 0.01	< 0.01	< 0.01	< 0.03
		post Treatment	0	0.14–0.94	< 0.01	< 0.01	0.16–0.96
		planting/sowing	29–35	0.012–0.32	0.012–0.050	< 0.01–0.028	0.090–0.37
		crop BBCH 30-33	71–78	< 0.01–0.039	0.034–0.19	0.035–0.065	0.079–0.29
		crop BBCH 89	147–153	< 0.01	< 0.01-0.076	< 0.01–0.068	< 0.03–0.15
	carrots	pre Treatment	0	< 0.01	< 0.01	< 0.01	< 0.03
		post Treatment	0	0.21–0.56	< 0.01	< 0.01	0.23–0.58
		planting/sowing	29-35	0.033–0.52	< 0.01–0.041	< 0.01–0.020	0.094–0.57
		crop BBCH 41	86-116	< 0.01–0.012	< 0.01–0.14	< 0.01–0.088	< 0.03–0.24
		crop BBCH 49	147–166	< 0.01	< 0.01–0.031	0.013–0.040	0.035–0.080
	cauliflower	pre Treatment	0	< 0.01	< 0.01	< 0.01	< 0.03
		post Treatment	0	0.16–0.42	< 0.01	< 0.01	0.18-0.44
		planting/sowing	29–35	0.050–0.26	< 0.01–0.054	< 0.01-0.017	0.11-0.28
		crop BBCH 41	78–119	< 0.01–0.015	< 0.01–0.082	< 0.01-0.057	< 0.03-0.15
		crop BBCH 49	105–135	< 0.01	< 0.01–0.082	< 0.01-0.10	< 0.03-0.19

Plant Back Interval (days)	Crop	Sampling event	DAT (days)	Range of residues [a] (mg/kg eq in dry soil)			
				parent	M650F03	M650F04	Total
	lettuce	pre Treatment	0	< 0.01–0.024	< 0.01	< 0.01	< 0.03-0.044
		post Treatment	0	0.21–0.77	< 0.01	< 0.01	0.23-0.79
		planting/sowing	29–35	0.021–0.16	< 0.01–0.051	< 0.01-0.017	0.074-0.22
		crop BBCH 41	54–78	< 0.01–0.017	0.021–0.054	0.019–0.044	0.075–0.11
		crop BBCH 49	67–98	< 0.01–0.010	< 0.01–0.088	0.015–0.060	0.047–0.16
119–133	wheat	pre Treatment	0	< 0.01	< 0.01	< 0.01	< 0.03
		post Treatment	0	0.14–0.53	< 0.01	< 0.01	0.16–0.55
		planting/sowing	119–133	< 0.01	< 0.01–0.075	0.044–0.052	0.065–0.13
		crop BBCH 30-33	153–218	< 0.01	< 0.01–0.014	< 0.01–0.034	< 0.03–0.068
		crop BBCH 71/73-89	258–450	< 0.01	< 0.01	< 0.01–0.031	< 0.03–0.051
	carrots	pre Treatment	0	< 0.01	< 0.01	< 0.01	< 0.03
		post Treatment	0	0.24–0.36	< 0.01	< 0.01	0.26–0.38
		planting/sowing	119–133	< 0.01	< 0.01–0.051	0.028–0.054	0.048–0.095
		crop BBCH 41	182–283	< 0.01	< 0.01–0.015	< 0.01–0.048	< 0.03–0.073
		crop BBCH 49	230–332	< 0.01	< 0.01	< 0.01–0.035	< 0.03–0.055
	cauliflower	pre Treatment	0	< 0.01	< 0.01	< 0.01	< 0.03
		post Treatment	0	0.21–0.58	< 0.01	< 0.01	0.23–0.60
		planting/sowing	119–133	< 0.01	< 0.01–0.049	0.017–0.056	0.037–0.10
		crop BBCH 41	177–303	< 0.01	< 0.01	< 0.01–0.045	< 0.03–0.065
		crop BBCH 49	209–324	< 0.01	< 0.01	< 0.01–0.051	< 0.03–0.071
	lettuce	pre Treatment	0	< 0.01	< 0.01	< 0.01	< 0.03
		post Treatment	0	0.12–0.52	< 0.01	< 0.01	0.14–0.54
		planting/sowing	119–133	< 0.01	< 0.01–0.042	0.027–0.077	0.047–0.13
		crop BBCH 41	149–221	< 0.01	< 0.01–0.016	< 0.01–0.048	0.032–0.074
		crop BBCH 49	166–231	< 0.01	< 0.01–0.019	0.013–0.049	0.039–0.071
365	wheat	pre Treatment	0	< 0.01	< 0.01	< 0.01	< 0.03
		post Treatment	0	0.30–0.40	< 0.01	< 0.01	0.32–0.42
		planting/sowing	365	< 0.01	< 0.01	< 0.01	< 0.03
		crop BBCH 30-33	411–476	< 0.01	< 0.01	< 0.01–0.016	< 0.03–0.036
		crop BBCH 89	488–513	< 0.01	< 0.01	< 0.01	< 0.03
	carrots	pre Treatment	0	< 0.01	< 0.01	< 0.01	< 0.03
		post Treatment	0	0.20–0.37	< 0.01	< 0.01	0.22–0.39
		planting/sowing	365	< 0.01	< 0.01	< 0.01	< 0.03
		crop BBCH 41	440–484	< 0.01	< 0.01	< 0.01	< 0.03
		crop BBCH 49	466–491	< 0.01	< 0.01	< 0.01–0.013	< 0.03–0.033
	cauliflower	pre Treatment	0	< 0.01	< 0.01	< 0.01	< 0.03
		post Treatment	0	0.25–0.44	< 0.01	< 0.01	0.27–0.46
		planting/sowing	365	< 0.01	< 0.01	< 0.01	< 0.03
		crop BBCH 41	419–477	< 0.01	< 0.01	< 0.01–0.015	< 0.03–0.035
		crop BBCH 49	437–514	< 0.01	< 0.01	< 0.01–0.017	< 0.03–0.037
	lettuce	pre Treatment	0	< 0.01–0.014	< 0.01	< 0.01	< 0.03–0.034
		post Treatment	0	0.26–0.48	< 0.01	< 0.01	0.28–0.50
		planting/sowing	365	< 0.01	< 0.01	< 0.01–0.013	< 0.03–0.033
		crop BBCH 41	398–457	< 0.01	< 0.01	< 0.01–0.019	< 0.03–0.039
		crop BBCH 49	411–462	< 0.01	< 0.01	< 0.01–0.016	< 0.03–0.036

a Residues for M650F03, M650F04 and total are expressed as ametoctradin equivalents. The factors for converting M650F03 residues to parent equivalents is 1.2449 and for M650F04 residues to parent equivalents is 1.3929. Total is the sum of parent, M650F03 and M650F04. For calculation purposes "< 0.01" is set at "0.01".

Study 3

The uptake of ametoctradin soil residues by rotational crops was investigated in a field rotational crop study in the USA during the 2008/2009 season [Norris and Saha, 2009, 2009/7006074]. Three crop groups were investigated; root and tuber vegetables (radish), leafy vegetables (lettuce), and cereal grains (winter wheat). The tank mix contained 200 g/L SC formulation of ametoctradin, 225 g/L SC formulation of dimethomorph and an adjuvant. The spray solution (213–286 L/ha) was applied as

three broadcast applications to bare soil using commercial ground equipment. The soil types covered were loamy sand in Georgia and sandy loam in California. The target dose rate was 0.30 kg ai/ha per application at a 4–6 day re-treatment interval (0.90 kg ai/ha/season). The actual application rate of ranged between 0.20–0.30 kg ai/ha (total 0.80–0.91 kg ai/ha/season). The crops were planted at four plant back intervals (PBI) after treatment: 29–30, 60, 90–91, and 120–121 DAT. Soil samples were not taken (confirmed by manufacturer). Wheat was harvested at 137–147 (forage and hay, BBCH 49–59) and 221–251 (grain and straw at crop maturity) days after planting. Hay samples were allowed to dry under ambient conditions (protected from rain) for 7–20 days prior to collection. Lettuce (leaves) was harvested at 64–126 days (BBCH 45–49) after planting and radish (tops and roots) 62–99 days (BBCH 45-49) after planting. After harvest, plant samples were immediately stored frozen at -5 °C and thereafter at -20 °C or lower [BASF 2012d] for 61–191 (radish tops and roots), 63–164 days (lettuce leaves), 157–210 days (wheat forage), 159–198 days (wheat hay), 71–133 days (wheat straw) and 71–107 days (wheat grain) until extraction. Extracts were analysed within 0–8 days of extraction.

Samples were analysed for ametoctradin, metabolite M650F03 and M650F04 using HPLC-MS-MS method L0078/01. Results were not corrected for control samples (< 0.01 mg/kg for each analyte and each commodity), nor for average concurrent method recoveries (87–101% for each analyte and each commodity). Results are shown in Table 37.

Table 37 Residues in rotational crops after three broadcast applications to bare soil with a total rate 0.80–0.91 kg ai/ha

Location, trial no., (variety)	Soil type	RAC	PBI (days)	DAS/ DAP (days)	DAT (days)	Residues (mg/kg) [a]			
						Parent [b]	M650F03 [b]	M650F04 [b]	Total [b]
Tift, GA, USA, 2007, R080035 (Pioneer 26R61)	loamy sand	wheat forage	30	144	174	< 0.01	0.074	0.047[c]	0.16
			60	144	204	< 0.01	0.032	0.036[c]	0.097
			91	144	235	< 0.01	0.058	0.042[c]	0.14
			120	144	264	< 0.01	0.047[c]	0.076[c]	0.17
Tift, GA, USA, 2007, R080035 (Pioneer 26R61)	loamy sand	wheat hay	30	144	174	< 0.01	0.15	0.18	0.44
			60	144	204	< 0.01	0.060	0.032	0.13
			91	144	235	< 0.01	0.018	0.053	0.10
			120	144	264	< 0.01	0.013	0.091	0.15
Tift, GA, USA, 2007, R080035 (Pioneer 26R61)	loamy sand	wheat grain	30	221	251	< 0.01	< 0.01	0.026	0.057
			60	221	281	< 0.01	< 0.01	0.013	0.039
			91	221	312	< 0.01	< 0.01	< 0.01	< 0.036
			120	221	341	< 0.01	< 0.01	0.011	0.037
Tift, GA, USA, 2007, R080035 (Pioneer 26R61)	loamy sand	wheat straw	30	221	251	< 0.01	0.16	0.13	0.38
			60	221	281	< 0.01	0.052[c]	0.083[c]	0.18
			91	221	312	< 0.01	< 0.01	0.034	0.067
			120	221	341	< 0.01	< 0.01	0.041	0.077
Fresno, CA, USA, 2007, R080036 (Pacifica)	sandy loam	wheat forage	31	134	165	< 0.01	0.061	0.070	0.18
			60	147	207	< 0.01	< 0.01	0.043	0.079
			89	134	223	< 0.01	< 0.01	0.022	0.052
			118	147	265	< 0.01	< 0.01	0.027[c]	0.058
Fresno, CA, USA, R080036 (Pacifica)	sandy loam	wheat hay	31	134	165	< 0.01	0.10	0.030	0.17
			60	147	207	< 0.01	0.038	0.099	0.19
			89	134	223	< 0.01	0.091	0.073	0.22
			118	147	265	< 0.01	0.059	0.076	0.18
Fresno, CA, USA, 2007, R080036	sandy loam	wheat grain	31	251	282	< 0.01	< 0.01	0.018	0.046
			60	222	282	< 0.01	< 0.01	0.026	0.057
			89	251	340	< 0.01	< 0.01	0.026	0.057

Location, trial no., (variety)	Soil type	RAC	PBI (days)	DAS/ DAP (days)	DAT (days)	Residues (mg/kg) [a]			
						Parent [b]	M650F03 [b]	M650F04 [b]	Total [b]
(Pacifica)			118	222	340	< 0.01	0.016	0.14	0.22
Fresno, CA, USA, 2007, R080036 (Pacifica)	sandy loam	wheat straw	31	251	282	< 0.01	0.13	0.10	0.30
			60	222	282	< 0.01	0.13	0.15	0.38
			89	251	340	< 0.01	0.13	0.19	0.43
			118	222	340	< 0.01	0.33	0.28	0.78
Tift, GA, USA, 2007, R080035 (Two Star)	loamy sand	leaf lettuce	30	73	103	< 0.01	< 0.01	< 0.01	< 0.036
			60	73	133	< 0.01	< 0.01	< 0.01	< 0.036
			91	73	164	< 0.01	< 0.01	< 0.01	< 0.036
			120	73	193	< 0.01	< 0.01	< 0.01	< 0.036
Fresno, CA, USA, 2007, R080036 (Pacifica)	sandy loam	leaf lettuce	31	64	95	< 0.01	< 0.01	< 0.01	< 0.036
			60	126	186	< 0.01	< 0.01[c]	< 0.01[c]	< 0.036
			89	94	183	< 0.01	< 0.01	< 0.01	< 0.036
			118	126	244	< 0.01	< 0.01[c]	< 0.01[c]	< 0.036
Tift, GA, USA, 2007, R080035 (White Icicle)	loamy sand	radish tops	30	70	100	< 0.01	0.056	< 0.01	0.093
			60	70	130	< 0.01	< 0.01	< 0.01	< 0.036
			91	70	161	< 0.01	< 0.01	< 0.01	< 0.036
			120	70	190	< 0.01	< 0.01	< 0.01	< 0.036
Tift, GA, USA, 2007, R080035 (White Icicle)	loamy sand	radish root	30	70	100	< 0.01	0.040	< 0.01[c]	0.074
			60	70	130	< 0.01	< 0.01	< 0.01	< 0.036
			91	70	161	< 0.01	< 0.01	< 0.01	< 0.036
			120	70	190	< 0.01	< 0.01	< 0.01	< 0.036
Fresno, CA, USA, 2007, R080036 (Crunchy Royal F1)	sandy loam	radish tops	31	82	113	< 0.01	0.10	< 0.01	0.15
			60	99	159	< 0.01	0.014	< 0.01[c]	0.041
			89	62	151	< 0.01	0.068	< 0.01	0.11
			118	99	217	< 0.01	0.011	< 0.01[c]	0.037
Fresno, CA, USA, 2007, R080036 (Crunchy Royal F1)	sandy loam	radish root	31	62	93	< 0.01	0.020	< 0.01	0.048
			60	99	159	< 0.01	< 0.01	< 0.01[c]	< 0.036
			89	92	181	< 0.01	0.012	< 0.01	0.039
			118	99	217	< 0.01	< 0.01	< 0.01[c]	< 0.036

PBI = plant back interval; DAS = days after sowing; DAP = days after planting; DAT = days after treatment

a Results presented are means of replicate field samples.

b All analytes are reported in terms of themselves. For calculation of total residue conversion factors of 1.2449 and 1.3292 for M650F03 and M650F04 were used, respectively.

c Mean of replicate field samples includes multiple analyses of the same field samples.

Environmental fate in water/sediment systems

The Meeting also received information on the hydrolysis and photolysis of ametoctradin in water and degradation in water/sediment systems. Only the hydrolysis and photolysis studies were considered relevant for the present evaluation (see chemical section). The other studies were not summarized.

Residue analysis

The Meeting received information on enforcement/monitoring methods for the determination of ametoctradin in plant commodities and ametoctradin and its metabolites M650F01 and M650F06 in animal commodities (meat, fat, liver, kidney and milk). In addition the Meeting received information on analytical methods for the determination of ametoctradin and its metabolites M650F03 and

M650F04 in plant commodities as used in the various study reports (supervised residue trials, storage stability studies and processing studies). The analytical residue methods have been evaluated according to the guidance provided by OECD (Series on Pesticides number 39) as indicated in the FAO manual 2009.

Validation results are required for every crop commodity submitted for MRL-setting: at least one full validation for a commodity within the five defined crop groups (high acid content, high water content, high oil content, high protein content and high starch content) and a reduced validation for every other commodity within a certain crop group. Where validation results do not meet the criteria given below, this is indicated.

When the analytical method is validated according to a full validation scheme, it means that:

- at least five recovery experiments per level were conducted on at least two levels (LOQ and 10× LOQ) and average recovery per level was shown to be between 70–120% and the relative standard deviation (RSD_r or CV) per level was shown to be < 20%
- at least two control samples were analysed and were shown to be below 0.3× LOQ
- the calibration was conducted with at least five single points or at least three duplicate points and was shown to be linear (either standards in solvent or matrix matched standards)

When the analytical method is validated according to a reduced validation scheme, it means that:

- a full validation is available for a crop in the same crop group (high acid content, high water content, high oil content, high protein content and high starch content)
- at least three recovery experiments per level were conducted on at least two levels (LOQ and 10× LOQ) and the average recovery per level was shown to be between 70–120% and the relative standard deviation (RSD_r or CV) per level was < 20%
- at least two control samples were analysed and shown to be below 0.3× LOQ
- the calibration was conducted with at least five single points or at least three duplicate points and was shown to be linear (only relevant for matrix matched standards; standards in solvent are already covered by full validation).

Analytical methods for enforcement

Compatibility with existing multi-residue methods

The compatibility of ametoctradin and its metabolites with an existing multi-residue method was tested using the FDA Multi-residue Method Testing Protocol [Tarkalanov *et al.,* 2009, 2009/7006278]. The protocols consist of one protocol for determining if the compounds are naturally fluorescent (protocol A); two protocols for determining GC characteristics of chemicals (protocol C and G); three protocols by which chemicals can be evaluated through the FDA multi-residue testing program (protocols D, E and F); one protocol for methylation of acidic analytes, in case the native volatility is insufficient for GC determination (protocol B).

Based on the molecular structure of ametoctradin and its soil metabolites M650F03 and M650F04 Protocols A and C apply to ametoctradin, M650F03 and M650F04. Protocol B applies to M650F03 and M650F04. Protocol G does not apply. Protocols D, E and F are tested only for these analytes who produce a chromatographic response during Protocol C.

Protocol A indicates that the triazolopyrimidine structures present in the molecules of ametoctradin, M650F03 and M650F04 provides for possible natural fluorescence. However, the signal intensity for all three analytes in HPLC with fluorescence detection is insufficient for practical purposes.

Protocol C experiments demonstrated that ametoctradin produces weak non-linear signal with GC-NPD, inadequate for trace analysis. GC-NPD is unsuitable for detecting the M650F03 and M650F04, either, because they produce no response at all.

Protocol B is applicable to molecules with acidic structures. Experiments demonstrated that M650F03 and M650F04 cannot be methylated or that the methylated derivatives produce no sufficient response in GC-NPD.

Since ametoctradin and its metabolites were not compatible with existing GC or HPLC-fluorescence multi-residue methods, only single residue methods were submitted to the Meeting.

HPLC-MS-MS Method L0117/01

HPLC-MS-MS Method L0117/01, version May 2008, is intended as enforcement method for the determination of parent ametoctradin in plant matrices [Schweda and Mackenroth, 2008a, 2008/1028661]. In addition, HPLC-MS-MS Method L0117/01 was used in supervised trials in/on bulb onions and dried hops. Samples were homogenised with dry ice and 5 g samples were extracted with a mixture of MeOH/water (50:50, v/v). An aliquot of the extract was mixed with 0.2 M NaOH (1:1, v/v) and was partitioned against DCM. After thorough mixing and centrifugation, an aliquot of the DCM phase was evaporated to dryness and re-dissolved in water/MeOH/formic acid (50:50:1, v/v/v). The final determination of ametoctradin was performed by HPLC-MS-MS by using the mass transition of m/z 276 to 176 (quantification) and m/z 276 to 149 (confirmation).

HPLC-MS-MS Method L0117/01 was validated according to the full validation scheme for commodities with high acid content (oranges and grapes), high water content (bulb onions, tomatoes and head lettuce), high starch content (potato tubers and wheat grains) and high oil content (sunflower seeds) [Schweda and Mackenroth, 2008a, 2008/1028661]. The validation was performed for the quantification transition ions as well as for the confirmation transition ions. The reported LOQ was 0.01 mg/kg for each commodity. Average recoveries at 0.01 mg/kg and 0.1 mg/kg were within 70–120% limits and RSDs were within 20%. Linearity (coefficient of correlation > 0.99) was observed in the range of 0.025 to 1.0 ng/mL (equivalent concentration in the samples not stated) using six duplicate solvent standards. No interfering peaks > 0.3LOQ (i.e., 0.003 mg/kg) were detected in any of the control extracts.

In many of the supervised field trials, ametoctradin was mixed with dimethomorph. Since two characteristic mass transitions were used to monitor ametoctradin, the method achieves a high level of specificity. An interference with dimethomorph and/or its metabolites can be excluded [BASF, 2012c].

HPLC-MS-MS Method L0117/01 was validated according to the full validation scheme by an independent laboratory (ILV) for orange whole fruit, lettuce, potato tubers, wheat grain and sunflower seeds [Schwarz, 2008, 2008/1037015]. The validation was performed for the quantification transition ions as well as for the confirmation transition ions. The reported LOQ was 0.01 mg/kg for each commodity. Average recoveries at 0.01 mg/kg and 0.1 mg/kg were within 70–120% limits and RSDs were within 20%, except for sunflower seed (10× LOQ, 67% and 69% for quantification and confirmation transition ions, respectively). This indicates that method L0117/01 needs to be adapted for commodities with high oil content. Since commodities with high oil content are not under evaluation here, this is considered to have no impact on the MRL proposals. Linearity (coefficient of correlation > 0.999) was observed in the range of 0.025 to 5.0 ng/mL (equivalent concentration in the samples not stated) using seven single solvent standards. No interfering peaks > 0.3 LOQ (i.e., 0.003 mg/kg) were detected in any of the control samples.

Additional validation results for HPLC-MS-MS Method L0117/01 were available for dried hops from supervised trials reports. The analytical method was validated according to the full validation scheme for dried hops [Harant, 2010a, 2010/1122090]. The validation was performed for the quantification transition ions only. The reported LOQ was 0.01 mg/kg for dried hops. Average recoveries at 0.01 and 1.0 mg/kg were within 70–120% limits and RSDs were within 20%. Linearity (coefficient of correlation > 0.999) was observed in the range of 0.025 to 1.0 ng/mL (equivalent

concentration in the samples not stated) using six duplicate solvent standards. Since interfering peaks > 0.3 LOQ (0.0029–0.0049 mg/kg, n = 3) were found, the appropriate LOQ for dried hops is 0.02 mg/kg.

In the 2008 US trials on hops, the method was slightly modified. Volumes of DCM were changed and after final evaporation samples were dissolved in ACN/water (10:90, v/v) instead of water/MeOH/formic acid (50:50:1, v/v/v). Validity of the modification was verified with 1–3 recoveries per concentration level [Jordan, 2009c, 2009/7003320].

A separate radiovalidation experiment was carried out for the determination of parent and its metabolites M650F03 and M650F04 in plant matrices [Rabe and Mackenroth, 2008b]. Selected samples from the tomato and potato metabolism studies and the confined rotational crop study were extracted once with a mixture of MeOH and water (50:50) as used in HPLC-MS-MS Methods L0078 and L0117. The total radioactive residues in the extracts were determined to calculate the extractabilities and compare them with the extractabilities found during the metabolism study (plant homogenates extracted three times with MeOH and two times with water). The solvent mixture used for residue analysis in plant matrices (MeOH : water 50:50) extracted slightly lower amounts of total radioactive residues as the combined MeOH and water extracts in the metabolism studies (Table 38) and resulted in comparable HPLC patterns. Therefore it can be concluded that the extraction solvent used for HPLC-MS-MS Methods L0078 and L0104/01 is sufficiently able to extract the analytes defined.

Based on the validation experiments, HPLC-MS-MS Method L0117/01 is considered valid for the determination of parent in commodities with high acid content (oranges and grapes), high water content (bulb onions, tomatoes and head lettuce), high starch content (potato tubers and wheat grains), and dried hops, The valid LOQ is 0.01 mg/kg for all plant commodities, except dried hops (0.02 mg/kg).

Table 38 Extractability of residues of ^{14}C-ametoctradin in plant matrices

Plant matrix	Extracted residues (%TRR) [a] original metabolism study	Extracted residues (%TRR) MeOH:water (50:50, v/v)	Extraction efficiency for MeOH:water
wheat grain	80.9	75.3	93.1
wheat forage	92.5	86.0	93.0
potato leaf	99.1	92.2	93.0
tomato fruit	99.3	95.0	95.7

a Values given as% TRR of wheat grain (1.8 mg/kg eq), wheat forage (1.7 mg/kg eq), potato leaf (44.7 mg/kg eq) and tomato fruit (0.36 mg/kg eq), respectively;

HPLC-MS-MS Method L0104/01

HPLC-MS-MS Method L0104/01, version May 2008, is intended as enforcement method and as data generation method for the determination of parent ametoctradin and its metabolites M650F01 and M650F06 in animal commodities [Schweda and Mackenroth, 2008c, 2008/1022140]. Samples were homogenised with dry ice and 5 g samples were extracted with a mixture of MeOH/water (50:50, v/v). An aliquot of the extract was centrifuged and the supernatant was cleaned by solid phase extraction using a strong cation mixed-mode column (Strata X-C). Analytes were eluted from the column using ACN/ammonia (95:5, v/v). The eluate was evaporated to dryness and reconstituted in MeOH/water/formic acid (50/50/0.1 v/v/v). The final determination of ametoctradin, M650F01 and M650F06 was performed by HPLC-MS-MS. The transitions for quantification were m/z 276 to 176 for parent, m/z 250 to 176 for M650F01, and m/z 278 to 217 for M650F06. The transitions for confirmation were m/z 276 to 149 for parent, m/z 250 to 149 for M650F01, and m/z 278 to 176 for M650F06.

HPLC-MS-MS Method L0104/01 was validated according to the full validation scheme for cow muscle, cow fat, cow liver, cow kidney, cow milk, cow cream and hen eggs [Schweda and Mackenroth, 2008c, 2008/1022140]. The validation was performed for the quantification transition

ions as well as for the confirmation transition ions. Fortification was performed with a mixture of parent, M650F01 and M650F06. The reported LOQ was 0.01 mg/kg for each commodity. Average recoveries at 0.01 mg/kg and 0.1 mg/kg were within 70–120% limits and RSDs were within 20%. Linearity (coefficient of correlation > 0.999) was observed in the range 0.05 to 2.5 ng/mL for all three analytes (equivalent concentration in the samples not stated) using six duplicate solvent standards. No interfering peaks > 0.3LOQ (i.e., 0.003 mg/kg) were detected in any of the control samples for any of the three analytes.

HPLC-MS-MS Method L0104/01 was validated according to the full validation scheme by an independent laboratory (ILV) for cow fat, cow liver, cow kidney, cow milk and hen eggs [MacDougall, 2008, 2008/1022841]. The validation was performed for the quantification transition ions only. Fortification was performed with a mixture of parent, M650F01 and M650F06. The reported LOQ was 0.01 mg/kg for each commodity. Average recoveries at 0.01 mg/kg and 0.1 mg/kg were within 70–120% limits and RSDs were within 20%. Linearity (by graph) was observed in the range 0.05 to 2.5 ng/mL for all three analytes (equivalent concentration in the samples not stated) using six single solvent standards. No interfering peaks > 0.3LOQ (i.e., 0.003 mg/kg) were detected in any of the control samples.

In an actual feeding study in dairy cows [MacDougall, 2011, 2011/1036848], method L0104/01 was slightly modified. The MeOH extract was added to a portion of water/HCl (100/0.2, v/v) before clean up on SPE (Strata XC. The modified method was validated according to the reduced validation scheme for cow milk and cow liver. The reported LOQ was 0.01 mg/kg for each commodity. Average recoveries at 0.01 and 1.0 mg/kg ranged from 69–96% for parent, 83–97% for M650F01 and 82–98% for M650F06 and RSDs were within 20%. The recovery of 69% for parent is just below the criterion of 70% and this is considered to have no impact on the results of the feeding study. Linearity (by graph) was observed in the range 0.05 to 2.5 ng/mL for all three analytes (equivalent concentration in the samples not stated) using six single solvent standards. No interfering peaks > 0.3LOQ (i.e., 0.003 mg/kg) were detected in any of the control samples.

A separate radiovalidation experiment was carried out for the determination of parent and its metabolites M650F01 and M650F06 in animal matrices [Schweda and Mackenroth, 2008c, 2008/1022140]. Homogenized samples of goat liver and goat kidney from the goat metabolism study were extracted once with a mixture of MeOH and water (50:50) as used in HPLC-MS-MS Method L0104/01. The total radioactive residues in the extracts and remaining solids were determined to calculate the extractabilities and compare them with the extractabilities found during the metabolism study (tissue homogenates extracted three times with MeOH, followed by two extraction steps with water). The solvent mixture used for residue analysis in animal matrices (MeOH : water 50:50) extracted similar or slightly higher amounts of total radioactive residues as the combined MeOH extracts in the metabolism study (Table 39) and resulted in comparable HPLC patterns. Therefore it can be concluded that the extraction solvent used for HPLC-MS-MS Method L0104/01 is sufficiently able to extract the metabolites defined. Extraction efficiency for individual metabolites was not investigated in this study.

Based on the validation experiments, HPLC-MS-MS Method L0104/01 and its modifications is considered valid for the determination of parent and metabolites M650F01 and M650F06 in animal tissues, milk and eggs. The valid LOQ is 0.01 mg/kg for all animal commodities.

Table 39 Extractability of residues of ^{14}C-ametoctradin in goat matrices with different solvent mixtures

Goat matrix	Origin	Solvent mixture	Extracted residues (%TRR) [a]	Remaining solids (%TRR) [a]	Sum (%TRR) [a]
Liver	Original metabolism study	Methanol (3×) followed by water (2×)	52.9	47.1	100.0
Liver	Original metabolism study	Methanol (3×) [b]	47.3	52.7 [c]	100.0
Liver	Current study	Methanol / water (50:50) (1×)	46.5	57.4	103.9
Kidney	Original metabolism	Methanol (3×) followed by water	63.0	37.0	100.0

Goat matrix	Origin	Solvent mixture	Extracted residues (%TRR) [a]	Remaining solids (%TRR) [a]	Sum (%TRR) [a]
	study	(2×)			
Kidney	Original metabolism study	Methanol (3×) [b]	56.1	43.9 [c]	100.0
Kidney	Current study	Methanol / water (50:50) (1×)	74.9	27.3	102.1

a Values given as% TRR of liver (0.095 mg/kg eq) and kidney (0.034 mg/kg eq), respectively;

b Data re-calculated from extraction with MeOH (3×) followed by water (2×);

c Calculated as residue after extraction with MeOH

Analytical methods used in study reports

HPLC-MS-MS Method L0078/01

HPLC-MS-MS Method L0078/01, version June 2007, is intended as data generation method for the determination of parent ametoctradin and its metabolites M650F03 and M650F04 in plant matrices [Schweda and Mackenroth, 2008b, 2008/1022139]. HPLC-MS-MS method L0078, draft June 2007, is identical to the validated method [Schweda, 2007, no DocID]. Samples were homogenised with dry ice and 5 g samples were extracted with a mixture of MeOH/water (50:50, v/v). An aliquot of the extract was centrifuged and the supernatant was cleaned by solid phase extraction with two connected columns. Using MeOH/water (20:80, v/v) as washing solution, parent ametoctradin was bound on the SDB-L column, while the metabolites M650F03 and M650F04 were washed off onto the second column (X-AW). The columns were disconnected. Parent was eluted with ACN/water (70/30, v/v) from the SDB-L column, while metabolites M650F03 and M650F03 were eluted with ACN/formic acid (96/4, v/v) from the X-AW column. Aliquots of the eluates of the SDB-L and X-AW columns were mixed (ratio 1.0:2.5, v/v), evaporated to dryness and re-dissolved in water/MeOH/formic acid (50/50/0.1, v/v/v). The final determination of parent, M650F03 and M650F04 was performed by HPLC-MS-MS. The transitions for quantification were m/z 276 to 176 for parent, m/z 222 to 176 for M650F03, and m/z 208 to 190 for M650F04. The transitions for confirmation were m/z 276 to 149 for parent, m/z 222 to 121 for M650F03, and m/z 208 to 123 for M650F04.

The method was validated according to the full validation scheme for commodities with high acid content (orange whole fruit and grapes), high water content (bulb onions, tomatoes and head lettuce), high starch content (potato tubers and wheat grains) and high oil content (sunflower seeds) [Schweda and Mackenroth, 2008b, 2008/1022139]. The validation was performed for the quantification transition ions only. Fortification was performed with a mixture of parent, M650F03 and M650F04. The reported LOQ was 0.01 mg/kg for each commodity. Average recoveries at 0.01 mg/kg and 0.1 mg/kg were within 70–120% limits and RSDs were within 20%. Linearity (coefficient of correlation > 0.99) was observed in the range of 0.025 to 2.5 ng/mL for all three analytes (equivalent concentration in the samples not stated) using seven duplicate solvent standards. No interfering peaks > 0.3 LOQ (i.e., 0.003 mg/kg) were detected in any of the control extracts.

In many of the supervised field trials, ametoctradin was mixed with dimethomorph. Since two characteristic mass transitions were used to monitor ametoctradin and the two metabolites M650F03 and M650F04, the method achieves a high level of specificity. An interference with dimethomorph and/or its metabolites can be excluded [BASF, 2012].

The method was validated according to the full validation scheme by an independent laboratory (ILV) for orange whole fruit, head lettuce, potato tubers, wheat grain, and sunflower seeds [Klimmek and Weber, 2008a/b, 2008/1013094, 2008/1037123]. The validation was performed for the quantification transition ions as well as for the confirmation transition ions. Fortification was performed with a mixture of parent, M650F03 and M650F04. The reported LOQ was 0.01 mg/kg for each commodity. Average recoveries at 0.01 mg/kg and 0.1 mg/kg were within 70–120% limits and RSDs were within 20%. Linearity (coefficient of correlation > 0.999) was observed in the range of 0.025 to 10 ng/mL for all three analytes (equivalent concentration in the samples not stated) using

eight single solvent standards. No interfering peaks > 0.3LOQ (i.e., 0.003 mg/kg) were detected in orange whole fruit, head lettuce, potato tubers, and wheat grain for any of the three analytes. Since interfering peaks were found in sunflower seeds for M650F03 (< 0.003–0.0037 mg/kg, n = 6), the appropriate LOQ is 0.02 mg/kg

In addition, HPLC-MS-MS Method L0078/01 was validated according to the full validation scheme for dried hops and beer [Braun, 2011, 2011/1101445]. The reported LOQ was 0.01 mg/kg for green hops and beer, 0.1 mg/kg for parent in dried hops and 0.01 mg/kg for the metabolites in dried hops. Average recoveries at 0.1 and 10 mg/kg for dried hops and 0.01 and 0.1 mg/kg for beer were within 70–120% limits and RSDs were within 20%. Linearity (coefficient of correlation > 0.999) was observed in the range of 0.025 to 1.0 ng/mL (equivalent concentration in the samples not stated) using six duplicate solvent standards. No interfering peaks > LOQ (i.e., 0.01 mg/kg for beer, 0.1 mg/kg for parent in dried hops and 0.01 mg/kg for metabolites in dried hops) were detected.

In addition HPLC-MS-MS Method L0078/01 was validated according to the reduced validation scheme for several processed commodities: processed grapes (wet pomace, rosé wine and raisins [Braun, 2008c, 2008/1022152]), processed gherkins (canned gherkin [Braun, 2008d, 2008/1022148]), processed tomatoes (canned tomato, raw juice, ketchup and paste [Braun, 2008b, 2008/1022150]) and processed potatoes (cooked potato, deep-fried potatoes (chips) and potato flakes [Braun, 2008a, 2008/1022149]). The validation was performed for the quantification transition ions only. The reported LOQ was 0.01 mg/kg for each commodity. Average recoveries at 0.01 and 1.0 mg/kg were within 70–120% limits and RSDs were within 20%. No interfering peaks (< 0.01 mg/kg) were detected, except 0.014–0.028 mg/kg parent in grape wet pomace. For grape wet pomace the appropriate LOQ for parent is 0.09 mg/kg.

In addition HPLC-MS-MS Method L0078/01 was validated according to the reduced validation scheme for several rotational crop commodities: wheat (forage and straw), carrots (whole immature plant, tops and roots) and cauliflower (whole immature plant, inflorescence) [Klimmek, 2009, 2009/1110621]. The reported LOQ was 0.01 mg/kg for each commodity. Average recoveries at 0.01 and 0.1 were within 70–120% limits and RSDs were within 20%. No interfering peaks (< 0.01 mg/kg) were detected.

For wheat hay, radish tops and radish roots, method L0078/01 was validated with only 1–2 recoveries per level in a rotational crop study [Norris and Saha, 2009, 2009/7006074]. Since these commodities were analysed as part of a rotational crop study, other commodities from the same crop groups showed good validation results and in the present evaluation no MRLs are proposed for rotational crops, this is considered acceptable for the present evaluation.

HPLC-MS-MS Method L0078/01 was used in the supervised field trials with slight modifications. The final solution for grapes, bulb onions, spring onions, cucumber, melon, pumpkin, summer squash, pepper, tomato and hops was made with ACN/water (1:9, v/v) instead of water/MeOH/formic acid. Chromatographic HPLC parameters differed from the original method for all commodities. The modified analytical method was validated according to the reduced validation scheme for spring onions [White, 2010a, 2009/7004732], broccoli, cauliflower, head cabbage and mustard greens [White, 2010d, 2009/7006205], cucumber, melon, pumpkin and summer squash [White, 2010b, 2009/7006306], chilli peppers and sweet peppers [White, 2010c, 2009/7006204], spinach and celery [White, 2010e, 2009/7003324], dried hops [Jordan, 2009c, 2009/7003320, metabolites only]. The validation was performed for the quantification transition ions only. Fortification was performed with a mixture of parent, M650F03 and M650F04. The reported LOQ was 0.01 mg/kg for each commodity. No interfering peaks > LOQ (i.e., 0.01 mg/kg) were detected. Average recoveries at 0.01 and 1.0 mg/kg were within 70–120% limits and RSDs were within 20%, except for the commodities listed in Table 40. Based on the results in Table 40 more appropriate LOQs lies in between 0.01–1 mg/kg for parent in chilli peppers, spinach and celery and M650F03 in spring onions and M650F04 in cucumbers. In the absence of acceptable recovery data, the Meeting decided to utilize the level of 1 mg/kg as LOQ for these commodity/analyte combinations until suitable validation data are provided to define an appropriate LOQ for these commodities. The

precision of 22% for spinach at 10 mg/kg is just above the 20% criterion and this is considered to have no impact on the selection of residues.

A separate radiovalidation experiment was carried out for the determination of parent and its metabolites M650F03 and M650F04 in plant matrices [Rabe and Mackenroth, 2008b]. Selected samples from the tomato and potato metabolism studies and the confined rotational crop study were extracted once with a mixture of MeOH and water (50:50) as used in HPLC-MS-MS Methods L0078 and L0117. The total radioactive residues in the extracts were determined to calculate the extractabilities and compare them with the extractabilities found during the metabolism study (plant homogenates extracted three times with MeOH and two times with water). The solvent mixture used for residue analysis in plant matrices (MeOH : water 50:50) extracted slightly lower amounts of total radioactive residues as the combined MeOH and water extracts in the metabolism studies (Table 39) and resulted in comparable HPLC patterns. Therefore it can be concluded that the extraction solvent used for HPLC-MS-MS Methods L0078 and L0104/01 is sufficiently able to extract the analytes defined.

Based on the validation experiments, HPLC-MS-MS Method L0078/01 is considered valid for the determination of parent, M650F03 and M650F04 in commodities with high acid content (orange whole fruit and grapes), high water content (bulb onions, spring onions, broccoli, cauliflower, head cabbages, cucumbers, melons, pumpkins, summer squash, tomatoes, sweet peppers, chilli peppers, lettuce, spinach, mustard greens and celery), high starch content (potato tubers and wheat grains), high oil content (sunflower seeds) and dried hops. Further the method is considered valid for processed commodities on grapes, gherkins, tomatoes, potatoes and hops. The valid LOQ is 0.01 mg/kg for all plant commodities, except 0.02 mg/kg for M650F03 in sunflower seeds, 0.09 mg/kg for parent in grape wet pomace, 0.1 mg/kg for parent in dried hops. For parent in chilli peppers, spinach and celery, M650F03 in spring onions and spinach, and M650F04 in cucumbers additional validation data are needed to define an appropriate LOQ.

Table 40 Validation results for HPLC-MS-MS Method L0078/01 not compliant with the recovery criteria (70–120%) or precision criteria (20%)

Commodity	Analyte	reported LOQ mg/kg	spike level mg/kg	n	% recovery mean	% recovery range	RSD_r	control samples mg/kg (n)	reference, method
spring onions	parent	0.01	0.01 1	3 3	116 95	108–125 89–101	7.0 6.2	< LOQ (3)	White, 2010, 2009/7004732
	M650F03	0.01	0.01 1	3 3	113 97	108–120 92–105	5.7 7.1	< LOQ (3)	idem
	M650F04	0.01	0.01 1	3 3	132 94	112–146 89–100	14 6.1	< LOQ (3)	idem
cucumbers	parent	0.01	0.01 1	4 6	86 91	75–109 79–103	19 9.9	< LOQ	White, 2010, 2009/7006306
	M650F03	0.01	0.01 1	9 8	102 90	73–154 62–104	24 14	< LOQ	idem
	M650F04	0.01	0.01 1	7 7	88 87	78–95 73–96	6.8 9.2	< LOQ	idem
chilli peppers	parent	0.01	0.01 1	3 4	85 83	71–110 80–92	26 7.0	< LOQ	White, 2010, 2009/7006204
	M650F03	0.01	0.01 1	4 4	100 88	86–122 81–95	15 8.0	< LOQ	idem
	M650F04	0.01	0.01 1	4 4	95 86	93–115 73–90	18 9.1	< LOQ	idem
spinach	parent	0.01	0.01 1 20 200	8 6 5 2	73 74 111 106	41–101 61–82 75–143 105–106	27 11 22 0.9	< LOQ	White, 2010, 2009/7003324
	M650F03	0.01	0.01 1 20	8 8 6	90 92 94	32–113 83–100 82–97	29 6.5 6.3	< LOQ	idem
	M650F04	0.01	0.01 1	8 8	90 89	75–101 85–101	11 5.6	< LOQ	idem

Commodity	Analyte	reported LOQ mg/kg	spike level mg/kg	n	% recovery mean	% recovery range	RSD_r	control samples mg/kg (n)	reference, method
			20	6	89	78–93	6.7		
celery	parent	0.01	0.01 1 10	6 7 4	79 80 79	53–104 60–97 75–83	24 16 5.1	< LOQ	White, 2010, 2009/7003324
	M650F03	0.01	0.01 1 20	8 8 3	103 90 89	88–118 85–93 87–92	11 3.3 3.4	< LOQ	idem
	M650F04	0.01	0.01 1 20	8 8 3	93 86 87	86–105 85–89 83–93	7.2 1.2 5.7	< LOQ	idem

HPLC-MS-MS Method L0091 for soil

HPLC-MS-MS Method L0091, version 01, July 2007, is intended as data generation method for the determination of parent ametoctradin and its metabolites M650F01, M650F02, M650F03 and M650F04 in soil matrices [Beck and Class, 2008, 2008/1017003]. Prior to extraction, water was added to establish approximately 40% of the maximum water holding capacity of each soil. Soil samples (equivalent to 5 g dry soil each) were extracted by shaking with ACN followed by two extractions with ACN/water (50/50 v/v). An aliquot of the combined extracts was diluted with ACN/water (10/90 v/v). The final determination of parent and its metabolites M650F01, M650F02, M650F03 and M650F04 was performed by HPLC-MS-MS. The transitions for quantification were m/z 276.3 to 149.1 for parent, m/z 250.2 to 232.0 for M650F01, m/z 236.0 to 176.1 for M650F02, m/z 222.2 to 176.1 for M650F03, and m/z 208.2 to 190.2 for M650F04. The transitions for confirmation were m/z 276.3 to 176.2 for parent, m/z 250.2 to 149.1 for M650F01, m/z 236.0 to 218.2 for M650F02, m/z 222.2 to 204.2 for M650F03, and m/z 208.2 to 123.0 for M650F04.

HPLC-MS-MS Method L0091 was validated according to the full validation scheme for two soil types (sandy loam and clay) [Beck and Class, 2008, 2008/1017003]. The reported LOQ was 0.01 mg/kg for each soil type. Average recoveries at 0.01 and 0.1 mg/kg were within 70–120% limits and RSDs were within 20%. Linear or quadratic regression equations were generated with 1/× weighting, resulting in good correlation ($r \geq 0.998$) in the range of 0.01 to 10 ng/mL (equivalent concentration in the samples not stated) using seven single solvent standards. No interfering peaks (< 0.3LOQ i.e., 0.003 mg/kg) were detected.

HPLC-MS-MS Method L0091, version 01, was used in a storage stability study on soil with slight modifications [Leite, 2008, 2008/1035629 and Leite and Takahashi, 2010, 2010/1044234]. The shaking time with ACN was shorter (10 min instead of 30 min), the centrifuge rate was lower (2000 rpm instead of 4000 rpm) and the final solvent was not diluted. Validation was conducted at one concentration level. Average recoveries at 0.1 mg/kg were within 70–120% limits and RSDs were within 20%. Linearity (coefficient of correlation > 0.99) was observed in the range of 0.5 to 10 ng/mL (equivalent concentration in the samples not stated) using five triplicate solvent standards. No interfering peaks (< 0.3LOQ i.e., 0.003 mg/kg) were detected.

HPLC-MS-MS Method L0110/01 for soil

HPLC-MS-MS Method L0110/01, version 01, is intended as data generation method for the determination of parent ametoctradin and its metabolites M650F03 and M650F04 in soil matrices [Klimmek, 2010, 2010/1022763]. Soil samples were homogenised manually and 5 g dry soil was extracted with MeOH, followed by MeOH/water (50:50, v/v). The combined extracts were filtered and diluted with MeOH/water (50:50, v/v). The final determination of parent, M650F03 and M650F04 was performed by HPLC-MS-MS. The transitions for quantification were m/z 276 to 149 for parent, m/z 222 to 176 for M650F03, and m/z 208 to 190 for M650F04. The transitions for confirmation were m/z 276 to 176 for parent, m/z 222 to 204 for M650F03, and m/z 208 to 123 for M650F04.

HPLC-MS-MS Method L0110/01 was validated according to the full validation scheme for soil samples taken from control plots, soil type not indicated [Klimmek, 2010, 2010/1022763]. The reported LOQ was 0.01 mg/kg for each soil type. Average recoveries at 0.01, 0.1 and 1.0 mg/kg were within 70–120% limits and RSDs were within 20%. Linearity (coefficient of correlation > 0.99) was observed in the range of 0.06 to 100 ng/mL (equivalent concentration in the samples not stated) using eight single solvent standards. No interfering peaks (< 0.3LOQ i.e., 0.003 mg/kg) were detected.

Stability of pesticide residues in stored analytical samples

The Meeting received information on storage stability of parent, M650F03 and M650F04 in plant commodities and of parent, M650F01 and M650F06 in animal commodities. Storage stability studies in dried hops and processed commodities were not available [BASF 2012d].

Study 1

Storage stability was investigated by spiking various homogenised plant commodities with 0.1 mg/kg parent, M650F03 and M650F04 each, using a mixed solution [Lehmann and Mackenroth, 2008, 2008/1022126; Lehmann and Mackenroth, 2009, 2009/1072418; Lehmann and Mackenroth, 2010, 2010/1031703]. Samples were stored for 2 years at -20 ºC and were analysed in duplicate at various intervals using HPLC-MS-MS method L0078/1. Average concurrent recoveries at 0.1 mg/kg were 95–97% for each analyte. Levels in control samples were < 0.01 mg/kg (LOQ) except for two samples – 0.592 mg/kg parent in wheat straw at day 365 and 0.03 mg/kg parent in dried peas at day 752.

Storage stability results and concurrent recoveries are shown in Table 41 to Table 43. Metabolites M650F03 and M650F04 are stable for at least 2 years in all commodity types. Degradation of parent was found for some commodities after storage at -20 ºC.

When % remaining was expressed as % of the actual concentration at day 0 (corrected for concurrent recovery) 30% degradation was found after 190 days for tomatoes. The parent concentration declined further for tomatoes to a degradation level of 40% and remained at that level for the rest of the storage period (16 months). For grapes, head lettuce and potatoes an initial decline of around 15–25% was found in the first 6 months of storage, which remained at this level thereafter (16–25 months). The data indicate that parent is stable for a maximum of 6 months in commodities with high water content (tomatoes) unless proven otherwise (e.g. head lettuce and wheat forage 25 months). Parent is stable for at least 16 months in in commodities with high acid content (grapes) and 25 months in commodities with high starch content (potatoes, wheat grain), high protein content (dried peas) and straw (wheat straw).

Table 41 Storage stability for 0.1 mg/kg parent at -20 ºC in various commodities

commodity	Storage time (days)	% remaining of nominal (n = 2) [a] mean	range	average concurrent recovery (n = 2)
grapes	0	106	98–115	104
	105	84	81–86	96
	186	104	104–104	120
	287	67	65–68	125
	365	87	91–84	93
	490	62	62–62	83
	752	–		–
tomatoes	0	104	105–102	95
	105	88	87–89	96
	186	90	86–94	118
	287	57	56–58	98
	365	68	66–70	91
	490	50	47–53	84
	752	–		–
head lettuce	0	94	89–99	90
	105	89	88–90	98
	186	101	96–106	111

commodity	Storage time (days)	% remaining of nominal (n = 2) [a] mean	range	average concurrent recovery (n = 2)
	287	68	66–69	97
	365	89	88–91	99
	490	63	63–63	83
	752	75	71–78	91
wheat forage	0	86	85–86	98
	105	75	69–80	87
	186	90	86–94	106
	287	78	77–80	93
	365	78	77–80	89
	497	63	62–63	81
	752	74	72–76	90
potato tubers	0	117	113–120	104
	105	79	79–79	90
	186	93	89–98	106
	287	69	68–70	95
	365	82	81–82	84
	490	65	64–67	87
	752	76	75–77	91
dried peas	0	98	97–100	103
	116	83	83–84	92
	186	119	118–119	121
	287	69	64–74	85
	365	94	91–97	90
	490	81	78–83	95
	752	83	80–87	84
wheat grain	0	103	97–110	107
	116	87	83–92	95
	186	101	100–101	119
	287	86	83–88	90
	365	100	91–109	92
	497	65	63–67	79
	752	104	91–118	90
wheat straw	0	96	95–96	100
	116	80	76–84	80
	186	97	96–97	101
	287	80	78–83	78
	365	87	86–88	82
	497	77	76–78	83
	752	79	77–81	85

a % remaining of nominal (0.1 mg/kg) not corrected for concurrent recovery

Table 42 Storage stability for 0.1 mg/kg M650F03 at -20 ºC in various commodities

commodity	Storage time (days)	% remaining (n = 2) [a] mean	range	average concurrent recovery (n = 2)
grapes	0	98	89–108	101
	105	95	95–96	92
	186	97	96–98	94
	287	94	93–96	103
	365	93	92–94	93
	490	84	83–84	93
	752	86	83–88	84
tomatoes	0	92	90–94	97
	105	94	92–96	94
	186	95	91–98	95
	287	92	90–95	97
	365	90	89–92	96
	490	88	87–88	91

commodity	Storage time (days)	% remaining (n = 2) [a] mean	range	average concurrent recovery (n = 2)
	752	81	80–82	91
head lettuce	0	85	80–89	82
	105	97	97–97	97
	186	101	101–102	101
	287	90	89–90	100
	365	90	89–91	100
	490	82	81–82	87
	752	80	80–81	83
wheat forage	0	84	84–85	98
	105	88	86–89	96
	186	101	98–104	104
	287	92	92–92	108
	365	84	82–85	94
	497	79	78–80	87
	752	86	83–90	92
potato tubers	0	105	105–105	103
	105	91	91–92	92
	186	100	97–103	86
	287	93	93–94	100
	365	86	85–87	90
	490	85	84–86	93
	752	80	78–80	84
dry peas	0	102	102–102	110
	116	96	95–96	98
	186	104	104–104	98
	287	94	89–99	97
	365	90	87–93	96
	490	98	96–99	100
	752	84	83–86	85
wheat grain	0	99	95–102	102
	116	98	95–101	104
	186	87	84–90	94
	287	87	80–94	99
	365	87	87–87	91
	497	80	78–81	94
	752	85	84–86	87
wheat straw	0	101	100–102	105
	116	96	93–100	99
	186	107	105–108	106
	287	96	96–97	101
	365	95	92–98	94
	497	97	96–99	105
	752	85	84–86	87

a %remaining (i.e., percentage of nominal) not corrected for concurrent recovery

Table 43 Storage stability for 0.1 mg/kg M650F04 at -20 ºC in various commodities

commodity	Storage time (days)	% remaining (n = 2) [a] mean	range	average concurrent recovery (n = 2)
grapes	0	102	94–110	98
	105	104	103–105	94
	186	92	90–94	92
	287	93	91–95	98
	365	83	81–84	94
	490	87	86–88	98
	752	78	77–79	86
tomatoes	0	101	100–102	97
	105	103	101–106	91
	186	89	89–90	92
	287	87	86–88	95
	365	78	77–78	92
	490	89	88–90	97
	752	80	78–82	97
head lettuce	0	93	87–98	85
	105	111	102–119	100
	186	92	91–92	102
	287	96	96–96	99
	365	81	80–82	95
	490	87	85–88	97
	752	80	78–82	90
wheat forage	0	90	90–90	104
	105	95	89–100	95
	186	91	90–92	100
	287	92	91–93	101
	365	74	73–74	91
	497	82	80–83	94
	752	81	79–84	92
potato tubers	0	111	110–113	104
	105	96	95–96	97
	186	92	90–94	97
	287	91	90–92	100
	365	78	76–81	91
	490	87	86–89	99
	752	76	76–76	85
dried peas	0	106	105–106	107
	116	95	92–97	98
	186	89	88–89	95
	287	91	88–95	97
	365	79	78–81	96
	490	94	93–96	103
	752	81	80–82	92
wheat grain	0	107	96–118	106
	116	98	95–100	102
	186	80	77–82	95
	287	85	83–87	97
	365	78	78–79	93
	497	75	74–77	91
	752	77	77–77	94
wheat straw	0	100	100–101	107
	116	103	100–105	102
	186	99	95–103	107
	287	99	98–100	99
	365	82	80–83	93
	497	94	93–94	104
	752	81	80–81	89

a %remaining (i.e., percentage of nominal) not corrected for concurrent recovery

Study 2

In a separate study the storage stability of parent was investigated in tomatoes and lettuce with incurred residues [Rabe and Mackenroth, 2008, 2008/1043913]. Samples were derived from plant metabolism studies, where tomatoes and lettuce were treated with a mixture of unlabelled, 2,7-^{14}C-labelled and 2,5,7-^{13}C-labelled ametoctradin using a spray application at a nominal rate of 4× 0.30 kg ai/ha (tomatoes) or 3× 0.24 kg ai/ha (lettuce). The samples were stored for 1150 and 766 days at -18 ºC until extraction [BASF, 2012c]. Samples were analysed using extraction with MeOH and with water as originally described in the metabolism studies, and re-analysis with LSC. The nature of the compound extracted was determined by HPLC.

The tomato samples were not taken from the metabolism study referenced with 2008/1006293, but from an older study, not submitted for this evaluation. This study was started in March 2005. In the March 2005 study four applications of 0.30 kg ai/ha were performed with a MeOH/water mixture whereas in study 2008/1006293 the test substance was applied three times with 0.30 kg ai/ha in the blank formulation [BASF, 2012d].

The HPLC chromatograms show that parent is the main constituent in the MeOH extracts (88.7–92.3% in tomato and 100% in lettuce). Besides this peak a number of very minor or minor peaks with varying intensity were observed in tomato. None of these peaks can be ascribed to M650F03 or M650F04 [BASF, 2012c].

Based on the HPLC pattern the concentration of parent in the MeOH extracts can be calculated [BASF, 2012c]. For tomato the concentration of parent is 0.289 mg/kg in the original metabolism study and 0.297 mg/kg in the current study. In the lettuce study the concentration of parent was 8.39 mg/kg in the original metabolism study and. 9.53 mg/kg in the current study. From the results in Table 44 it can be concluded that parent is stable in homogenised tomatoes and lettuce for at least 3 years.

Table 44 Storage stability of radioactivity in grown samples of tomato and lettuce

		Original metabolism study			Current study—re-analysis			
		Storage time (days)	Conc. (mg/kg eq)	%TRR	Storage time (days)	Conc. (mg/kg eq)	%TRR	% remaining
Tomato	TRR calculated	22	0.322	100.0	1150	0.342	100.0	
	CH_3OH-Extract	22	0.315	97.9	1150	0.335	98.1	
	parent	22 [a] + 12 [b]	0.289		1150 [a] + 4 [b]	0.297		103%
Lettuce	TRR calculated	16	8.485	100.0	766	9.634	100.0	
	CH3OH-Extract	16	8.392	98.9	766	9.527	98.9	
	parent	16 [a] + 13 [b]	8.39		766 + 5 [b]	9.53		114%

a Time between harvest and extraction

b Time between extraction and analysis [BASF, 2012c]

Study 3

Storage stability was investigated in bovine milk spiked individually with 0.1 mg/kg parent, M650F01 or M650F06 [MacDougall, 2011, 2011/1036848]. Samples were stored for 34–41 days at –20 ºC and were analysed for parent, M650F01 and M650F06 using HPLC-MS-MS method L0104/01 with slight modifications. Average concurrent recoveries ranged from 69–96% for parent, 83–97% for M650F01 and 82–98% for M650F06 at 0.01 and 0.1 mg/kg in different matrices. Residues in control samples were < 0.01 mg/kg for each analyte.

Storage stability results and concurrent recoveries are shown in Table 45. Parent and metabolites M650F01 are stable for at least 41 days and M650F06 for at least 34 days in milk.

Table 45 Storage stability for 0.1 mg/kg parent, M650F01 and M650F06 at –20 ºC in milk

commodity	analyte	Storage time (days)	% remaining (n = 3) [a] mean	range	average concurrent recovery (n = 3)	
milk	parent	0	101	99–104	–	
		41	84	80–89	85	83–89
	M650F01	0	88	85–91	–	
		41	78	76–81	77	67–82
	M650F06	0	85	80–88	–	
		34	92	90–94	91	82–99

a %remaining (i.e., percentage of nominal) not corrected for concurrent recovery

Study 4

Storage stability was investigated in a German standard soil 2.2 (loamy sand) [Leite, 2008, 2008/1035629 and Leite and Takahashi, 2010, 2010/1044234]. It was taken freshly from the upper 20 cm from a field site near Hanhofen, Rhenish Palatinate, Germany. After air drying for 3 days, the soil was sieved to 2 mm mesh. Two days after sieving, the soil was adjusted to 20% of the maximum water holding capacity. The moist soil was spiked with a mixed solution of 0.1 mg/kg parent, M650F01, M650F02, M650F03 and M650F04. Samples were stored for 24 months at –20 ºC in the dark and were analysed for parent, M650F01, M650F02, M650F03 and M650F04 using a modification of HPLC-MS-MS method L0091, version 01. Residues in the stored samples were not corrected for average concurrent recoveries (within 70–110% for each analyte). Residues in control samples were < 0.01 mg/kg for each analyte.

Storage stability results and concurrent recoveries are shown in Table 46. Parent and metabolites M650F01, M650F02, M650F03 and M650F04 are stable for at least 24 months in moist soil.

Table 46 Storage stability for 0.1 mg/kg analyte at –20 ºC in moist soil

commodity	analyte	Storage time (days)	% remaining (n = 2) [a] mean	range	average concurrent recovery (n = 2)
loamy sand	parent	0	99.0	99–99	–
		30	80	78–82	94
		63	78	77–80	88
		94	72	71–74	89
		213	87	86–88	106
		275	93	90–96	109
		369	82	79–84	101
		737	72	71–73	86
	M650F01	0	84	83–85	–
		30	77	71–84	100
		63	79	79–80	102
		94	80	80–81	104
		213	87	86–87	110
		275	87	83–91	111
		369	91	84–97	103
		737	86	81–91	115
	M650F02	0	99	95–103	–
		30	89	88–91	100
		63	85	81–90	97
		94	96	85–108	108
		213	104	103–105	111
		275	100	97–104	112
		371	95	93–96	108
		737	87	86–87	96
	M650F03	0	104	102–106	–
		30	84	81–88	96
		63	101	98–105	109

commodity	analyte	Storage time (days)	% remaining (n = 2) [a] mean	range	average concurrent recovery (n = 2)
loamy sand	parent	0	99.0	99–99	–
		94	98	96–101	109
		213	100	95–104	104
		275	89	87–91	98
		369	85	85–85	102
		737	108	105–110	106
	M650F04	0	92	90–95	–
		30	91	88–94	102
		63	97	92–103	108
		94	82	76–88	92
		213	85	77–92	95
		275	96	94–98	108
		369	82	82–82	97
		737	108	100–116	120

a % remaining (i.e., percentage of nominal), not corrected for concurrent recovery

USE PATTERNS

Ametoctradin is a registered fungicide in several countries and the original registered labels in the original language were submitted for Argentina, Austria, Canada, Chile, Colombia, Estonia, France, Germany, Hungary, Italy, Latvia, Lithuania, Macedonia, Netherlands, Romania, Turkey, the United Kingdom and the USA. Use patterns were submitted for grapes, tree tomatoes, bulb vegetables, Brassica vegetables, fruiting vegetables, leafy vegetables, root and tuber vegetables, stalk and stem vegetables, herbs, spices (roots/rhizomes) and hops. Only the labels for which residue trials were available were summarized, and therefore label information on tree tomatoes, herbs and spices (roots/rhizomes) was not included in Table 47. In consultation with the manufacturer, label information from countries for which no English label translations were available was not included in Table 47. Therefore only the registered labels for USA, Canada (CAN) and some European countries were summarized.

Table 47 Registered pre-harvest uses of ametoctradin

Crop (code)	Country	Form	Application				PHI, days
			Method	Rate kg ai/ha	Spray conc, kg ai/hL	Number	
Berries and other small fruit							
Grape	USA	SC 200 g/L [a, o]	foliar spray	0.23–0.31 (max 1.2/season)	0.13–0.16	1–4 [f] (7–10 day interval)	14 plant back restriction 14 days
Grape	USA	SC 300 g/L [a, o]	foliar spray	0.23–0.31 (max 1.2/season)	0.13–0.16	1–4 [f] (7–10 day interval)	28 plant back restriction 14 days
Grape	CAN	SC 200 g/L [a, o]	foliar spray	0.24	0.12–0.15	1–4 [f] (7–10 day interval)	14 plant back restriction 30 days
Grape	CAN	SC 300 g/L [b, o]	foliar spray	0.24–0.3	0.12–0.15	1–4 [f] (7–10 day interval)	14 plant back restriction 30 days
Grape	France	WG 120 g/kg [d]	foliar spray	0.30	–	3 [f] (12–14 day interval)	35
Grape	Italy	WG 120 g/kg [d]	foliar spray	0.30	–	3 (8–12 day interval)	35
Grape	Hungary	WG 120 g/kg	foliar spray	0.30	0.030–0.075	3	35

Crop (code)	Country	Form	Application				PHI, days
			Method	Rate kg ai/ha	Spray conc, kg ai/hL	Number	
		[d]				(10–12 day interval)	
Grape	Macedonia	WG 120 g/kg [f]	foliar spray	0.30	0.030–0.075	3 (10–14 day interval)	35
Bulb vegetables							
Bulb vegetables [h]	USA	SC 200 g/L, SC 300 g/L, [a, b, o,]	foliar spray:	0.31 (max 0.92/season)	max. 0.16	1–3 [f] (5–7 day interval)	0 plant back restriction 14 days
Bulb vegetables [h]	USA	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray (aerial)	0.31 (max 0.92/season)	max. 0.66	1–3 [f] (5–7 day interval)	0 plant back restriction 14 days
Bulb vegetables [h]	CAN	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray	0.30	max. 0.15	1–3 [f] (5–7 day interval)	0 plant back restriction 30 days
Bulb vegetables [h]	CAN	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray (aerial)	0.30	max. 0.6	1–3 [f] (5–7 day interval)	0 plant back restriction 30 days
Brassica vegetables							
Brassica vegetables [i]	USA	SC 200 g/L/ [a, o]	foliar spray	0.31 (max 0.92/season)	max. 0.16	1–3 [f] (7 day interval)	0 plant back restriction 14 days
Brassica vegetables [i]	USA	SC 200 g/L/ [a, o]	foliar spray (aerial)	0.31 (max 0.92/season)	max. 0.66	1–3 [f] (7 day interval)	0 plant back restriction 14 days
Brassica vegetables: head and stem only [i]	USA	SC 300 g/L [b, o]	foliar spray	0.31 (max 0.92/season)	max. 0.16	1–3 [f] (7 day interval)	7 plant back restriction 14 days
Brassica vegetables: head and stem only [i]	USA	SC 300 g/L [b, o]	foliar spray (aerial)	0.31 (max 0.92/season)	max. 0.66	1–3 [f] (7 day interval)	7 plant back restriction 14 days
Brassica vegetables: leafy only [i]	USA	SC 300 g/L [b, o]	foliar spray	0.31 (max 0.92/season)	max. 0.16	1–3 [f] (7 day interval)	0 plant back restriction 14 days
Brassica vegetables: leafy only [i]	USA	SC 300 g/L [b, o]	foliar spray (aerial)	0.31 (max 0.92/season)	max. 0.66	1–3 [f] (7 day interval)	0 plant back restriction 14 days
Brassica vegetables [i]	CAN	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray	0.24–0.30	0.12–0.15	1–3 [f] (5–7 day interval)	0 plant back restriction 30 days
Brassica vegetables [i]	CAN	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray (aerial)	0.24–0.30	max. 1.2–1.5	1–3 [f] (5–7 day interval)	0 plant back restriction 30 days

Crop (code)	Country	Form	Application				PHI, days
			Method	Rate kg ai/ha	Spray conc, kg ai/hL	Number	
Fruiting vegetables – cucurbits							
Fruiting vegetables – cucurbits [j]	USA	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray	0.31 (max 0.92/season)	max. 0.16	1–3 [f] (5–7 day interval)	0 plant back restriction 14 days
Fruiting vegetables – cucurbits [j]	USA	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray (aerial)	0.31 (max 0.92/season)	max. 0.66	1–3 [f] (5–7 day interval)	0 plant back restriction 14 days
Fruiting vegetables – cucurbits [j]	CAN	SC 200 g/L/ [a, o]	foliar spray	0.24–0.30	max. 0.15	1–3 [f] (5–7 day interval)	0 plant back restriction 30 days
Fruiting vegetables – cucurbits [j]	CAN	SC 200 g/L/ [a, o]	foliar spray (aerial)	0.24–0.30	max. 0.6	1–3 [f] (5–7 day interval)	0 plant back restriction 30 days
Fruiting vegetables – cucurbits [j]	CAN	SC 300 g/L [b, o]	foliar spray	0.24–0.30	max. 0.15	1–3 [f] (5–7 day interval)	1 plant back restriction 30 days
Fruiting vegetables – cucurbits [j]	CAN	SC 300 g/L [b, o]	foliar spray (aerial)	0.24–0.30	max. 0.6	1–3 [f] (5–7 day interval)	1 plant back restriction 30 days
Cucumber	Italy	SC 300 g/L [b]	foliar spray	0.24	–	2 (interval 7–10 days)	3
Cucumber	Macedonia	SC 300 g/L [b]	foliar spray	0.24–0.30	0.048–0.15	4 (interval 10–14 days)	1
Cucumber	Romania [p]	SC 300 g/L [b]	foliar spray	0.24	–	–	–
Fruiting vegetables – other than cucurbits							
Fruiting vegetables [k]	USA	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray	0.31 (max 0.92/season)	max. 0.16	1–3 [f] (5–7 day interval)	4 plant back restriction 14 days
Fruiting vegetables [k]	USA	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray (aerial)	0.31 (max 0.92/season)	max. 0.66	1–3 [f] (5–7 day interval)	4 plant back restriction 14 days
Fruiting vegetables [k]	CAN	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray	0.30	max. 0.15	1–3 [f] (5–7 day interval)	4 plant back restriction 30 days
Fruiting vegetables [k]	CAN	SC 200 g/L, SC 300 g/L, [a, b, o]	foliar spray (aerial)	0.30	max. 0.6	1–3 [f] (5–7 day interval)	4 plant back restriction 30 days
Cucumber	Macedonia	SC 300 g/L [b]	foliar spray	0.24–0.30	0.048–0.15	4 (interval 10–14 days)	1
Leafy vegetables (excluding Brassica leafy vegetables)							
Leafy vegetables	USA	SC 200 g/L [a, o]	foliar spray	0.31 (max 0.92/season)	max. 0.16	1–3 [f] (5–7 day interval)	0 plant back restriction

Crop (code)	Country	Form	Application				PHI, days
			Method	Rate kg ai/ha	Spray conc, kg ai/hL	Number	
[l]							14 days
Leafy vegetables [l]	USA	SC 200 g/L [a, o]	foliar spray (aerial)	0.31 (max 0.92/season)	max. 0.66	1–3 [f] (5–7 day interval)	0 plant back restriction 14 days
Lettuce (head & leaf)	USA	SC 300 g/L, [b, o]	foliar spray	0.31 (max 0.92/season)	max. 0.16	1–3 [f] (7 day interval)	0 plant back restriction 14 days
Lettuce (head & leaf)	USA	SC 300 g/L [b, o]	foliar spray (aerial)	0.31 (max 0.92/season)	max. 0.66	1–3 [f] (7 day interval)	0 plant back restriction 14 days
Leafy vegetables [l]	CAN	SC 200 g/L SC 300 g/L [a, b, n]	foliar spray	0.30	max. 0.15	1–3 [f] (5–7 day interval)	0 plant back restriction 30 days
Leafy vegetables [l]	CAN	SC 200 g/L SC 300 g/L [a, b, n]	foliar spray (aerial	0.30	max. 0.6	1–3 [f] (5–7 day interval)	0 plant back restriction 30 days
Root and tuber vegetables							
Potato	Austria & Germany [e]	WG 80 g/kg [c]	spray BBCH15–BBCH89	0.20	0.040–0.10	1–4 (5–10 day interval)	7
Potato	Nether lands [e]	SC 300 g/L [b]	spray BBCH 15	0.24	ns	1–4 (5–7 day interval)	7
Potato	Nether lands [e]	WG 80 g/kg [c]	spray	0.20	ns	1–4 (5–7 day interval)	7
Potato	UK	SC 300 g/L [b]	spray	0.24 (max 0.96/season)	0.048–0.12	1–4 [g] (7–10 day interval)	7
Potato	UK	WG 80 g/kg [c]	spray	0.20 (max 0.80/season)	0.040–0.10	1–4 [g] (7–10 day interval)	7
Root and tuber vegetables [m]	USA	SC 200 g/L [a, o]	spray	0.31 (max 0.92/season)	0.13–0.16	1–3 [f] (5–7 day interval)	4 plant back restriction 14 days
Root and tuber vegetables [m]	USA	SC 200 g/L [a, o]	spray (aerial)	0.31 (max 0.92/season)	0.66	1–3 [f] (5–7 day interval)	4 plant back restriction 14 days
Potatoes	USA	SC 300 g/L [b, o]	spray	0.24–0.31 (max 0.92/season)	0.13–0.16	1–3 [f] (5–7 day interval)	4 plant back restriction 14 days
Potatoes	USA	SC 300 g/L [b, o]	spray (aerial)	0.24–0.31 (max 0.92/season)	0.66	1–3 [f] (5–7 day interval)	4 plant back restriction 14 days
Potatoes	CAN	SC 200 g/L [a, o]	spray	0.24–0.30	0.12–0.15	1–3 [f] (5–7day interval)	4 plant back restriction 30 days
Potatoes	CAN	SC 200 g/L/ [a, o]	spray (aerial)	0.24–0.30	0.54–0.6	1–3 [f] (5–7 day interval)	4 plant back restriction

Crop (code)	Country	Form	Application				PHI, days
			Method	Rate kg ai/ha	Spray conc, kg ai/hL	Number	
							30 days
Potatoes	CAN	SC 300 g/L [b, o]	spray	0.24–0.30	0.12–0.15	1–3 [f] (5–10 day interval)	4 plant back restriction 30 days
Potatoes	CAN	SC 300 g/L [b, o]	spray (aerial)	0.24–0.30	0.54–0.6	1–3 [f] (5–10 day interval)	4 plant back restriction 30 days
Dried herbs							
Hops	USA	SC 200 g/L, [a, o]	foliar spray	0.31 (max 0.92/season)	0.13–0.16	1–3 [f] (7 day interval)	7 plant back restriction 14 days
Hops	USA	SC 300 g/L [b, o]	foliar spray	0.24–0.31 (max 0.88/season)	0.13–0.16	1–3 [f] (10 day interval)	7 plant back restriction 14 days
Hops	CAN	SC 200 g/L; SC 300 g/L [a, b, o]	foliar spray	0.24–0.30	0.12–0.15	1–3 [f] (10 day interval)	7 plant back restriction 30 days

A total of 34 different labels were submitted to the Meeting. Four main groups of products can be distinguished, one with the single active and three formulations, each containing different additional active ingredients:

ns = not stated

a SC formulation containing 200 g/L ametoctradin,

b SC formulation containing 300 g/L ametoctradin and 225 g/L dimethomorph,

c WG formulation containing 80 g/kg ametoctradin and 480 g/kg mancozeb.

d WG formulation containing 120 g/kg ametoctradin and 440 g metiram

e = No translation of label submitted, but intended use could be derived.

f = No more than two sequential applications at the time should be performed before alternating to another effective fungicide with a different mode of action for at least one application.

g = No more than three consecutive applications.

h Bulb vegetables include garlic, garlic (great headed), leek, onion (dry bulb), onion (green), onion (Welsh), shallot.

I Brassica vegetables include: head and stem Brassica (broccoli, Brussels sprouts, cabbage, cauliflower, cavalo broccoli, Chinese broccoli (gai lon), Chinese cabbage (napa), Chinese mustard cabbage (gai choy), kohlrabi) and leafy Brassica (broccoli raab (rapini), Chinese cabbage (bok choy), collards, kale, mizuna, mustard greens, mustard spinach and rape greens).

j Cucurbit vegetables include all types and hybrids of cantaloupe, Chinese waxgourd, citron melon, cucumber, edible gourds, gherkin, muskmelon, pumpkin, summer squash, watermelon, winter squash, zucchini, and *Momoridica* spp. including balsam apple, balsam pear, bitter melon and Chinese cucumber.

* Chayote is also included in the USA label, but not in the Canadian labels.

k Fruiting vegetables other than cucurbits include eggplant, ground cherry, pepino, pepper (all varieties), tomatillo, and tomato.

l Leafy vegetables USA label includes amaranth, arugula, cardoon, celery, Chinese celery, celtuce, chervil, chrysanthemum (edible leaved and garland), corn salad, garden and upland cress, dandelion, dock, endive, Florence fennel, head and leaf lettuce, orach, parsley, garden and winter purslane, red chicory radicchio, rhubarb, spinach, New Zealand and vine spinach, Swiss chard according to the USA label.

* Leafy vegetables CAN label only includes celtuce, upland cress, endive, head and leaf lettuce, and radicchio (red chicory).

m Root and tuber vegetables USA label includes arracacha, arrowroot, Chinese artichoke, Jerusalem artichoke, bitter and sweet cassava, root chayote, chufa, dasheen, edible canna, ginger, leren, potato, sweet potato, tanier, true yam, turmeric, and yam bean.

n DO NOT apply with adjuvant.

o The addition of a spreading/penetrating adjuvant is recommended to improve disease control performance.

p The formulation is registered in Romania, but is not yet marketed in September 2012. Therefore no original label was available for JMPR 2012. The dose rates were confirmed in a signed registration certificate.

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

The Meeting received information on supervised residue trials of ametoctradin for the following crops:

Group	Table	Commodity
Berries and other small fruits	48	Grapes, foliar spray, field
Bulb vegetables	49	Bulb onions, foliar spray, field
	50	Spring onions, foliar spray, field
Brassica vegetables	51	Broccoli, foliar spray, field
	52	Head cabbages, foliar spray, field
Fruiting vegetables, cucurbits	53	Cucumbers, foliar spray, field
	54	Cucumbers, foliar spray, indoors
	55	Gherkins, foliar spray, field
	56	Melons, foliar spray, field
	57	Pumpkins, foliar spray, field
	58	Summer squash, foliar spray, field
Fruiting vegetables other than cucurbits	59	Sweet peppers, foliar spray, field
	60	Sweet peppers, foliar spray, indoors
	61	Chilli peppers, foliar spray, field
	62	Tomatoes, foliar spray, field
Leafy vegetables	63	Head lettuce, foliar spray, field
	64	Leaf lettuce, foliar spray, field
	65	Mustard greens, foliar spray, field
	66	Spinach, foliar spray, field
Root and tuber vegetables	67	Potatoes, foliar spray, field
Stalk and stem vegetables	68	Celery, foliar spray, field
Dried herbs	69	Dry hops, foliar spray, field

Residues, application rates and spray concentrations have been rounded to two figures. Residue data are recorded unadjusted for percentage recoveries or for residue values in control samples unless otherwise stated. Unquantifiable residues are shown as below the reported LOQ (e.g. < 0.01 mg/kg). Where multiple samples were taken from a single plot or where multiple analyses were conducted on a single sample, the average value is reported. Where results from separate plots with distinguishing characteristics such as different formulations, crop varieties or treatment schedules were reported, results are listed separately for each plot. Residues from the trials conducted according to critical GAP have been used for the estimation of maximum residue levels, STMR and HR values. Those results are underlined.

Metabolites M650F03 and M650F04 were identified as soil metabolites. These metabolites were also seen at low levels in a variety of supervised field trials after foliar application. In most instances these levels were too low to quantitate but in some supervised field trials, the residues exceeded the LOQ and were reported. Since the formulation was applied 3–4 times with intervals of 5–9 days, it seems likely that the foliar spray from the early application(s) reached the soil because of incomplete soil coverage by the plants. Ametoctradin from these early applications degraded in the

soil to the metabolites M650F03 and M650F04 and these metabolites were taken up by the plants in low levels and were detected at harvest (10–35 days after the first application) [BASF, 2012b]. A separate column is presented in the tables where the total residue is listed (i.e., sum of parent, M650F03 and M650F03, expressed as parent equivalents).

The residues presented in the tables are given as parent or as total residue. The total residue represents the sum of parent + 1.2449× M650F03 + 1.3292× M650F04 (i.e., expressed as parent). Where residues of M650F03 and M650F04 were < 0.01 mg/kg, these were calculated as being at 0.01 mg/kg (expressed as metabolite) and then multiplied by the molecular weight conversion factor (1.2449 or 1.3292).

Grapes

The Meeting received supervised residue trials on grapes. Supervised residue trials on wine grapes were conducted in Canada (2008), USA (2008), Germany (2006, 2007), France (2006, 2007), Spain (2006, 2007), Italy (2006, 2007) and Greece (2006, 2007). Some German 2007 trials were conducted at an exaggerated rate for the purpose of processing studies. Results for a foliar spray treatment in the field are shown in Table 48. In Canada and the USA at each location two trials were conducted with two different spray concentrations. Residue levels in the trials are for the whole fruit after removal of stems (= Codex RAC) [BASF, 2012c]. Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were found in three out of 46 trials (indicated with subscript d). In these trials, soil metabolites ranged from < 0.01 mg/kg–0.09 mg/kg for M650F03 and 0.01–0.17 mg/kg for M650F04, which amounts to 2.3–18.1% of the total residue.

Table 48 Residues of ametoctradin after pre-harvest foliar spray on grapes

Location, year, (variety)	Form (g ai/L)	No	Interval (days)	kg ai/ ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Wayne, NY, USA, 2008 (Cayuga White)	SC 200 [a] + adjuvant NIS-LI 700	4	7–8–7	0.30 0.30 0.30 0.30	0.054 0.053 0.054 0.053	BBCH 81, 15 Aug	14 28	0.49 0.59	0.52 0.62	249262 2009/7002489 RCN R080044
Wayne, NY, USA, 2008 (Cayuga White)	SC 200 [a] + adjuvant NIS-LI 700	4	7–8–6	0.30 0.30 0.30 0.30	0.027 0.027 0.027 0.027	BBCH 81, 15 Aug	14 28	0.91 0.97	0.94 1.0	idem
Lehigh, PA, USA, 2008 (Concord)	SC 200 [a] + adjuvant Induce	4	7–7–6	0.31 0.30 0.30 0.30	0.053 0.053 0.053 0.053	BBCH 85, 27 Aug	14 26 [b]	0.34 0.32 [b]	0.37 0.35	249262 2009/7002489 RCN R080045
Lehigh, PA, USA, 2008 (Concord)	SC 200 [a] + adjuvant Induce	4	7–7–6	0.31 0.31 0.30 0.30	0.0086 0.0086 0.0086 0.0086	BBCH 85, 27 Aug	14 26	0.32 0.17 [c]	0.35 0.20	idem
Pepin, WI, USA, 2008 (King of the North)	SC 200 + adjuvant Induce	4	7–7–7	0.30 0.30 0.29 0.30	0.065 0.065 0.064 0.064	BBCH 85, 26 Aug	14 28	2.2 1.5	2.2 [d] 1.9 [d]	249262 2009/7002489 RCN R080046
Pepin, WI, USA, 2008 (King of the North)	SC 200 [a] + adjuvant Induce	4	7–7–7	0.30 0.30 0.30 0.30	0.032 0.032 0.032 0.032	BBCH 85, 26 Aug	14 28	1.6 1.1	1.6 1.1	idem
Kent, MI, USA, 2008 (Concord)	SC 200 [a] + adjuvant R–11	4	7–7–7	0.30 0.30 0.30 0.30	0.045 0.047 0.047 0.045	berries touching, 13 Aug	14 28	0.58 0.43	0.61 0.46	249262 2009/7002489 RCN R080047

Location, year, (variety)	Form (g ai/L)	No	Interval (days)	kg ai/ ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Kent, MI, USA, 2008 (Concord)	SC 200 [a] + adjuvant R-11	4	7–7–7	0.30 0.30 0.30 0.30	0.023 0.024 0.024 0.023	berries touching, 13 Aug	14 28	1.1 1.4	1.1 1.4	idem
Waterloo Wellington, ON, Canada, 2008 (Concord)	SC 200 [a] + adjuvant Agral 90	4	7–8–6	0.29 0.32 0.29 0.30	0.050 0.050 0.050 0.050	BBCH 83, 11 Sept	15 28	0.10 0.07	0.13 0.096	249262 2009/7002 489 RCN R080048
Waterloo Wellington, ON, Canada, 2008 (Concord)	SC 200 [a] + adjuvant Agral 90	4	7–8–6	0.30 0.31 0.29 0.29	0.025 0.025 0.025 0.025	BBCH 83, 11 Sept	15 28	0.19 0.21	0.22 [d] 0.24	idem
Glenn, CA, USA, 2008 (Ruby Red)	SC 200 [a] + adjuvant Sylgard	4	7–7–7	0.30 0.30 0.30 0.30	0.043 0.043 0.043 0.043	berry colour adv, 12 Aug	14 28	0.32 0.33	0.35 0.36	249262 2009/7002 489 RCN R080049
Glenn, CA, USA, 2008 (Ruby Red)	SC 200 [a] + adjuvant Sylgard	4	7–7–7	0.30 0.30 0.30 0.30	0.022 0.022 0.022 0.022	berry colour adv, 12 Aug	14 28	0.32 0.20	0.35 0.23	idem
Fresno, CA, USA, 2008 (Thompson Seedless)	SC 200 [a] + adjuvant Induce	4	7–7–7	0.30 0.30 0.29 0.29	0.042 0.042 0.042 0.042	fruit to ½ inch = 1.3 cm, 22 July	14 28	0.78 0.93	0.81 0.96	249262 2009/7002 489 RCN R080050 [f]
Fresno, CA, USA, 2008 (Thompson Seedless)	SC 200 [a] + adjuvant Induce	4	7–7–7	0.30 0.29 0.29 0.29	0.013 0.013 0.013 0.013	fruit to ½ inch = 1.3 cm, 22 July	14 28	1.2 1.7	1.3 [d] 1.8	idem [f]
Fresno, CA, USA, 2008 (Fiesta)	SC 200 [a] + adjuvant Induce	4	7–7–7	0.30 0.30 0.30 0.29	0.043 0.043 0.043 0.043	fruit to 2 inch, 22 July	0 7 14 28 35	1.3 2.3 1.9 1.4 0.98	1.3 2.4 1.9 1.4 1.0	249262 2009/7002 489 RCN R080051
Fresno, CA, USA, 2008 (Fiesta)	SC 200 [a] + adjuvant Induce	4	7–7–7	0.31 0.30 0.29 0.30	0.013 0.013 0.013 0.013	fruit to 2 inch, 22 July	0 7 14 28 35	0.97 1.1 0.99 0.74 0.72	1.0 1.1 1.0 0.77 0.75	idem
Madera, CA, USA, 2008 (Thompson Seedless)	SC 200 [a] + adjuvant Induce	4	7–7–7	0.29 0.30 0.30 0.30	0.042 0.042 0.042 0.042	near mature, 30 July	14 28	0.46 0.57	0.49 0.60	249262 2009/7002 489 RCN R080052
Madera, CA, USA, 2008 (Thompson Seedless)	SC 200 [a] + adjuvant Induce	4	7–7–7	0.29 0.30 0.30 0.30	0.016 0.016 0.016 0.016	near mature, 30 July	14 28	0.85 0.87	0.88 0.90	idem
Tulare, CA, USA, 2008 (Red Globe)	SC 200 [a] + adjuvant Dyne-Aric	4	7–8–7	0.31 0.30 0.30 0.30	0.043 0.043 0.043 0.043	BBCH 88, 9 Sept	14 28	0.52 0.38	0.55 0.41	249262 2009/7002 489 RCN R080053
Tulare, CA, USA, 2008 (Red Globe)	SC 200 [a] + adjuvant Dyne-Aric	4	7–8–7	0.30 0.30 0.30 0.30	0.017 0.017 0.017 0.017	BBCH 88, 9 Sept	14 28	1.1 1.3	1.1 1.4	idem

Location, year, (variety)	Form (g ai/L)	No	Interval (days)	kg ai/ ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Grant, WA, USA, 2008 (White Riesling)	SC 200 [a] + adjuvant R-11	4	7–7–7	0.30 0.30 0.30 0.31	0.050 0.050 0.050 0.050	BBCH 82, 17 Sept	14 28	0.47 0.62	0.50 0.65	249262 2009/7002489 RCN R080054
Grant, WA, USA, 2008 (White Riesling)	SC 200 [a] + adjuvant R-11	4	7–7–7	0.30 0.30 0.30 0.30	0.021 0.021 0.021 0.021	BBCH 82, 17 Sept	14 28	0.89 0.92	0.92 0.95	idem
Benton, OR, USA, 2008 (Pinot Noir)	SC 200 [a] + adjuvant R-11	4	7–7–7	0.29 0.30 0.30 0.31	0.059 0.063 0.063 0.064	BBCH 85, 24 Sept	14 28	0.53 0.38	0.56 0.41	249262 2009/7002489 RCN R080055
Benton, OR, USA, 2008 (Pinot Noir)	SC 200 [a] + adjuvant R-11	4	7–7–7	0.31 0.30 0.31 0.32	0.019 0.019 0.020 0.020	BBCH 85, 24 Sept	14 28	1.4 1.1	1.4 1.1	idem
Kern, CA, USA, 2008 (Crimson)	SC 200 [a] + adjuvant Pro-90	4	7–7–7	0.31 0.30 0.30 0.30	0.044 0.044 0.043 0.044	BBCH 88, 9 Sept	14 28	0.42 0.31	0.45 0.34	249262 2009/7002489 RCN R080547
Kern, CA, USA, 2008 (Crimson)	SC 200 [a] + adjuvant Pro-90	4	7–7–7	0.30 0.30 0.30 0.30	0.017 0.017 0.017 0.017	BBCH 88, 9 Sept	14 28	0.89 0.79	0.92 0.82	idem
Traustadt, Bavaria, Germany, 2007, (Spätburgunder)	SC 200	4	10–9–9	1.2 1.2 1.2 1.2	0.18 0.18 0.18 0.18	BBCH 85 12 Sept	0 21	19 11	19 11	249193 2008/1022152 L070908 [e]
Pfedelbach, Baden-Württemberg, Germany, 2007 (Lemberger)	SC 200	4	10–9–9	1.2 1.2 1.2 1.2	0.18 0.18 0.18 0.18	BBCH 83 13 Sept	0 21	6.3 6.1	6.3 6.1	249193 2008/1022152 L070909 [e]
Höhnstedt, Saxony-Anhalt, Germany, 2007, (Portugieser)	SC 200	4	10–9–10	1.1 1.1 1.1 1.1	0.18 0.18 0.18 0.18	BBCH 85 6 Sept	0 20	5.1 4.8	5.1 4.8	249193 2008/1022152 L070910 [e]
Radebeul, Saxony, Germany, 2007, (Palas)	SC200	4	10–10–10	1.1 1.1 1.1 1.1	0.18 0.18 0.18 0.18	BBCH 87 7 Sept	0 20	6.2 8.5	6.2 8.5	249193 2008/1022152 L070911 [e]
Malsch, Baden-Württemberg, Germany, 2006 (Spätburgunder)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 81 9 Aug	0 30 36 42	2.2 1.9 1.1 1.4	2.2 1.9 1.1 1.4	2007/1007962 AF/10616/BA3
Rauenberg, Baden-Württemberg, Germany, 2006 (Weissburgunder)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 81 9 Aug	0 30 36 42	1.9 1.2 0.17 0.81	1.9 1.2 0.19 0.83	2007/1007962 AF/10616/BA4

Location, year, (variety)	Form (g ai/L)	No	Interval (days)	kg ai/ ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Ockenheim, Germany, 2007 (Regent)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 85 27 July	0 27 34 42	2.0 1.4 1.7 1.7	2.1 1.4 1.7 1.7	2008/1004847 L070113
Kesten, Germany, 2007 (Dornfelder)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 81 14 Aug	0 28 35 42	2.4 1.6 2.2 1.3	2.4 1.6 2.2 1.3	2008/1004847 L070114
St Hilaire St Mesmin, Northern France, 2006 (Chardonnay)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 81 14 Aug	0 28 35 42	1.2 0.84 0.60 0.37	1.2 0.86 0.62 0.39	2007/1007962 AF/10616/BA1
Bonny sur Loire, Northern France, 2006 (Gamay)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 79-83 17 Aug	0 28 35 41	0.47 0.75 0.84 0.79	0.49 0.77 0.86 0.81	2007/1007962 AF/10616/BA2
St Hilaire, St Mesmin, Northern France, 2007 (Gris Meunier)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 77 9 Aug	0 28 35 42	11 1.9 2.2 4.2	11 2.0 2.2 4.2	2008/1004847 L070111
Bonny sur Loire Northern France, 2007 (Gamay)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 81-83 2 Aug	0 28 35 42	1.0 0.45 0.46 0.41	1.1 0.47 0.48 0.43	2008/1004847 L070112
Sistels, Southern France, 2006 (Tanat)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 87 6 Sept	0 29 34 42	1.7 1.5 1.1 <u>2.7</u>	1.7 1.5 1.1 2.7	2007/1007962 AF/10616/BA9
Grayssas, Southern France, 2007 (Tanat)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 85 30 Aug	0 28 35 42	2.6 2.8 1.0 <u>1.1</u>	2.6 2.8 1.0 1.1	2008/1004847 L070117
Trebujana, La Carrera, Spain, 2006 (Palominto)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 83-85 3 Aug	0 28 35 42	2.1 1.6 0.51 <u>0.72</u>	2.1 1.6 0.53 0.74	2007/1007962 AF/10616/BA5
Borja, Spain, 2007 (Garnacha)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 83 3 Sept	0 28 35 42	2.8 4.5 2.2 <u>3.1</u>	2.8 4.5 2.2 3.2	2008/1004847 L070115
Conselice, Emilia-Romagna, Italy, 2006 (Trebbiano)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 81 10 Aug	0 28 35 42	0.44 0.18 <u>1.1</u> 0.11	0.46 0.20 1.1 0.13	2007/1007962 AF/10616/BA6
Faravelli, Pavia, Italy, 2007 (Bonarda)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 81 20 Aug	0 28 35 42	0.30 0.14 <u>0.15</u> 0.079	0.32 0.16 0.17 0.099	2008/1004847 L070116
Thessaloniki, Macedonia, Greece, 2006 (Muschat)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 76-80 3 Aug	0 27 34 42	0.48 0.22 <u>0.37</u> 0.14	0.50 0.24 0.39 0.16	2007/1007962 AF/10616/BA8

Location, year, (variety)	Form (g ai/L)	No	Interval (days)	kg ai/ ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Pieria, Macedonia, Greece, 2007 (Muscat)	WG120 [g]	3	10–10	0.30 0.36 0.48	0.060 0.060 0.060	BBCH 81 30 July	0 28 35 42	1.2 0.37 <u>0.22</u> 0.14	1.2 0.39 0.24 0.16	2008/1004847

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Grape sample weighed 0.5 kg (less than required 1 kg). Grapes were overripe and dropping from the vines, limiting the available material for sampling. Samples are not considered representative and results are not selected for MRL derivation.

[c] Result represents average of two replicate analytical portions.

[d] Soil metabolites were actually found at levels of < 0.01–0.09 mg/kg M650F03 or 0.01–0.17 mg/kg M650F04.

[e] Exaggerated dose rates used for processing

[f] Grape trial 249262, 2009/7002489, RCN R080050 indicates that berries have a size of ½ inch (1.3 cm) at last application. The ½ inch size estimation (1.3 cm) is smaller than the 1.6 to 2.0 cm mature berry size for Thompson Seedless varieties. However, the first and second sampling 14 and 28 days after last application were documented as the fruit was "ripening" and "fully ripe", respectively. Therefore samples were adequately representative of a commercial crop [BASF, 2012d].

[g] Besides ametoctradin, the formulation also contained metiram (WG, 440 g/kg)

[Jordan, 2009a, 2009/7002489, 249262]

No unusual weather conditions. Plot size 7.4–94 m2 (no of trees not indicated). Ground equipment (tractor mounted or backpack airblast sprayers), spray volume 458–713 L/ha for concentrated sprays and 936–3663 L/ha for diluted sprays. One sample per plot was harvested by hand without bias. Grapes (from at least 12 bunches of vines, > 1 kg, except where indicated) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 216–301 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (71–106% for each analyte at 0.01 and 1 mg/kg).

[Braun, 2008c, 2008/1022152]

No unusual weather conditions. Plot size 180–240 m2 (no of trees not indicated). Airblast sprayer, spray volume 579–660 L/ha. Grapes (> 1 kg) were harvested at BBCH 83-89. Samples were stored at –18 °C for 256–284 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, draft version June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (70–119% at 0.01–80 mg/kg for parent and 0.01–0.1 mg/kg for metabolites).

[Oxspring, 2008, 2007/1007953]

No unusual weather conditions. Plot size not stated. Commercial spray equipment (knapsack sprayer, mist blower, backpack atomizer, pressurized gas sprayer with lance), spray volume 500–800 L/ha. Grapes (> 1 kg, 12 bunches) were harvested at BBCH 76-89. Samples were stored at –18 °C for 437 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, draft version June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (82–96% at 0.01 and 1.0 mg/kg for each analyte).

[Klimmek and Gizler, 2008, 2008/1004847]

No unusual weather conditions. Plot size 32–145 m2 (no of trees not indicated). Commercial spray equipment (knapsack sprayer, mist blower, pressurized gas sprayer with lance), spray volume 500–800 L/ha. Grapes (> 1 kg, 12 bunches) were harvested at BBCH 75-89. Samples were stored at –18 °C for 349 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, draft version June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (85–89% for all analytes).

Bulb vegetables

The Meeting received supervised residue trials on bulb onions and spring onions.

Bulb onions

Supervised residue trials on bulb onions were conducted in Canada (2008), USA (2008, 2009) and Germany (2007). German trials were conducted at an exaggerated rate for the purpose of processing studies. Results for a broadcast spray treatment in the field are shown in Table 49. Residue levels in the trials are for the whole commodity after removal of roots and adhering soil and whatever parchment skin is easily detached (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04, except in the German trials where parent alone was quantified. Soil metabolites were < 0.01 mg/kg in all trials.

Table 49 Residues of ametoctradin after pre-harvest broadcast spray on/in bulb onions

Location, year, (variety)	Form (g ai/L)	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Wayne, NY, USA, 2008, (Super Star Onion)	SC 200 [a] + adjuvant LI 700 NIS	3	6–5	0.30 0.30 0.30	0.11 0.11 0.11	2.5" = 5.72 cm bulbs, 23 Aug	0 1 3 7 10	0.21 0.18 0.18 0.20 0.22	0.24 0.20 0.21 0.23 0.24	284194 2009/7004 732 R0080022 [b]
Freeborn, MN, USA, 2008, (Candy)	SC 200 [a] + adjuvant Preference	3	5–5	0.29 0.30 0.30	0.11 0.11 0.11	Vegetative, 14 Aug	0 1 3 7 10	0.14 0.065 0.025 0.030 0.015	0.17 0.091 0.051 0.056 0.041	284194 2009/7004 732 R0080023 [b]
Stafford, KS, USA, 2008, (Candy)	SC 200 [a] + adjuvant Spreader 90	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 48, 21 July	0 1 3 7 10	0.25 0.090 0.075 0.030 0.015	0.28 0.12 0.10 0.056 0.041	284194 2009/7004 732 R0080024 [b]
Portage la Prairie, MB, Canada, 2008, (Genisis Hybrid)	SC 200 [a] + adjuvant Merge	3	5–5	0.29 0.30 0.30	0.11 0.11 0.11	BBCH 47, 18 Aug	0 2 3 7 10	0.84 0.62 0.45 0.15 0.25	0.87 0.65 0.48 0.18 0.28	284194 2009/7004 732 R0080025 [b]
Glenn, CA, USA, 2008, (White)	SC 200 [a] + adjuvant R-11	3	5–5	0.31 0.31 0.31	0.11 0.11 0.11	mature, 18 June	0 1 3 7 10	0.13 0.045 0.095 0.19 0.030	0.16 0.071 0.12 0.22 0.056	284194 2009/7004 732 R0080027 [b]
Hockley, TX, USA, 2008, (White)	SC 200 [a] + adjuvant R-11	3	5–4	0.31 0.30 0.31	0.11 0.11 0.11	tops falling, 15 Aug	0 1 3 7 10	0.21 0.12 0.085 0.035 0.025	0.24 0.15 0.11 0.061 0.051	284194 2009/7004 732 R0080028 [b]
Fresno, CA, USA, 2008, (Southport)	SC 200 [a] + adjuvant Induce	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	2.5" = 5.72 cm bulbs, 17 July	0 1 3 7 10	0.38 0.18 0.46 0.27 0.30	0.41 0.21 0.49 0.30 0.33	284194 2009/7004 732 R0080029 [b]
Washington, ID, USA, 2008, (Vaquero)	SC 200 [a] + adjuvant Preference	3	6–5	0.30 0.30 0.30	0.11 0.11 0.11	growth complete, 7 Sept	0 1 3 7 10	0.095 0.080 0.055 0.065 0.030	0.12 0.11 0.081 0.091 0.056	284194 2009/7004 732 R0080030 [b]

Location, year, (variety)	Form (g ai/L)	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Benton, OR, USA, 2008, (White Sweet Spanish)	SC 200 [a] + adjuvant R-11	3	5–8	0.32 0.32 0.34	0.11 0.11 0.11	BBCH 49, 6 Oct	0 1 3 7 10	0.095 0.035 0.070 0.055 0.050	0.12 0.061 0.096 0.081 0.076	284194 2009/7004732 R0080684 [b]
Willacy, TX, USA, 2009 (Yellow Granex)	SC 200 [a] + adjuvant P Plus	3	5–5	0.31 0.31 0.31	0.11 0.11 0.11	BBCH 47, 13 April	0 1 3 7 10	0.43 0.36 0.34 0.22 0.21	0.46 0.39 0.37 0.24 0.24	284194 2009/7004732 R0080690 [b, c]
Althen, Saxony, Germany, 2009, (Stuttgarter Riesen)	SC 300 [a]	2	7	0.76 0.77	0.33 0.36	BBCH 48 13 Jul 2009	0 7	0.54 0.26	– –	249154 2010/1093126 L090306 [d]
Nienburg, Saxony-Anhalt, Germany, 2009, (Stuttgarter Riesen)	SC 300 [a]	2	7	0.73 0.75	0.36 0.36	BBCH 48, 7 Jul 2009	0 7	0.23 0.18	– –	249154 2010/1093126 L090307 [d]
Motterwitz, Saxony, Germany, 2009, (Stuttgarter Riesen)	SC 300 [a]	2	7	0.73 0.76	0.36 0.36	BBCH 48, 17 Jul 2009	0 7	0.12 0.20	– –	249154 2010/1093126 L090308 [d]
Oderberg, Brandenburg, Germany, 2009, (Stuttgarter Riesen)	SC 300 [a]	2	7	0.73 0.70	0.36 0.36	BBCH 47, 30 Jun 2009	0 7	0.26 0.075	– –	249154 2010/1093126 L090309 [d]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L in US trials, SC 225 g/L in German trials).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Trials early in the growing season (last application in April) were commercially appropriate field trials. The southern planting zones in NAFTA have growing seasons nearly year round with up to three crops being cultivated per year. Bulb vegetables have two primary agricultural techniques. They can be planted and harvested in a 3–6 month window depending upon variety or they can be "overwintered" with a longer harvest date. The trial set at Willacy, TX had a bulb onion crop planted and cultivated in the field that was commercially appropriate [BASF, 2012b].

[d] Exaggerated dose rate used for processing.

[White, 2010a, 2009/7004732, 284194]

No unusual weather conditions. Plot size 33–124 m2. Ground equipment, spray volume 274–312 L/ha. Two samples per plot of dry onion bulbs (> 24 units, > 2 kg per sample) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 204–498 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (88–105% for each analyte at 0.01 and 1.0 mg/kg).

[Harant, 2010b, 2010/1093126]

No unusual weather conditions. Plot size 50 m2. Plot sprayer, spray volume 194–216 L/ha. Bulbs (number of plants not stated, 1.1–1.7 kg, although below the 2 kg limit in the FAO manual, it is considered acceptable because this is within Codex sampling limits) were harvested at BBCH 48. Samples were stored at –18 °C for 175–198 days (collection to analysis).

Samples were analysed for parent alone using HPLC-MS-MS method, Method L0117/01. Results were not corrected for control levels (< 0.01 mg/kg) nor for average concurrent method recoveries (70–96% at 0.01–1.0 mg/kg).

Spring onions

Supervised residue trials on spring onions (green onions) were conducted in the USA (2008, 2009 and 2011). Results for a broadcast spray treatment in the field are shown in Table 50. Residue levels in the trials are for the whole vegetable after removal of roots and adhering soil (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were < 0.01 mg/kg in all trials.

Table 50 Residues of ametoctradin after pre-harvest foliar spray on spring onions

Location, year, (variety)	Form (g ai/L)	No	Interval (days)	kg ai/ ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Tehama, CA, USA, 2008 (APT 410)	SC 200 [b] + adjuvant R-11	3	7–5	0.31 0.31 0.31	0.11 0.11 0.11	growth complete, 28 May	0 1 3 7 10	3.4 3.1 2.4 1.6 0.97	3.5 3.2 2.4 1.6 0.99	284194 2009/7004 732 R0080033 d, h
Fresno CA, USA, 2008 (Southport White 404)	SC 200 [b] + adjuvant Induce	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	mature 21 June	0 1 3 7 10	4.0 4.3 3.9 3.3 2.6	4.0 4.3 4.0 3.3 2.7	284194 2009/7004 732 R0080034 d, h
Willacy, TX, USA, 2009 (Yellow Granex)	SC 200 [b] + adjuvant P Plus	3	5–5	0.31 0.31 0.31	0.11 0.11 0.11	BBCH 15, 16 Feb	0 1 3 7 10	9.1 7.2 4.9 4.8 4.0	9.1 7.2 4.9 4.8 4.1	284194 2009/7004 732 R0080691 d, f
Marshall, OK, USA, 2011[(a)]	SC 300 [c]	3	5–5	0.55 0.55 0.54	0.17 0.17 0.17	BBCH 43 30 June	0 1	2.3 2.3	2.3 2.3	410652 2011/7004 999 R110160 d, g
Armstrong, TX, USA, 2011 (not specified)	SC 300 [c] + adjuvant X-77	3	6–5	0.54 0.55 0.55	0.16 0.21 0.17	BBCH 41 26 June	0 1	3.5 0.92	3.5 0.95	410652 2011/7004 999 R110161 d, g, i
Sutter, CA, USA, 2011 (Evergreen White)	SC 300 [c] + adjuvant Activator 90	3	4–5	0.53 0.53 0.53	0.28 0.28 0.28	BBCH 49 12 Oct	0 1	2.3 2.3	2.3 2.3	410652 2011/7004 999 R110162 d, e, f, g

[a] Mixture of four varieties: Walla Walla, Sweet Red, Red Candy Apple and Sweet Jumbo

[b] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[c] Besides ametoctradin, the formulation also contained dimethomorph (SC, 225 g/L).

[d] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[e] Freezer temperature increased to –2 °C for 1 day because of equipment failure. Since the samples remained frozen, this is considered to have no impact on the analytical results.

[f] Trials early or late in the growing season (last application in February or in October) were field trials following a standard agronomic practice for the growth region. The southern planting zones in NAFTA have growing seasons nearly year round with up to three crops being cultivated per year. The regions (Willacy, TX and Sutter, CA) do not typically have "hard freezing" temperatures and for cool season crops, late fall and winter crops are possible [BASF, 2012b].

[g] Green onions are typically commercially harvested between the 3 and 9 leaf stage (typically BBCH 19) [BASF, 2012b, Answers to questions 02]. Samples harvested at BBCH 41-49 are therefore not considered representative for green onions as traded and residue results are not selected for MRL derivation.

[h] Extrapolating from the planting/transplanting dates to the harvest dates indicate that the crops were harvested as "typical" green onions [BASF, 2012b]. "Growth complete" and "mature" are therefore representative for green onions as traded and results can be selected for MRL derivation if according to cGAP.

[I] Green onion samples weighed 0.4–1.1 kg (less than required 2 kg). Samples are not considered representative and results are not selected for MRL derivation.

[White, 2010a, 2009/7004732, 284194]

No unusual weather conditions. Plot size 74–118 m2. Ground equipment (not specified further), spray volume 278–291 L/ha. Two samples per plot of green onion whole plants without roots (> 24 units, > 2 kg per sample) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 257–519 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (70–105% for parent, M650F03 and M650F04 at 0.01, 1 and 10 mg/kg, except 69% for parent at 0.01 mg/kg (n = 2)). The low level of 69% is considered to have no impact on the values selected, since all values lie above 1 mg/kg.

[Schreier, 2011, 2011/7004999, 410652]

No unusual weather conditions. Plot size 28–89 m2. Ground equipment (backpack boom sprayer), spray volume 1870–337 L/ha. Two samples per plot of green onion whole plants without roots (> 24 units, 2.0–2.3 kg per sample, except in trial R110161, 0.4–1.1 kg) were harvested by hand when commercially acceptable. Samples were stored at –18 °C, except where indicated, for a maximum of 117 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (85–115% for parent, M650F03 and M650F04 at 0.01–1 mg/kg, except 122% for parent at 1.0 mg/kg (n = 2) and 132% for parent at 10 mg/kg (n = 1) Since the laboratory cannot demonstrate adequate method performance at the time of sampling and at the levels of interest, none of the trials can be selected.

Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead Brassicas

The Meeting received supervised residue trials on broccoli and head cabbage.

Broccoli

Supervised residue trials on broccoli were conducted in Canada (2008) and the USA (2008). Results for a broadcast spray treatment in the field are shown in Table 51. Residue levels in the trials are for the flower heads and stems, while the Codex RAC is defined as flower heads, immature inflorescence only. Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were < 0.01 mg/kg in all trials.

Table 51 Residues of ametoctradin after pre-harvest broadcast spray on broccoli

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	total, mg/kg	Study code; Doc ID; Trial no
Le-Haut-Richelieu, QC, Canada, 2008 (Packman)	SC 200 [a] + adjuvant Agral 90	3	6–8	0.32 0.31 0.30	0.11 0.11 0.11	BBCH 605, 15 July	0 1 3 7 10	1.8 2.4 1.7 1.2 0.12	1.9 2.4 1.7 1.2 0.15	308610 2009/7006205 RCN R080058 [b, e]
Dane, WI, USA, 2008 (Packman)	SC 200 [a] + adjuvant Prefer (NIS)	3	6–6	0.29 0.30 0.30	0.10 0.11 0.11	6–10" heads =15–25 cm 2 July	0 1 3 7 10	<u>1.3</u> 1.1 0.83 0.49 0.16	1.3 1.1 0.85 0.51 0.18	308610 2009/7006205 RCN R080059 [b]
Dane, WI USA, 2008 (Packman)	SC 200 [a] + adjuvant Prefer (NIS)	3	8–6	0.30 0.37 0.29	0.11 0.13 0.11	BBCH 48 11 Aug	0 1 3 7 10	<u>1.7</u> 1.6 1.1 1.0 0.64	1.7 1.6 1.1 1.1 0.67	308610 2009/7006205 RCN R080060 [b]
Tehama, CA, USA, 2008 (Green Magic)	SC 200 [a] + adjuvant R-11	3	9–7	0.31 0.31 0.31	0.11 0.11 0.11	mature 15 June	0 1 3 7 10	<u>2.5</u> 2.2 1.5 1.5 0.72	2.6 2.2 1.5 1.5 0.74	308610 2009/7006205 RCN R080062 [b]
Fresno, CA, USA, 2008 (Marathon)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	mature heads 26 June	0 1 3 7 10	3.0 <u>3.2</u> 2.4 2.4 2.1	3.1 3.3 2.5 2.4 2.2	308610 2009/7006205 RCN R080063 [b]
Fresno, CA, USA, 2008 (Green Magic)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	mature heads 20 Nov	0 1 3 7 10	<u>1.2</u> 0.73 0.82 0.70 0.46	1.2 0.76 0.85 0.72 0.48	308610 2009/7006205 RCN R080064 [b, c]
Yuma, AZ, USA, 2008 (Crown Set)	SC 200 [a] + adjuvant Ferti-Spred	3	7–7	0.30 0.30 0.31	0.11 0.11 0.11	early maturity 2 Jan	0 1 3 7 10	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.036 < 0.036 < 0.036 < 0.036 < 0.036	308610 2009/7006205 RCN R080065 [b, c, d, e]
Stanislaus, CA, USA, 2008 (Greenbelt)	SC 200 [a] + adjuvant Silwet L-77	3	7–7	0.30 0.30 0.31	0.11 0.11 0.11	BBCH 49 5 Dec	0 1 3 7 10	<u>2.9</u> 2.1 1.9 1.5 1.3	2.9 2.2 1.9 1.5 1.3	308610 2009/7006205 RCN R080066 [b, c]
Benton, OR USA, 2008 (Emerald Price)	SC 200 [a] + adjuvant R-11	3	7–7	0.30 0.30 0.32	0.11 0.11 0.11	BBCH 47 27 June	0 1 3 7 10	<u>1.6</u> 1.2 0.64 0.52 0.24	1.7 1.2 0.66 0.55 0.27	308610 2009/7006205 RCN R080067 [b]

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	total, mg/kg	Study code; Doc ID; Trial no
Uvalde, TX USA, 2008 (Marathon)	SC 200 [a] + adjuvant Kinetic	3	7–7	0.30 0.30 0.29	0.11 0.11 0.11	BBCH 49 1 Dec	0 1 3 7 10	1.2 0.80 0.70 0.46 0.28	1.2 0.82 0.73 0.49 0.31	308610 2009/7006205 RCN R080685 [b, c]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Trials early or late in the growing season (last application in November, December or January) were field trials following a standard agronomic practice for the growth region The southern planting zones in NAFTA have growing seasons nearly year round with up to three crops being cultivated per year. The regions (Fresno CA, Yuma, AZ, Stanislaus, CA, Uvalde, TX) do not typically have "hard freezing" temperatures and for cool season crops, late fall and winter crops are possible [BASF, 2012b].

[d] Tank solution samples are not required or generated in NAFTA studies, the applications are, however, completed under GLP. The tank mixing procedure including the exact amount of test substance added and sprayed is documented and mathematically confirmed. The applications were also made as a tank mix with dimethomorph and residues were present for that compound. BASF has confidence in this trial's analytical results [BASF, 2012b].

[e] Last treatment conducted when 50% of the flowers were open. Samples were harvested at 0–10 days after the last treatment. Manufacturer indicates that only commercially acceptable samples were selected from this field [BASF, 2012d]. Since the treatment was conducted when part of the crops were flowering and sampling was led by the appearance of the crops (i.e., non-random), the residue results are not considered representative for normal agricultural practice and therefore residue values are not selected for MRL derivation.

[White, 2010d, 2009/7006205, 308610]

No unusual weather conditions. Plot size 37–139 m2. Ground equipment (tractor mounted, backpack or handheld boom sprayers), spray volume 269–295 L/ha. Two samples per plot of flower heads and stems (> 12 units, > 2 kg per sample) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for a maximum of 275–485 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (90–114% for all analytes at 0.01, 1 and 5 mg/kg).

Cabbages, Head

Supervised residue trials on head cabbages were conducted in Canada (2008) and USA (2008). Results for a broadcast spray treatment in the field are shown in Table 52. Residue levels in the trials are for the whole commodity as marketed, after removal of obviously decomposed or withered leaves (i.e., heads with wrapper leaves, Codex-RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were < 0.01 mg/kg in all trials.

Table 52 Residues of ametoctradin after pre-harvest broadcast spray on head cabbages

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Wayne, NY, USA, 2008 (Rocket)	SC 200 [a] + adjuvant LI 700	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	mature heads 14 July	0 1 3 7 10	1.6 1.6 1.0 0.92 0.64	1.6 1.7 1.1 0.94 0.67	308610 2009/7006205 RCN R080068 [b]
Tift, GA, USA, 2008 (Early Thunder)	SC 200 [a] + adjuvant Induce	3	5–7	0.30 0.30 0.30	0.11 0.11 0.11	4–8" heads = 10–20 cm 24 Nov	0 1 3 7 10	3.1 2.7 3.1 1.9 1.6	3.1 2.7 3.1 2.0 1.7	308610 2009/7006205 RCN R080069 [b, c]

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Seminole, FL, USA, 2008 (White)	SC 200 [a] + adjuvant TT DWS 90	3	7–7	0.29 0.30 0.29	0.11 0.11 0.11	mature heads, 21 May	0 1 3 7 10	2.2 3.3 1.7 1.5 1.8	2.2 3.3 1.7 1.5 1.8	308610 2009/7006205 RCN R080070 [b, c]
Freeborn, MN, USA, 2008 (Market Pride)	SC 200 [a] + adjuvant Preference	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	vegetative, 4 Aug	0 1 3 7 10	0.26 0.27 0.35 0.18 0.16	0.29 0.30 0.38 0.21 0.19	308610 2009/7006205 RCN R080071 [b]
Le-Haut-Richelieu, QC, Canada, 2008 (Stonehead)	SC 200 [a] + adjuvant Agral 90	3	6–8	0.30 0.29 0.30	0.11 0.11 0.10	BBCH 409, 29 July	0 1 3 7 10	3.0 3.2 2.3 2.1 1.1	3.0 3.2 2.4 2.1 1.1	308610 2009/7006205 RCN R080072 [b] OK?
Dane, WI USA, 2008 (Artost)	SC 200 [a] + adjuvant Prefer (NIS)	3	8–7	0.29 0.30 0.31	0.11 0.11 0.11	BBCH 48, 26 Aug	0 1 3 7 10	1.5 2.2 0.37 1.4 1.0	1.6 2.3 0.40 1.4 1.1	308610 2009/7006205 RCN R080073 [b]
Zalava, TX USA, 2008 (Pennant)	SC 200 [a] + adjuvant Kinetic	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 49 15 Sept	0 1 3 7 10	0.84 1.8 1.4 0.78 1.4	0.86 1.8 1.4 0.81 1.4	308610 2009/7006205 RCN R080074 [b]
Pawnee, KS USA, 2008 (Stonehead)	SC 200 [a] + adjuvant Spreader 90	3	7–7	0.29 0.30 0.31	0.11 0.11 0.11	BBCH 49 3 Nov	0 1 3 7 10	6.2 7.5 5.8 4.0 4.4	6.2 7.5 5.8 4.1 4.4	308610 2009/7006205 RCN R080075 [b, c]
Tehama, CA USA, 2008 (Copenhagen)	SC 200 [a] + adjuvant R-11	3	7–9	0.31 0.31 0.31	0.11 0.11 0.11	mature, 8 June	0 1 3 7 10	1.0 1.1 0.62 0.89 0.54	1.0 1.1 0.65 0.92 0.56	308610 2009/7006205 RCN R080076 [b]
Benton, OR USA, 2008 (Primo)	SC 200 [a] + adjuvant R-11	3	7–7	0.29 0.29 0.31	0.11 0.11 0.11	BBCH 49, 30 July	0 1 3 7 10	1.4 0.74 0.92 0.47 0.38	1.4 0.77 0.95 0.50 0.41	308610 2009/7006205 RCN R080077 [b]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Trials early or late in the growing season (last application in November or May) were field trials following a standard agronomic practice for the growth region In these regions (Tift, GA, Seminole, FL, Pawnee, KS) late fall and early spring planting are common and preferred for cool season crops [BASF, 2012b].

[White, 2010d, 2009/7006205, 308610]

No unusual weather conditions. Plot size 33–372 m2. Ground equipment (tractor mounted, backpack or handheld boom sprayers), spray volume 268–292 L/ha. Two samples per plot of heads with wrapper leaves (> 12 units, kg not relevant for large Brassicas) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for a maximum of 302–553 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (87–106% for all analytes at 0.01, 1 and 10 mg/kg).

Fruiting vegetables, Cucurbits

The Meeting received supervised residue trials on cucumbers, gherkins, melons, pumpkins and summer squash.

Cucumbers

Supervised residue trials on outdoor and indoor grown cucumbers were conducted in Canada (2008), USA (2008), France (2006, 2007), Greece (2006), UK (2007), Netherlands (2007) and Spain (2007). Results for a broadcast spray treatment in the field are shown in Table 53. Results for greenhouse trials are shown in Table 54. Residue levels in the trials are for the whole fruit after removal of stems (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Only M650F03 was found in four out of 14 field trials (indicated with superscript c). In these trials, soil metabolites ranged from < 0.01 mg/kg–0.13 mg/kg for M650F03 and < 0.01 mg/kg for M650F04, which amounts to 15–92% of the total residue. Soil metabolites were not found in the greenhouse trials (each < 0.01 mg/kg).

Table 53 Residues of ametoctradin after pre-harvest broadcast spray on cucumbers grown outdoors

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Tift, GA, USA, 2008 (Daytona)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.29 0.30	0.11 0.11 0.11	flowers to mature fruit, 4 June	0 1 3 7 10	0.050 <u>0.060</u> 0.030 0.020 0.010	0.076 0.086 0.056 0.046 0.036	249271 2009/7006306 R0080316 [b]
Seminole, FL, USA, 2008 (Parks Bush Whopper)	SC 200 [a] + adjuvant Surfactant 90	3	7–7	0.29 0.29 0.29	0.10 0.10 0.10	BBCH 89, 28 May	0 1 3 7 10	0.075 <u>0.12</u> 0.055 0.040 0.010	0.10 0.14 0.081 0.066 0.036	249271 2009/7006306 R0080318 [b]
Freeborn, MN, USA, 2008 (Straight Eight)	SC 200 [a] + adjuvant Preference	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	fruiting, 20 Aug	0 1 3 7 10	0.12 0.12 <u>0.12</u> 0.070 0.055	0.14 0.14 0.14 0.096 0.081	249271 2009/7006306 R0080319 [b]
Le Haut-Richelieu, QC, Canada, 2008 (Orient Express II)	SC 200 [a] + adjuvant Agral 90	3	6–8	0.30 0.29 0.30	0.10 0.10 0.11	BBCH 63, 15 July	0 3 7 10	<u>0.08</u> 0.07 0.02 < 0.01 [b]	0.11 0.096 0.046 < 0.036	249271 2009/7006306 R0080320 [d]
Jefferson, IA, USA, 2008 (Straight Nine)	SC 200 [a] + adjuvant Preference	3	7–7	0.30 0.30 0.30	0.10 0.10 0.11	BBCH 85, 6 Aug	0 1 3 7 10	<u>0.16</u> 0.13 0.13 0.085 0.065	0.18 [c] 0.16 [c] 0.16 [c] 0.11 0.091	249271 2009/7006306 R0080321 [b]
Stafford, KS, USA, 2008 (Slice Master)	SC 200 [a] + adjuvant Spreader 90	3	7–7	0.29 0.30 0.30	0.10 0.11 0.11	BBCH 79, 28 July	0 1 3 7 10	<u>0.24</u> 0.13 0.11 0.020 0.015	0.29 [c] 0.18 [c] 0.14 [c] 0.12 [c] 0.20 [c]	249271 2009/7006306 R0080322 [b]
Uvalde, TX, USA, 2008 (Turbo)	SC 200 [a] + adjuvant Kinetic	3	8–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 82, 21 May	0 1 3 7 10	<u>0.090</u> 0.080 0.040 0.035 0.030	0.12 0.11 0.066 [c] 0.061 [c] 0.056 [c]	249271 2009/7006306 R0080323 [b]

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Benton, OR USA, 2008 (Indy F1)	SC 200 [a] + adjuvant R-11	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 75, 13 Aug	0 1 3 7 10	0.14 <u>0.16</u> 0.075 0.070 0.035	0.16 0.19 0.10 0.096 0.061	249271 2009/7006306 R0080324 [b]
Allones, Northern France, 2006 (Marketer)	SC 300 [a]	3	7–7	0.24 0.24 0.24	0.080 0.080 0.080	BBCH 81 8 Aug	0 1 3 8	0.32 0.37 0.09 0.05	0.34 0.39 0.11 0.07	247504 2007/1007956 AF/10512/BA5
Saulx les Chartreux, Northern France, 2007 (Raider)	SC 300 [a]	3	7–7	0.24 0.24 0.24	0.080 0.080 0.080	BBCH 74-79 8 Oct	0 1 3 7	0.36 0.38 0.13 0.18	0.38 0.40 0.15 0.20	249184 2008/1004856 L070066
Montauban, Southern France, 2006 (Raider)	SC 300 [a]	3	7–7	0.24 0.24 0.24	0.080 0.080 0.080	BBCH 77 1 Aug	0 1 3 7	0.11 0.17 0.09 0.06	0.13 [c] 0.19 0.11 [c] 0.09 [c]	247504 2007/1007956 AF/10512/BA3
Montauban, Southern France, 2007 (Raider)	SC 300 [a]	3	7–7	0.24 0.24 0.24	0.080 0.080 0.080	BBCH 65-89 17 Jul	0 1 3 7	0.034 0.037 0.038 0.025	0.054 0.057 0.058 0.045	249184 2008/1004856 L070062
Imathia, Macedonia, Greece, 2006 (Opera)	SC 300 [a]	3	7–7	0.24 0.24 0.24	0.080 0.080 0.080	BBCH 89 21 Aug	0 1 4 7	0.24 0.09 0.06 0.05	0.26 0.11 0.08 0.07	247504 2007/1007956 AF/10512/BA4
Imathia, Macedonia, Greece, 2007 (803)	SC 300 [a]	3	7–7	0.24 0.24 0.24	0.080 0.080 0.080	BBCH 86 19 Jul	0 1 4 7	0.17 0.11 0.033 0.016	0.19 0.13 0.053 0.036	249184 2008/1004856 L070064

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC 500 g/L US or SC 225 g/L EU).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Soil metabolites were actually found at a level of < 0.01–0.13 mg/kg M650F03 and < 0.01 mg/kg M650F04. Samples where metabolites > 0.01 mg/kg were found were analysed 3–5 times, and the average result was used in the calculations.

[d] Cucumber trial 249271; 2009/7006306; R0080320 indicated BBCH 63 as growth stage for the last application, meaning that the 3rd flower open on the main stem. The growth stage represented in the raw data was the predominant growth stage for the entire plot and did not exclude the availability of mature fruit. The samples were harvested at DAT = 0–3–7–10. Fruits were not harvested at DAT=1 because there was not enough mature fruit one day after the first sampling. At the other harvest days, there was enough mature fruit available [BASF, 2012d].

[White, 2010b, 2009/7006306]

No unusual weather conditions. Plot size 70–158 m2. Ground equipment (backpack or handheld boom sprayers), spray volume 266–289 L/ha. Two samples per plot of whole fruits (> 12 fruits from 12 plants, kg not relevant) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 297–494 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (86–95% for all analytes at 0.01 and 1 mg/kg).

[Oxspring S, 2008b, 2007/1007956, 247504

No unusual weather conditions. Plot size not stated. Commercial spray equipment (plot sprayer, pressurized gas sprayer), spray volume 300 L/ha. Whole fruits (> 12 fruits, > 2 kg) were harvested at BBCH 77-89. Samples were stored at –18 °C for 526 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method

L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (89–117% for all analytes at 0.01 and 1 mg/kg).

[Klimmek and Gizler, 2008c, 2008/1004856, 249184]

No unusual weather conditions. Plot size 30–120 m2. Commercial spray equipment or equipment simulating commercial practice (plot sprayer, pressurized gas sprayer), spray volume 300 L/ha. Whole fruits (> 12 fruits, > 2 kg) were harvested at BBCH 65-89. Samples were stored at –18 °C for 238 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, draft June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (79–93% for all analytes at 0.01 and 1 mg/kg).

Table 54 Residues of ametoctradin after pre-harvest broadcast spray on cucumbers grown indoors

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Hull, UK, 2007 (Eminentia)	SC 300 [a]	3	7–7	0.24 0.24 0.24	0.040 0.040 0.040	BBCH 85 7 Aug	0 1 3 7	0.11 0.024 0.011 < 0.01	0.13 0.044 0.031 < 0.03	249181 2007/1004855 L070075
Bergen, Netherlands, 2007 (Fitness)	SC 300 [a]	3	7–7	0.22 0.25 0.26	0.048 0.048 0.048	BBCH 87 8 Aug	0 1 3 7	0.087 0.18 0.10 0.034	0.11 0.20 0.12 0.054	249181 2007/1004855 L070077
Cadiz, Spain, 2007, (Aitea)	SC 300 [a]	3	7–7	0.24 0.24 0.25	0.030 0.030 0.030	BBCH 84 24 Sept	0 1 3 7	0.044 0.033 0.037 < 0.01	0.064 0.053 0.057 < 0.03	249181 2007/1004855 L070079
Lagraulet St Nicolas, Southern France, 2007 (Loustick)	SC 300 [a]	3	7–7	0.25 0.24 0.24	0.044 0.040 0.040	BBCH 72 28 Aug	0 1 3 7	0.15 0.15 0.10 0.039	0.17 0.17 0.12 0.059	249181 2007/1004855 L070081

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 225 g/L).

[Klimmek and Gizler, 2008b, 2008/1004855, 249181]

Greenhouse plots. Plot size 22–58 m2. Commercial spray equipment or equipment simulating commercial practice (backpack or handheld boom sprayers), spray volume 456–823 L/ha. Whole fruits (> 12 fruits, > 1 kg) were harvested at BBCH 72-89. Samples were stored at –18 °C for 185 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01, draft June 2007 = L0078/01 Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (83–89% for all analytes at 0.01 and 1 mg/kg).

Gherkins

Supervised residue trials on gherkins were conducted in Germany (2007). German trials were conducted at an exaggerated rate for the purpose of processing studies. Results for a broadcast spray treatment in the field are shown in Table 55. Residue levels in the trials are for the whole fruit after removal of stems (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Only M650F03 was found in one out of four trials (indicated with superscript b). In this trial, soil metabolites were 0.012 mg/kg for M650F03 and < 0.01 mg/kg for M650F04, which amounts to 10% of the total residue.

Table 55 Residues of ametoctradin after pre-harvest broadcast spray on gherkins

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Motterwitz, Saxony, Germany, 2007 (Nadine)	SC 300 [a]	3	6–8	0.72 0.68 0.71	0.24 0.24 0.24	BBCH 89, 31 Jul	0 1	0.24 0.091	0.27 0.12	249151; 2008/1022148 L070841 [c]
Nienburg, Saxony-Anhalt, Germany, 2007 (Nadine)	SC 300 [a]	3	7–7	0.67 0.72 0.70	0.24 0.24 0.24	BBCH 89, 15 Aug	0 1	0.75 0.78	0.78 0.81	249151; 2008/1022148 L070842 [c]
Klein Radden, Brandenburg, Germany, 2007 (Pasalimo)	SC 300 [a]	3	7–7	0.69 0.67 0.67	0.24 0.24 0.24	BBCH 89 4 Jul	0 [d] 1	0.23 0.072	0.26 0.098	249151; 2008/1022148 L070843 [c]
Alitzheim, Bavaria, Germany, 2007 (Samona)	SC 300 [a]	3	7–7	0.77 0.78 0.76	0.24 0.24 0.24	BBCH 89 11 Jul	0 [d] 1	1.8 0.24	1.8 0.27 [b]	249151; 2008/1022148 L070844 [c]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 225 g/L).

[b] Soil metabolites were actually found at a level of 0.012 mg/kg M650F03 and < 0.01 mg/kg M650F04.

[c] Exaggerated dose rates used for processing

[d] Sample size too low (1.0–1.6 kg); results cannot be used for MRL derivation.

[Braun, 2008d, 2008/1022148]
No unusual weather conditions. Plot size 30–50 m^2. Plot sprayer with boom, spray volume 280–324 L/ha. Fruits (> 2 kg except where indicated) were harvested at BBCH 89. Samples were stored at –18 °C for 295–338 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, draft version June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for individual concurrent method recoveries at 0.01–2.0 mg/kg for parent and 0.01–0.1 mg/kg for metabolites (70–102% for each analyte).

Melons

Supervised residue trials on melons (cantaloupe) were conducted in the USA (2008). Results for a broadcast spray treatment in the field are shown in Table 56. Residue levels in the trials are for the whole fruit after removal of stems (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were not found in any of the trials (< 0.01 mg/kg each).

Table 56 Residues of ametoctradin after pre-harvest broadcast spray on melons

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Tift, GA, USA, 2008 (Athena)	SC 200 [a] + adjuvant Induce	3	7–8	0.30 0.30 0.30	0.11 0.11 0.10	flowers to mature fruit, 27 June	0 1 3 7 10	0.47 0.59 0.37 0.26 0.062 [c]	0.50 0.62 0.40 0.28 0.088	249271 2009/7006306 R080325 [b]
Freeborn, MN, USA, 2008 (WR-1776)	SC 200 [a] + adjuvant Preference	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	fruiting, 12 Sept	0 1 3 7 10	1.7 1.3 1.1 0.90 0.80	1.7 1.3 1.1 0.92 0.82	249271 2009/7006306 R080326 [b]

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Le Haut-Richelieu, USA, 2008 (Primo)	SC 200 [a] + adjuvant Agral 90	3	8–8	0.30 0.29 0.31	0.10 0.10 0.10	BBCH 87, 13 Sept	0 1 3 7 10	0.49 0.36 0.32 0.30 0.38	0.52 0.38 0.35 0.33 0.41	249271 2009/7006306 R080327 [b, c, d]
Jefferson, IA, USA, 2008 (Delicious 51)	SC 200 [a] + adjuvant Preference	3	7–8	0.29 0.29 0.30	0.10 0.11 0.11	BBCH 85, 25 Aug	0 1 3 7 10	0.46 [c] 0.36 [c] 0.60 0.48 0.14 [c]	0.49 0.38 0.63 0.51 0.17	249271 2009/7006306 R080328 [b]
Uvalde, TX, USA, 2008 (Rocket)	SC 200 [a] + adjuvant Kinetic	3	6–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 70, 3 June	0 1 3 7 10	1.3 0.62 0.64 0.46 0.28	1.3 0.65 0.67 0.48 0.30	249271 2009/7006306 R080329 [b, e]
Glenn, CA, USA, 2008 (Sol Real)	SC 200 [a] + adjuvant R-11	3	7–7	0.31 0.31 0.31	0.11 0.11 0.11	BBCH 80, 15 Aug	0 1 3 7 10	0.12 0.13 0.18 0.18 0.17	0.14 0.16 0.21 0.21 0.20	249271 2009/7006306 R080330 [b]
Fresno, CA, USA, 2008 (Hales Best)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 89, 14 Oct	0 1 3 7 10	0.78 0.80 0.74 0.60 0.78	0.80 0.82 0.77 0.63 0.81	249271 2009/7006306 R080331 [b]
Yuma, AZ, USA, 2008 (Lerado)	SC 200 [a] + adjuvant Ferti-Spred	3	7–7	0.30 0.30 0.31	0.11 0.11 0.11	BBCH 89, 18 June	0 1 3 7 10	0.72 0.46 0.56 0.24 0.14	0.75 0.49 0.59 0.27 0.17	249271 2009/7006306 R080332 [b]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Results for individual field samples are the average of 2–3 replicate analytical portions.

[d] Melon trial 249271; 2009/7006306; R080327 indicated BBCH 97 as growth stage for the last treatment. BBCH in the raw data was an incorrect entry/typographical error: eight days earlier for the sampling the BBCH was 701(71) and the BBCH at sampling should have been 801 (87) [BASF, 2012d].

[e] Melon trial 249271; 2009/7006306; R080329 indicated BBCH 70 as growth stage at last treatment. This means that none of the fruits has reached typical size and form. Samples were harvested at DAT 0–10. While the dominant plant stage was BBCH 70, there were sufficient commercially acceptable fruits and these were the ones harvested and provided as samples [BASF, 2012d]. Because the samples were taken according to the appearance of the fruits (i.e., non-random), the values are considered not representative for MRL setting and therefore this trial is not selected for MRL setting.

[White, 2010b, 2009/7006306, 249271

No unusual weather conditions. Plot size 93–184 m2. Ground equipment (tractor mounted, backpack or handheld boom sprayers), spray volume 272–295 L/ha. Two samples per plot of whole fruits (> 12 fruits from 12 plants, kg not relevant) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 297–494 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (83–94% for all analytes at 0.01, 1 and 10 mg/kg).

Pumpkins

Supervised residue trials on pumpkins (winter squash) were conducted in the USA (2008). Results for a broadcast spray treatment in the field are shown in Table 57. Residue levels in the trials are for the whole fruit after removal of stems (= Codex RAC). Samples were analysed for parent and two soil

metabolites M650F03 and M650F04. Soil metabolites were not found in any of the trials (< 0.01 mg/kg each).

Table 57 Residues of ametoctradin after pre-harvest broadcast spray on pumpkins

Location, year, (variety)	Form	No	Interval (days)	kg ai/ ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Wayne, NY, USA, 2008 (Table Ace)	SC 200 [a] + adjuvant LI 700 NIS	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	fruit 90% final size, 16 Sept	0 1 3 7 10	0.34 0.28 0.33 0.16 [c] 0.20	0.37 0.31 0.36 0.19 0.23	249271 2009/7006306 R080334 [b]
Seminole, FL, USA, 2008 (Early Butternut hybrid)	SC 200 [a] + adjuvant Surfactant 90	3	7–7	0.30 0.29 0.29	0.11 0.10 0.11	BBCH 89, 16 May	0 1 3 7 10	0.075 0.095 0.065 0.10 0.055	0.10 0.12 0.091 0.13 0.081	249271 2009/7006306 R080336 [b, d]
Freeborn, MN USA, 2008 (Butternut Waltham)	SC 200 [a] + adjuvant Preference	3	7–7	0.29 0.30 0.30	0.10 0.11 0.11	fruiting, 5 Sept	0 1 3 7 10	0.045 0.12 0.065 0.14 0.12	0.071 0.15 0.091 0.17 0.15	249271 2009/7006306 R080337 [b]
Jefferson, IA, USA, 2008 (Table Queen)	SC 200 [a] + adjuvant Preference	3	7–7	0.30 0.30 0.30	0.11 0.11 0.10	BBCH 88, 24 Sept	0 1 3 7 10	1.2 1.3 1.3 0.54 0.34	1.3 1.3 1.3 0.57 0.37	249271 2009/7006306 R080339 [b]
Fresno, CA USA, 2008 (Green Spaghetti)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	fruit to 5" = 13 cm, 31 Oct	0 1 3 7 10	0.47 0.45 0.37 0.37 0.46	0.49 0.47 0.40 0.39 0.48	249271 2009/7006306 R080696 [b, c, e]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Results for individual field samples are the average of two replicate analyses.

[d] Trials early in the growing season (last application in May) were field trials following a standard agronomic practice for the growth region In these regions (Seminole, FL) early Butternut Hybrid winter Squash is considered a very early winter squash that may be seeded or transplanted in very early spring with harvest beginning in mid-spring [BASF, 2012b].

[e] Pumpkin trial 249271; 2009/7006306; R080696 indicated that fruits had the size of 5 inch = 13 cm at last application. Samples were harvested at DAT = 0–10. The winter squash variety for this trial "Green Spaghetti" is small and typically ranges in size from 7–12" depending on environmental conditions and how long they are allowed to "ripen" on the vine. Though small, the squash was mature and commercially viable at all sampling intervals [BASF, 2012d].

[White, 2010b, 2009/7006306, 249271]

No unusual weather conditions. Plot size 33–293 m2. Ground equipment (tractor mounted, backpack or handheld boom sprayers), spray volume 275–285 L/ha. Two samples per plot of whole fruits (> 12 fruits from 12 plants, kg not relevant) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 297–494 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (72–94% for all analytes at 0.01, 1 and 10 mg/kg).

Squash, Summer

Supervised residue trials on summer squash were conducted in Canada (2008) and USA (2008). Results for a broadcast spray treatment in the field are shown in Table 58. Residue levels in the trials are for the whole fruit after removal of stems (= Codex RAC). Samples were analysed for parent and

two soil metabolites M650F03 and M650F04. Soil metabolites were not found in any of the trials (< 0.01 mg/kg each).

Table 58 Residues of ametoctradin after pre-harvest broadcast spray on summer squash

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Wayne, NY, USA, 2008 (Sunray)	SC 200 [a] + adjuvant LI 700 NIS	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	fruit 80–100% final size, 16 Sept	0 1 3 7 10	<u>0.36</u> 0.28 0.33 0.24 0.18	0.39 0.31 0.36 0.27 0.21	249271 2009/7006306 R080333 [b]
Tift, GA, USA, 2008 (Lemon Drop L)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.10 0.11	flowers to small fruits, 21 May	0 1 3 7 10	<u>0.13</u> 0.020 0.045 0.010 < 0.01	0.16 0.046 0.071 0.036 < 0.036	249271 2009/7006306 R080335 [b, d, e]
Le Haut-Richelieu, QC, Canada, 2008 (Embassy)	SC 200 [a] + adjuvant Agral 90	3	6–8	0.30 0.29 0.28	0.10 0.10 0.11	BBCH 73, 15 July	0 1 3 7 10	0.20 <u>0.22</u> 0.078 [c] 0.010 < 0.01	0.23 0.25 0.10 0.036 < 0.036	249271 2009/7006306 R080338 [b]
Glenn, CA, USA, 2008 (Gold Star)	SC 200 [a] + adjuvant R-11	3	7–7	0.31 0.31 0.29	0.11 0.11 0.10	BBCH 89 10 July	0 1 3 7 10	0.84 <u>0.98</u> 0.72 [c] 0.62 0.53	0.87 1.0 0.75 0.65 0.56	249271 2009/7006306 R080340 [b]
Bentor, OR USA, 2008 (Noche)	SC 200 [a] + adjuvant R-11	3	7–7	0.30 0.30 0.31	0.11 0.11 0.11	BBCH 76, 17 July	0 1 3 7 10	<u>1.1</u> 0.44 0.28 0.023 [c] < 0.01	1.1 0.47 0.30 0.048 < 0.036	249271 2009/7006306 R080342 [b]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Results for individual field samples are the average of two replicate analyses.

[d] Trials early in the growing season (last application in May) were field trials following a standard agronomic practice for the growth region In these regions (Tift, GA) Lemon Drop L Summer will germinate any time after the average soil temperature is greater than 15 °C and is typically planted/transplanted in early spring [BASF, 2012c].

[e] Summer squash trial 249271; 2009/7006306; R080335 indicated small fruits at last application. The variety of summer squash planted at this trial was Lemon Drop L, a creamy yellow hybrid; smooth glossy skin squash with an early, 41 days to harvest. The first sampling occurred 40–41 days from plant to first sampling. In the raw data, the fruit is described as "mature". This variety is a small squash harvested at around 6–8 inches in length or once mature [BASF, 2012d, Answers to questions04].

[White, 2010b, 2009/7006306, 249271]

No unusual weather conditions. Plot size19–156 m2. Ground equipment (tractor mounted, backpack or handheld boom sprayers), spray volume 263–291 L/ha. Two samples per plot of whole fruits (> 12 fruits from 12 plants, > 2 kg) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 297–494 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (72–94% for all analytes at 0.01, 1 and 10 mg/kg).

Fruiting vegetables, other than Cucurbits

The Meeting received supervised residue trials on tomatoes, sweet peppers and chilli peppers.

Peppers, Sweet

Supervised residue trials on indoor and outdoor grown sweet peppers (bell peppers) were conducted in Canada (2008), the USA (2008), Greece (2007), Italy (2007), Spain (2007), France (2007), Germany (2007), Netherlands (2007) and Belgium (2007). Results for a broadcast spray treatment in the field are shown in Table 59. Results for greenhouse trials are shown in Table 60. Residue levels in the trials are for the whole fruit after removal of stems (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were not found in any of the trials (< 0.01 mg/kg each).

Table 59 Residues of ametoctradin after pre-harvest foliar spray on sweet peppers

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Steele, MN, USA, 2008 (Jupiter)	SC 200 [a] + adjuvant Preference	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	fruiting, 18 Aug	4 10 14	0.085 [c] 0.025 [c] 0.020 [c]	0.11 0.051 0.046	249568 2009/7006204 R080284 [b]
Freeborne, MN, USA, 2008 (Jupiter)	SC 200 [a] + adjuvant Preference	3	7–7	0.30 0.31 0.30	0.11 0.11 0.11	fruiting, 18 Aug	4 10 14	0.16 0.12 0.14	0.19 0.14 0.16	249568 2009/7006204 R080285 [b]
RM of Portage la Prairie, MB, Canada, 2008 (California Wonder)	SC 200 [a] + adjuvant Merge	3	7–7	0.29 0.32 0.30	0.11 0.11 0.11	BBCH 87, 26 Aug	4 10 14	0.050 0.045 0.010	0.076 0.071 0.036	249568 2009/7006204 R080286 [b]
Le Haut-Richelieu, QC, Canada, 2008 (Bell Boy)	SC 200 [a] + adjuvant Agral 90	3	7–8	0.31 0.31 0.31	0.11 0.11 0.11	BBCH 73, 29 Aug	4 10 14	0.22 0.15 0.16	0.25 0.18 0.19	249568 2009/7006204 R080287 [b]
Cass, ND, USA, 2008 (Green Bell Pepper)	SC 200 [a] + adjuvant Activator 90	3	6–8	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 81, 11 Sept	4 10 14	0.14 [c] 0.095 [c] 0.070	0.16 0.12 0.096	249568 2009/7006204 R080288 [b]
Uvalde, TX, USA, 2008 (Camelot)	SC 200 [a] + adjuvant Induce	3	7–7	0.29 0.29 0.30	0.11 0.10 0.11	BBCH 74, 18 Aug	4 10 14	0.080 0.070 0.050	0.11 0.096 0.076	249568 2009/7006204 R080289 [b]
Fresno, CA, USA, 2008 (Bell)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	Mature peppers, 19 June	4 10 14	0.84 0.53 0.23	0.86 0.56 0.26	249568 2009/7006204 R080291

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Results for individual field samples are the average of multiple replicate analyses.

[White, 2010c, 2009/7006204, 249568]

No unusual weather conditions. Plot size 36–93 m2. Ground equipment (backpack or handheld boom sprayers), spray volume 271–293 L/ha. Two samples per plot of whole fruits (> 12 fruits from 12 plants, > 2 kg) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 102–528 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (76–88% for all analytes at 0.01 and 1 mg/kg in sweet pepper).

Table 60 Residues of ametoctradin after pre-harvest foliar spray on sweet peppers under greenhouse conditions

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Thessaloniki, Greece, 2007, (Yanka)	SC 300 [a]	3	7–7	0.24 0.24 0.24	0.048 0.048 0.048	BBCH 79-85 28 June	0 1 4 7	0.36 0.21 0.19 0.13	0.38 0.23 0.21 0.15	249169 2008/1004851 L070068
Caleppio di Settala, Italy, 2007, (Pyrean)	SC 300 [a]	3	7–7	0.24 0.24 0.24	0.030 0.030 0.030	BBCH 87-89 26 Sept	0 1 2 7	1.1 0.47 0.28 0.26	1.1 0.49 0.30 0.28	249169 2008/1004851 L070069
Penafior, Spain, 2007, (Stilo)	SC 300 [a]	3	7–7	0.24 0.24 0.25	0.030 0.030 0.030	BBCH 89 17 Sept	0 1 3 7	0.48 0.64 0.90 0.46	0.50 0.66 0.92 0.48	249169 2008/1004851 L070070
Bioule, Southern France, 2007, (Joselito)	SC 300 [a]	3	7–7	0.23 0.24 0.24	0.080 0.080 0.080	BBCH 78 16 Oct	0 1 3 7	0.29 0.36 0.37 0.26	0.31 0.38 0.39 0.28	249169 2008/1004851 L070067
Dampiere en Burly, Northern France, 2007, (Vidi)	SC 300 [a]	3	7–7	0.23 0.25 0.22	0.030 0.030 0.030	BBCH 72-75 24 Jul	0 1 3 7	0.20 0.16 0.20 0.14	0.22 0.18 0.22 0.16	249169 2008/1004851 L070071
Kleve, Germany, 2007, (Funky)	SC 300 [a]	3	7–7	0.25 0.24 0.25	0.040 0.040 0.040	BBCH 87 17 Sept	0 1 3 7	0.55 0.32 0.34 0.10	0.57 0.34 0.36 0.12	249169 2008/1004851 L070072
Meterik, Netherlands, 2007, (Oliver)	SC 300 [a]	3	7–7	0.25 0.25 0.24	0.040 0.040 0.040	BBCH 87 20 Sept	0 1 4 7	0.29 0.28 0.22 0.14	0.31 0.30 0.24 0.16	249169 2008/1004851 L070073
Rummen, Belgium, 2007, (Yollowonder)	SC 300 [a]	3	7–7	0.24 0.24 0.24	0.048 0.048 0.048	BBCH 87 11 Jul	0 1 3 7	0.55 0.59 0.79 0.54	0.57 0.61 0.81 0.56	249169 2008/1004851 L070074

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 225 g/L).

[Klimmek and Gizler, 2008d, 2008/1004851, 249169]

Greenhouse: Plot size 30–36 m2. Commercial equipment or equipment simulating commercial practice (backpack or handheld boom sprayers), spray volume 500–800 L/ha. Samples of whole fruits (> 12 fruits, > 2 kg) at BBCH 72-89. Samples were stored at –18 °C for 162 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, version June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (87–93% for all analytes at 0.01 and 1 mg/kg in sweet pepper).

Peppers, Chili

Supervised residue trials on chili peppers (non-bell peppers) were conducted in the USA (2008). Results for a foliar spray treatment in the field are shown in Table 61. Residue levels in the trials are for the whole fruit after removal of stems (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were not found in any of the trials (< 0.01 mg/kg each).

The laboratory could not show adequate performance of the analytical method for chilli peppers at 0.01 mg/kg. In the absence of acceptable recovery data at levels between 0.01–1 mg/kg, the Meeting decided to utilize the level of 1 mg/kg as LOQ for parent in chilli pepper until suitable validation data are provided to define an appropriate LOQ for these commodities (see validation of analytical method section). Since all residue values lie below 1 mg/kg, none of the residue values can be selected.

Table 61 Residues of ametoctradin after pre-harvest foliar spray on chili peppers

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Tift, GA, USA, 2008 (SPP-0634)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.10 0.10	flowers to large fruit, 30 June	4 10 14	0.15 0.075 0.055	0.18 0.10 0.081	249568 2009/7006204 R080282 [b]
Seminole, FL, USA, 2008 (Hungarian Yellow Wax)	SC 200 [a] + adjuvant TT DWS 90	3	7–7	0.29 0.29 0.29	0.10 0.11 0.10	mature peppers (17.8 cm),7 May	4 10 14	0.68 0.42 0.22	0.71 0.45 0.25	249568 2009/7006204 R080283 [b, d]
Tehama, CA, USA, 2008 (Piemento)	SC 200 [a] + adjuvant R-11	3	7–7	0.31 0.31 0.31	0.11 0.11 0.11	fruit mature / flowering 17 July	4 10 14	0.42 0.50 0.42 [c]	0.45 0.52 0.44	249568 2009/7006204 R080290 [b]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Results come from 2 replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Results for individual field samples are the average of multiple replicate analyses.

[d] Trials early in the growing season (last application in May) were field trials following a standard agronomic practice for the growth region In these regions (Seminole, FL), the growing seasons is nearly year round and the short transplant to harvest time in peppers allows commercially available crops to be cultivated in early spring [BASF, 2012b].

[White, 2010c, 2009/7006204, 249568]

No unusual weather conditions. Plot size 67–93 m2. Ground equipment (backpack or handheld boom sprayers), spray volume 276–294 L/ha. Two samples per plot of whole fruits (> 24 fruits from 12 plants, > 2 kg) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 102–528 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (83–100% for all analytes at 0.01 and 1 mg/kg in chilli pepper).

Tomatoes

Supervised residue trials on tomatoes were conducted in Canada (2008), USA (2008) and Germany (2007). German trials were conducted at an exaggerated rate for the purpose of processing studies. Results for a foliar spray treatment in the field are shown in Table 62. Residue levels in the trials are for the whole fruit after removal of stems (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Only M650F03 was found in one out of 24 trials (indicated with superscript d). In this trial, soil metabolites were 0.015 mg/kg for M650F03 and < 0.01 mg/kg for M650F04, which amounts to 53% of the total residue.

Table 62 Residues of ametoctradin after pre-harvest foliar spray on tomatoes

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Wayne, NY, USA, 2008 (Sunshine)	SC 200 [a] + adjuvant LI 700 NIS	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 87, 26 Aug	4 10 14	0.16 0.15 0.14	0.19 0.18 0.16	249568 2009/7006204 R080262 [b]
Tift, GA, USA, 2008 (BHN-640)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.10 0.10	flowers to ripe fruit, 30 June	4 10 14	0.10 0.095 0.035	0.13 0.12 0.061	249568 2009/7006204 R080263 [b]
Seminole, FL, USA, 2008 (Better Boy)	SC 200 [a] + adjuvant TT DWS 90	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	mature greens, 21 May	4 10 14	0.15 0.14 0.080 [c]	0.18 0.16 0.11	249568 2009/7006204 R080264 [b, e]
Freeborn, MN, USA, 2008 (Celebrity)	SC 200 [a] + adjuvant Preference	3	6–7	0.30 0.30 0.30	0.11 0.11 0.11	mature greens, 22 Aug	4 10 14	0.20 0.12 0.025	0.22 0.15 0.051	249568 2009/7006204 R080265 [b]
RM of Portage la Prairie, MB, Canada, 2008 (Basket Vee)	SC 200 [a] + adjuvant Merge	3	7–7	0.30 0.28 0.29	0.11 0.11 0.11	BBCH 78, 7 Aug	4 10 14	0.16 0.13 0.035	0.19 0.16 0.061	249568 2009/7006204 R080266 [b]
RM of Portage la Prairie, MB, Canada, 2008 (Bush Beefstake)	SC 200 [a] + adjuvant Merge	3	7–7	0.30 0.29 0.30	0.11 0.11 0.11	BBCH 80, 7 Aug	4 10 14	0.18 0.12 0.12	0.20 0.15 0.15	249568 2009/7006204 R080267 [b]
Verchéres, QC, Canada, 2008 (Big Reef)	SC 200 [a] + adjuvant Agral 90	3	6–7	0.31 0.29 0.31	0.11 0.10 0.11	BBCH 81, 12 Aug	4 10 14	0.12 0.070 0.040	0.14 0.096 0.066	249568 2009/7006204 R080268 [b]
Verchéres, QC, Canada, 2008 (Mountain Spring)	SC 200 [a] + adjuvant Agral 90	3	6–7	0.31 0.31 0.30	0.11 0.11 0.11	BBCH 81, 12 Aug	4 10 14	0.10 [c] 0.080 0.040	0.13 0.11 0.066	249568 2009/7006204 R080269 [b]
Dane, WI, USA, 2008 (Celebrity)	SC 200 [a] + adjuvant Preference	3	7–7	0.30 0.30 0.30	0.12 0.11 0.11	BBCH 79, 25 Aug	4 10 14	0.18 0.20 0.10 [c]	0.20 0.22 0.13	249568 2009/7006204 R080270 [b]
Cass, ND, USA, 2008 (Early Time)	SC 200 [a] + adjuvant Activator 90	3	8–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 74, 18 Sept	4 10 14	0.16 0.13 0.13	0.18 0.16 0.16	249568 2009/7006204 R080271 [b]
Stafford, KS, USA, 2008 (Heartland)	SC 200 [a] + adjuvant Spreader 90	3	7–7	0.31 0.30 0.31	0.11 0.11 0.11	BBCH 79, 28 July	4 10 14	0.050 0.030 0.030	0.076 0.056 0.062 [d]	249568 2009/7006204 R080272 [b]
Pepin, WI, USA, 2008 (Big Boy)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 80, 15 Aug	4 10 14	0.11 0.075 [c] 0.075 [c]	0.14 0.10 0.10	249568 2009/7006204 R080273 [b]
Tehama, CA, USA, 2008 (AB-2)	SC 200 [a] + adjuvant R-11	3	7–7	0.31 0.31 0.31	0.11 0.11 0.11	BBCH 88, 31 July	4 10 14	0.70 0.58 0.42 [c]	0.73 0.61 0.45	249568 2009/7006204 R080274 [b]
Tehama, CA, USA, 2008 (Large Cherry)	SC 200 [a] + adjuvant R-11	3	7–7	0.31 0.31 0.31	0.11 0.11 0.11	BBCH 87, 14 Aug	4 10 14	0.70 [c] 0.59 0.76	0.73 0.62 0.79	249568 2009/7006204 R080275 [b]
Fresno, CA, USA, 2008 (6368)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	green fruit 6.35 cm, 7 July	4 10 14	0.035 0.025 0.020	0.061 0.051 0.046	249568 2009/7006204 R080276 [b]

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Fresno, CA, USA, 2008 (8892)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 80, 7 July	4 10 14	0.19 <u>0.22</u> 0.15	0.22 0.25 0.18	249568 2009/7006204 R080277 [b]
Fresno, CA, USA, 2008 (H8004)	SC 200 [a] + adjuvant HC Oil Conc	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 84, 4 Aug	4 10 14	<u>0.22</u> 0.18 0.16	0.25 0.21 0.19	249568 2009/7006204 R080278 [b]
Madera, CA, USA, 2008 (Shady Lady)	SC 200 [a] + adjuvant Induce	3	6–8	0.31 0.29 0.32	0.11 0.11 0.11	mature tomatoes, 11 July	4 10 14	<u>0.25</u> 0.24 0.18	0.28 0.27 0.21	249568 2009/7006204 R080279 [b]
Tulare, CA, USA, 2008 (cherry tomato: Cherry Red)	SC 200 [a] + adjuvant Pro 90	3	7–7	0.30 0.30 0.31	0.10 0.11 0.11	fruit maturation / breaker, 29 Dec	4 10 14	<u>0.32</u> 0.15 0.19 [c]	0.35 0.18 0.22	249568 2009/7006204 R080280 [b, e]
Tulare, CA, USA, 2008 (cherry tomato: Cherry Red)	SC 200 [a] + adjuvant Pro 90	3	7–7	0.30 0.30 0.30	0.10 0.10 0.10	breaker / mature, 24 July	4 10 14	0.40 [c] <u>0.60</u> 0.53 [c]	0.42 0.62 0.55	249568 2009/7006204 R080281 [b]
Cunnersdorf, Saxony, Germany, 2007 (Inkas F1)	SC 200	3	7–6	0.91 0.90 0.97	0.31 0.31 0.31	BBCH 87, 29 Aug	0 [g] 1	2.0 2.2	2.0 2.2	249190 2008/1022150 L070894 [f]
Nienburg, Saxony-Anhalt, Germany, 2007 (Rendita)	SC 200	3	7–7	0.93 0.91 0.91	0.31 0.31 0.31	BBCH 89, 11 Sept	0 [g] 1	2.0 1.0	2.0 1.0	249190 2008/1022150 L070895 [f]
Motterwitz, Saxony, Germany, 2007 (Rendita)	SC 200	3	7–6	0.86 1.0 0.97	0.31 0.31 0.31	BBCH 87, 2 Sept	0 [g] 1	3.6 2.1	3.6 2.1	249190 2008/1022150 L070896 [f]
Blankenhagen, Mecklenburg, Germany, 2007 (Rendita)	SC 200	3	7–7	0.90 0.97 0.92	0.31 0.31 0.31	BBCH 89, 11 Sept	0 [g] 1	1.9 1.0	1.9 1.0	249190 2008/1022150 L070897 [f]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Results for individual field samples are the average of multiple replicate analyses.

[d] Soil metabolites were actually found at a level of 0.015 mg/kg M650F03 and < 0.01 mg/kg M650F04.

[e] Trials early or late in the growing season (last application in May or Decembers) were field trials following a standard agronomic practice for the growth region In these regions (Seminole, FL, Tulare, CA), the growing seasons is nearly year round and the short transplant to harvest time in tomatoes allows commercially available crops to be cultivated year round [BASF, 2012b].

[f] Exaggerated dose rates used for processing

[g] Sample size too low (0.51–1.2 kg); results cannot be used for MRL derivation.

[White, 2010c, 2009/7006204, 249568]

No unusual weather conditions. Plot size 30–186 m2. Ground equipment (tractor mounted, backpack or handheld boom sprayers), spray volume 261–294 L/ha. Two samples per plot of whole fruits (> 12 fruits from 12 plants, > 2 kg) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 102–528 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight

modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (81–93% for all analytes at 0.01 and 1 mg/kg).

[Braun, 2008b, 2008/1022150]

No unusual weather conditions. Plot size 50 m2. Plot sprayer with boom, spray volume 280–328 L/ha. Whole fruits (> 2 kg, except where indicated) were harvested at BBCH 87-89. Samples were stored at –18 °C or lower for 261–323 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS draft method L0078 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries at 0.01–5.0 mg ai/kg parent or 0.01–0.1 mg/kg metabolites (68–105% for parent, 79–113% for M650F03 and 60–105% for M650F04).

Leafy vegetables (including Brassica leafy vegetables)

The Meeting received supervised residue trials on head lettuce, leaf lettuce, mustard greens and spinach.

Lettuce, Head

Supervised residue trials on head lettuce were conducted in Canada (2008) and the USA (2008). Results for a broadcast spray treatment in the field are shown in Table 63. Residue levels in the trials are for the whole commodity as usually marketed, after removal of obviously decomposed or withered leaves (i.e., heads with wrapper leaves, Codex-RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were not found (< 0.01 mg/kg) in any of the trials.

Although full method validation results for parent were within limits (see analytical methods) average concurrent recoveries for parent were too low (69% at 0.01 mg/kg; 53% at 20 mg/kg) with a too high RSD (26% at 0.01 mg/kg) indicating inaccuracy of the analytical method for head lettuce at a level of 0.01 and 20 mg/kg at the time of measurement of the actual samples. Since selected residue levels are in the range of 3–10 mg/kg, this may affect selection of residue values.

Table 63 Residues of ametoctradin after pre-harvest broadcast spray on head lettuce

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Wayne, NY, USA, 2008 (Ithaca MTP)	SC 300 [a] + adjuvant LI 700 NIS	3	4–6	0.30 0.30 0.29	0.11 0.11 0.11	BBCH 49 26 June	0 1 3 7 10	2.9 2.9 1.6 1.1 0.86	3.0 3.0 1.7 1.1 0.89	330496 2009/7003324 RCN R080224 [b]
Seminole, FL, USA, 2008 (Great Lakes)	SC 300 [a] + adjuvant Surfactant 90	3	5–4	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 49, 2 May	0 1 3 7 10	3.9 4.8 3.8 1.9 1.4	3.9 4.8 3.8 1.9 1.5	330496 2009/7003324 RCN R080225 [b, d]
Dane, WI, USA, 2008 (Fall Green MGO)	SC 300 [a] + adjuvant Preference	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	small to medium heads, 2 Sept	0 1 3 7 10	2.6 1.6 1.1 0.55 0.46	2.7 1.6 1.1 0.58 0.49	330496 2009/7003324 RCN R080226 [b]
La Vallée du Richelieu, QC, Canada, 2008 (Grand Rapid)	SC 300 [a] + adjuvant Agral 90	3	4–4	0.30 0.30 0.32	0.11 0.11 0.11	BBCH 47, 1 July	0 1 3 7 10	5.2 5.0 3.8 3.8 1.8	5.2 5.0 3.8 3.8 1.9	330496 2009/7003324 RCN R080227 [b]
Tehama, CA, USA, 2008 (Sidewinder)	SC 300 [a]	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	head development, 17 Nov	0 1 3 7 10	6.2 6.1 5.0 7.1 4.9 [c]	6.2 6.2 5.0 7.1 4.9	330496 2009/7003324 RCN R080228 [b, d]

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Fresno, CA, USA, 2008 (Great Lakes 659)	SC 300 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 49, 3 June	0 1 3 7 10	5.7 2.2 1.0 0.74 0.38	5.7 2.3 1.0 0.76 0.41	330496 2009/7003324 RCN R080229 [b]
Tulare, CA, USA, 2008 (Tellmark)	SC 300 [a] + adjuvant Activator 90	3	5–5	0.30 0.30 0.31	0.10 0.10 0.11	heading, 3 June	0 1 3 7 10	3.3 4.1 [c] 1.6 1.9 2.5	3.4 4.2 1.6 1.9 2.5	330496 2009/7003324 RCN R080230 [b]
Monterey, CA, USA, 2008 (Telluride)	SC 300 [a] + adjuvant Activator 90	3	4–6	0.30 0.30 0.30	0.10 0.11 0.11	BBCH 49, 9 June	0 1 3 7 10	3.2 1.4 1.7 0.36 [c] 0.44 [c]	3.2 1.4 1.7 0.39 0.47	330496 2009/7003324 RCN R080231 [b]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 225 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Results for individual field samples are the average of multiple replicate analyses.

[d] Trials early or late in the growing season (last application in May or November) were field trials following a standard agronomic practice for the growth region In these regions (Seminole, FL, Tehama, CA) head lettuce is produced nearly year round [BASF, 2012b].

[White, 2010e, 2009/7003324, 330496]

No unusual weather conditions. Plot size 24–124 m2. Ground equipment (tractor mounted, backpack or handheld boom sprayers), spray volume 270–294 L/ha. Two samples per plot of heads with wrapper leaves (12 plants, > 1 kg) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 178–581 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (69–83% for parent (with RSD 13–26%) and 84–88% for M650F03 and M650F04 at 0.01, 1 and 10 mg/kg; 53% for parent at 20 mg/kg).

Lettuce, Leaf

Supervised residue trials on leaf lettuce were conducted in Canada (2008) and the USA (2008). Results for a broadcast spray treatment in the field are shown in Table 64. Residue levels in the trials are for the whole commodity as usually marketed, after removal of obviously decomposed or withered leaves (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were found in one out of nine trials (indicated with superscript d). In this trial soil metabolites ranged from 0.01–0.10 mg/kg for M650F03 and < 0.01–0.02 mg/kg for M650F04 which amounts to 0.2–8.8% of the total residue.

Although full method validation results for parent were within limits (see analytical methods) average concurrent recoveries for parent were too low (69% at 0.01 mg/kg; 53% at 20 mg/kg) with a too high RSD (26% at 0.01 mg/kg) indicating inaccuracy of the analytical method for leaf lettuce at a level of 0.01 and 20 mg/kg at the time of measurement of the actual samples. Since selected residue levels are in the range of 5–20 mg/kg, this may affect selection of residue values.

Table 64 Residues of ametoctradin after pre-harvest broadcast spray on leaf lettuce

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Tift, GA, USA, 2008 (Italian Isher)	SC 300 [a] + adjuvant Induce	3	4–5	0.30 0.30 0.30	0.11 0.11 0.11	7–10" = 18–25 cm 3 June	0 1 3 7 10	18 9.0 4.4 3.1 1.6	18 [d] 9.0 [d] 4.4 [d] 3.1 [d] 1.8 [d]	330496 2009/7003324 RCN R080215 [b]
Seminole, FL, USA, 2008 (Bibb)	SC 300 [a] + adjuvant Surfactant 90	3	4–5	0.30 0.30 0.30	0.11 0.11 0.11	vegetative, 16 April	0 1 3 7 10	7.9 [c] 5.2 2.5 0.67 0.78 [c]	7.9 5.2 2.5 0.70 0.80	330496 2009/7003324 RCN R080216 [b, e]
Dane, WI USA, 2008 (Black Seeded Simpson)	SC 300 [a] + adjuvant Preference	3	5–5	0.30 0.31 0.31	0.11 0.11 0.11	vegetative, 2 Sept	0 1 3 7 10	18 14 [c] 5.5 2.4 1.5 [c]	18 14 5.5 2.5 1.5	330496 2009/7003324 RCN R080217 [b]
La Vallée du Richelieu, QC, Canada, 2008 (Great Lake)	SC 300 [a] + adjuvant Agral 90	3	5–6	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 49, 23 June	0 1 4 7 10	3.9 2.9 0.83 1.1 1.1	3.9 2.9 0.86 1.1 1.1	330496 2009/7003324 RCN R080218 [b]
Tehama, CA, USA, 2008 (Tohema)	SC 300 [a] + adjuvant R-11	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 49 17 Nov	0 1 3 7 10	15 14 [c] 19 20 16	15 14 19 20 16	330496 2009/7003324 RCN R080219 [b, e]
Fresno, CA, USA, 2008 (Salad Bowl)	SC 300 [a] + adjuvant Induce	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	24 leaves, 15 May	0 1 3 7 10	2.8 4.7 5.0 1.5 0.74	2.8 4.7 5.1 1.5 0.77	330496 2009/7003324 RCN R080220 [b, e]
Tulare, CA, USA, 2008 (Butter Crunch)	SC 300 [a] + adjuvant Activator 90	3	5–6	0.30 0.31 0.30	0.11 0.10 0.10	7–9 leaves, 9 June	0 1 3 7 10	5.2 4.4 5.0 [c] 2.5 2.3	5.2 4.5 5.0 2.5 2.3	330496 2009/7003324 RCN R080221 [b]
Monterey, CA, USA, 2008 (Sumbelt)	SC 300 [a] + adjuvant Activator 90	3	5–6	0.31 0.31 0.30	0.10 0.10 0.10	8–11 leaves, 27 May	0 1 3 7 10	8.5 7.2 4.9 2.8 1.1	8.5 7.2 4.9 2.8 1.1	330496 2009/7003324 RCN R080222 [b, e]
Benton, OR, USA, 2008 (Red Sails)	SC 300 [a] + adjuvant R-11	3	5–5	0.30 0.31 0.31	0.11 0.11 0.11	BBCH 49, 9 Aug	0 1 3 7 10	11 10 6.2 2.9 2.6	11 10 6.2 3.0 2.6	330496 2009/7003324 RCN R080223 [b]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 225 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Results for individual field samples are the average of multiple replicate analyses.

[d] Soil metabolites were actually found at a level of < 0.01–0.10 mg/kg (M650F03) and < 0.01–0.02 mg/kg (M650F04).

[e] Trials early or late in the growing season (last application in April, May, November) were field trials following a standard agronomic practice for the growth region In these regions (Seminole, FL, Tehama, CA, Fresno CA, Monterey, CA) leaf lettuce is produced nearly continuously from early spring to early winter [BASF, 2012b].

[White, 2010e, 2009/7003324, 330496]

No unusual weather conditions. Plot size 42–226 m2. Ground equipment (backpack or handheld boom sprayers), spray volume 278–297 L/ha. Two samples per plot of leaves (12 plants, > 1 kg) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 178–581 days (collection to analysis). Samples were analysed for parent,

M650F03 and M650F04 using HPLC-MS-MS method L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (69–83% for parent (with RSD 13–26%) and 84–88% for M650F03 and M650F04 at 0.01, 1 and 10 mg/kg; 53% for parent at 20 mg/kg).

Mustard greens

Supervised residue trials on mustard greens were conducted in the USA (2008). Results for a broadcast spray treatment in the field are shown in Table 65. Residue levels in the trials are for the whole commodity as usually marketed, after removal of obviously decomposed or withered leaves (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Only M650F03 was found in three out of seven trials (indicated with superscript c). In these trials, soil metabolites ranged from 0.010 mg/kg – 0.15 mg/kg for M650F03 and < 0.01 mg/kg for M650F04, which amounts to 0.1–1.5% of the total residue.

Table 65 Residues of ametoctradin after pre-harvest broadcast spray on mustard greens

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Tift, GA, USA, 2008 (Southern Giant Curl)	SC 200 [a] + adjuvant Induce	3	7–7	0.29 0.30 0.30	0.10 0.11 0.11	8 leaves, 3 Dec	0 1 3 7 10	13 13 11 4.4 3.2	13 13 11 4.4 3.2	308610 2009/7006205 RCN R080078 [b, d]
Seminole, FL, USA, 2008 (Savannah)	SC 200 [a] + adjuvant TT DWS 90	3	6–7	0.29 0.29 0.29	0.11 0.11 0.11	BBCH 19, 10 Nov	0 1 3 7 10	28 22 14 10 9.3	28 [c] 22 [c] 14 [c] 10 [c] 9.4 [c]	308610 2009/7006205 RCN R080080 [b, d]
Prima, AR, USA, 2008 (Florida Broadleaf)	SC 200 [a] + adjuvant Dyne Amic	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	6 leaves, 17 May	0 1 3 7 10	13 12 11 16 12	13 [c] 12 [c] 11 [c] 16 [c] 12 [c]	308610 2009/7006205 RCN R080081 [b, d]
Freeborn, MN, USA, 2008 (Southern Giant Curl)	SC 200 [a] + adjuvant Preference	3	8–7	0.28 0.31 0.30	0.10 0.11 0.11	vegetative, 21 July	0 1 3 7 10	13 8.8 7.3 4.4 3.4	13 8.8 7.3 4.4 3.4	308610 2009/7006205 RCN R080082 [b]
Uvalde, TX USA, 2008 (Southern Giant Curl)	SC 200 [a] + adjuvant Kinetic	3	7–7	0.29 0.30 0.29	0.11 0.11 0.11	BBCH 49, 24 Sept	0 1 3 7 10	19 18 15 10 4.7	19 [c] 18 [c] 15 [c] 10 [c] 4.7 [c]	308610 2009/7006205 RCN R080083 [b]
Fresno, CA USA, 2008 (Florida Broadleaf)	SC 200 [a] + adjuvant Induce	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	mature leaves, 19 May	0 1 3 7 10	6.7 9.2 8.2 3.5 2.9	6.8 9.2 8.2 3.5 2.9	308610 2009/7006205 RCN R080084 [b, d]
Yuma, AZ USA, 2008 (Southern Giant Curl)	SC 200 [a] + adjuvant Ferti-Spred	3	7–7	0.29 0.30 0.30	0.11 0.11 0.11	mature, 6 Nov	0 1 3 7 10	23 24 15 10 8.2	23 24 15 10 8.2	308610 2009/7006205 RCN R080085 [b, d]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Results come from 2 replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Soil metabolites were actually found at levels of 0.010–0.050 mg/kg (M650F03) and < 0.01 mg/kg (M650F04).

[d] Trials early or late in the growing season (last application in May, November, December) were field trials following a standard agronomic practice for the growth region In these regions (Seminole, FL, Prima, AR, Fresno CA, Yuma, AZ) mustard greens are cool season vegetables that are produced in both early spring and fall [BASF, 2012b].

[White, 2010d, 2009/7006205, 308610]

No unusual weather conditions. Plot size 70–167 m2. Ground equipment (backpack or handheld boom sprayers), spray volume 267–289 L/ha. Two samples per plot of leaves (> 12 plants, kg not stated) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 305–516 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (90–109% for all analytes at 0.01, 1, 5, and 30 mg/kg).

Spinach

Supervised residue trials on spinach were conducted in Canada (2008) and the USA (2008). Results for a broadcast spray treatment in the field are shown in Table 66. Residue levels in the trials are for the whole commodity as usually marketed, after removal of obviously decomposed or withered leaves (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were not found (< 0.01 mg/kg) in any of the trials.

The laboratory could not show adequate performance of the analytical method for spinach at 0.01 mg/kg. In the absence of acceptable recovery data at levels between 0.01–1 mg/kg, the Meeting decided to utilise the level of 1 mg/kg as LOQ for parent in spinach until suitable validation data are provided to define an appropriate LOQ for these commodities (see validation of analytical method section). Since all the residue values lie above 1 mg/kg, this has no impact on the selection of residue values.

Table 66 Residues of ametoctradin after pre-harvest broadcast spray on spinach

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Wayne, NY, USA, 2008 (Melody)	SC 300 [a] + adjuvant LI 700 NIS	3	6–5	0.31 0.30 0.30	0.11 0.11 0.11	close to maturity, 16 June	0 1 3 7 10	6.0 3.0 3.7 1.6 0.98	6.0 3.1 3.8 1.6 1.0	330496 2009/7003324 RCN R080232 [b]
Tift, GA, USA, 2008 (Space F1)	SC 300 [a] + adjuvant Induce	3	5–5	0.30 0.30 0.30	0.11 0.10 0.10	9–16 leaves, 18 May	0 1 3 7 10	20 16 12 2.8 1.1	20 16 12 2.8 1.1	330496 2009/7003324 RCN R080233 [b]
Dane, WI, USA, 2008 (Unipack 151)	SC 300 [a] + adjuvant Preference	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	6–8" = 15–20 cm, 25 Aug	0 1 3 7 10	34 35 5.5 3.2 4.9	34 35 5.6 3.2 4.9	330496 2009/7003324 RCN R080234 [b, d]
La Vallée du Richelieu, QC, Canada, 2008 (Tyee)	SC 300 [a] + adjuvant Agral 90	3	4–4	0.31 0.32 0.31	0.11 0.11 0.11	BBCH 51, 15 July	0 1 3 7 10	12 12 9.3 7.1 5.1	12 12 9.3 7.1 5.1	330496 2009/7003324 RCN R080235 [b, d]
Uvalde, TX, USA, 2008 (Siena)	SC 300 [a] + adjuvant Kinetic	3	7–7	0.30 0.30 0.29	0.11 0.11 0.11	BBCH 49, 1 Dec	0 1 3 7 10	13 11 9.8 6.9 6.6	13 11 9.8 6.9 6.7	330496 2009/7003324 RCN R080236 [b, c]
Jerome, ID, USA, 2008 (Unipack 151)	SC 300 [a] + adjuvant Activator 90	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 48, 6 Oct	0 1 3 7 10	13 11 9.8 5.3 2.7	13 11 9.8 5.3 2.8	330496 2009/7003324 RCN R080237 [b]

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Tehama, CA, USA, 2008 (Crocodile)	SC 300 [a] + adjuvant R-11	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	12"height = 30 cm 6 Dec	0 1 3 7 10	19 14 <u>21</u> 14 14	19 14 21 14 14	330496 2009/7003324 RCN R080238 [b, d]
Benton, OR, USA, 2008 (Avenger)	SC 300 [a] + adjuvant R-11	3	5–8	0.30 0.30 0.29	0.11 0.11 0.11	BBCH 49, 6 Oct	0 1 3 7 10	<u>11</u> 6.5 5.8 4.9 4.7	11 6.5 5.9 4.9 4.7	330496 2009/7003324 RCN R080239 [b]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 225 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Trials late in the growing season (last application in December) were field trials following a standard agronomic practice for the growth region. In these regions (Uvalde, TX, Tehama, CA) spinach is a cool season vegetable that is produced nearly year round. In southern growth areas, spinach is commonly cultivated well into winter because of the lack of "hard freezes" [BASF, 2012b].

[d] Spinach trials RCN R080234/RCN R080235/RCN R080238 indicate as growth stage of last treatment 6–8 inch; BBCH 51; 12 inch height respectively. Since the field report did not indicate bolting in the raw data or that the samples provided were commercially inappropriate, samples are considered representative for commercial trading [BASF, 2012d].

[White, 2010e, 2009/7003324, 330496]

No unusual weather conditions. Plot size 42–167 m2. Ground equipment (tractor mounted, backpack or handheld boom sprayers), spray volume 274–294 L/ha. Two samples per plot of leaves (12 plants, > 1 kg) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 178–581 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (73–106% for all analytes at 0.01, 1 and 20 mg/kg (RSD 5.6–29%); 106% for parent at 200 mg/kg).

Potatoes

Supervised residue trials on <u>potatoes</u> were conducted in Canada (2008), the USA (2008) and Germany (2007). German trials were conducted at an exaggerated rate for the purpose of processing studies. Results for a broadcast spray treatment in the field are shown in Table 67. Residue levels in the trials are for the whole commodity after removal of tops and after removal of adhering soil (= Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were found in two out of 25 trials (indicated with superscript c). In these trials, soil metabolites were 0.010–0.030 mg/kg for M650F03 and < 0.01–0.010 mg/kg for M650F04, which amounts to 72–84% of the total residue.

Table 67 Residues of ametoctradin after pre-harvest broadcast spray on potatoes

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	soil type	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Wayne, NY, USA, 2008, (Superior)	SC 200 + adjuvant LI 700 NIS	3	6–4	0.30 0.30 0.30	0.11 0.11 0.11	vines 50% desiccated, 6 Sept	muck	4	<u>0.035</u>	0.061	249259 2009/7003273 R080108 [a]
Wayne, NY, USA, 2008 (Norland)	SC 200 + adjuvant LI 700 NIS	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	vines drying, 16 Sept	silt loam	4	<u>0.025</u>	0.051	249259 2009/7003273 R080109 [a]
Lehigh, PA, USA, 2008 (Dark Red Norland)	SC 200 + adjuvant Dyne-Amic	3	4–5	0.31 0.31 0.30	0.098 0.10 0.099	bulking, 10 July	clay loam	4	<u>< 0.01</u>	< 0.036	249259 2009/7003273 R080110 [a, d]

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	soil type	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Queens, PEI, Canada, 2008 (Yukon Gold)	SC 200 + adjuvant Ag-Surf	3	6–6	0.30 0.29 0.29	0.12 0.12 0.12	BBCH 48, 16 Sept	sandy loam	4	< 0.01	< 0.036	249259 2009/7003273 R080111 [a]
Queens, PEI Canada, 2008 (Shepody)	SC 200 + adjuvant Ag-Surf	3	6–6	0.31 0.30 0.29	0.12 0.12 0.12	BBCH 47, 16 Sept	sandy loam	4	< 0.01	< 0.036	249259 2009/7003273 R080112 [a]
Tift, GA, USA, 2008 (Red Pointiac)	SC 200 + adjuvant Induce	3	4–6	0.30 0.30 0.30	0.13 0.13 0.13	tubers 8.25 cm, 29 May	loamy sand	4	< 0.01	0.036 [c]	249259 2009/7003273 R080113 [a, c]
Seminole, FL, USA, 2008 (Red Pointiac)	SC 200 + adjuvant Tricard Surf 90	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	growth stage not reported, 21 April	sand	4	0.025	0.051	249259 2009/7003273 R080114 [a, c]
Freeborne, MN, USA, 2008 (Cascade)	SC 200 + adjuvant Preference	3	5–5	0.30 0.30 0.31	0.16 0.16 0.16	BBCH 6N9, 18 Aug	sandy clay loam	4	< 0.01	< 0.036	249259 2009/7003273 R080115 [a]
Cass, ND, USA, 2008 (Goldrush)	SC 200 + adjuvant Induce	3	5–6	0.31 0.29 0.28	0.16 0.16 0.16	BBCH 89, 14 Sept	clay loam	0 1 4 7 10	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.036 < 0.036 < 0.036 < 0.036 < 0.036	249259 2009/7003273 R080116 [a]
Jefferson, IA, USA, 2008 (Kennebec)	SC 200 + adjuvant Preference	3	5–5	0.29 0.30 0.30	0.19 0.19 0.13	BBCH 95, 9 Aug	silt loam	4	< 0.01	< 0.036	249259 2009/7003273 R080117 [a]
Dane, WI USA, 2008 (Superior)	SC 200 + adjuvant Preference	3	5–5	0.39 0.30 0.31	0.16 0.098 0.10	BBCH 48, 11 Aug	silt loam	4	< 0.01	< 0.036	249259 2009/7003273 R080118 [a]
Pepin, WI USA, 2008 (Burbank)	SC 200 + adjuvant Induce	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 6N9, 30 Aug	sandy loam	4	0.010	0.036	249259 2009/7003273 R080119 [a]
Taber, AB, Canada, 2008 (Russet Burbank)	SC 200 + adjuvant Ag-Surf	3	5–8	0.29 0.31 0.29	0.20 0.19 0.20	BBCH 47-49, 25 Sept	loam	4	0.010	0.036	249259 2009/7003273 R080120 [a]
Cache, UT, USA, 2008 (Klondike Rose)	SC 200 + adjuvant Ad-Wet 90	3	5–4	0.31 0.31 0.29	0.16 0.16 0.16	bulking, 25 Aug	sandy loam	4	0.010	0.036	249259 2009/7003273 R080121 [a, d]
Sacramento, CA, USA, 2008 (1533)	SC 200 + adjuvant R-11	3	5–5	0.30 0.30 0.30	0.16 0.16 0.16	bulking, 6 Sept	clay	4	0.010	0.036	249259 2009/7003273 R080122 [a, d]
Payette, ID USA, 2008 (Norkotah)	SC 200 + adjuvant Preference	3	6–5	0.31 0.30 0.30	0.13 0.13 0.13	BBCH 48, 29 Aug	loam	4	< 0.01	< 0.036	249259 2009/7003273 R080123 [a]
Washington, ID, USA, 2008 (Ranger Russet)	SC 200 + adjuvant Preference	3	7–4	0.30 0.30 0.30	0.13 0.13 0.13	BBCH 48, 27 Sept	sandy loam	4	< 0.01	< 0.036	249259 2009/7003273 R080124 [a]

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	soil type	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Bingham, ID, USA, 2008 (Ranger Russet)	SC 200 + adjuvant Ad-Wet 90	3	5–4	0.30 0.31 0.30	0.16 0.16 0.16	mature, 5 Sept	silt loam	0 1 4 7 10	0.010 0.015 <u>< 0.01</u> < 0.01 < 0.01	0.036 0.041 < 0.036 < 0.036 < 0.036	249259 2009/7003273 R080125 [a]
Power, ID, USA, 2008 (Russet Burbank)	SC 200 + adjuvant Agri-Dex	3	4–6	0.29 0.31 0.30	0.16 0.16 0.16	BBCH 47, 4 April	silt loam	4	<u>0.010</u>	0.036	249259 2009/7003273 R080126 [a]
Benton, OR, USA, 2008 (Gemstar Burbank)	SC 200 + adjuvant R-11	3	5–5	0.31 0.31 0.30	0.11 0.11 0.11	BBCH 49, 27 Sept	silt loam	4	<u>< 0.01</u>	< 0.036	249259 2009/7003273 R080127 [a]
Strathcona, AB, Canada, 2008 (Russet Burbank E3)	SC 200 + adjuvant Merge	4	4–4–5	0.30 0.30 0.30 0.30	0.15 0.16 0.16 0.16	BBCH 94, 11 Sept	clay loam	4	<u>0.020</u>	0.046	249259 2009/7003273 R080128 [a]
Motterwitz, Saxony, Germany, 2007, (Licara)	SC 200	6	5–5–4–5–3	0.76 0.69 0.68 0.76 0.68 0.71	0.25 0.25 0.25 0.25 0.25 0.25	BBCH 93, 22 Aug	–	0 6	< 0.01 < 0.01	0.048 [c] 0.061 [c]	249187 2008/1022149; L070898 [e]
Gerbitz, Saxony-Anhalt, Germany, 2007, (Melody)	SC 200	6	5–5–5–5–5	0.75 0.75 0.73 0.73 0.70 0.74	0.24 0.25 0.25 0.25 0.25 0.25	BBCH 91, 20 Aug	–	0 7	< 0.01 < 0.01	< 0.036 < 0.036	249187 2008/1022149; L070899 [e]
Kitzscher, Saxony, Germany, 2007, (Agria)	SC 200	6	5–4–5–7–4	0.720.690.710.700.740.72	0.25 0.25 0.25 0.25 0.25 0.25	BBCH 93, 26 Aug	–	0 7	0.015 < 0.01	0.041 < 0.036	249187 2008/1022149; L070900 [e]
Blankenhagen, Mecklenburg, Germany, 2007, (Kalena)	SC 200	6	5–5–5–6–4	0.700.730.740.780.750.73	0.25 0.25 0.25 0.25 0.25 0.25	BBCH 95, 27 Aug	–	0 7	< 0.01 < 0.01	< 0.036 < 0.036	249187 2008/1022149; L070901 [e]

[a] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[b] Soil metabolites were actually found at levels of 0.010 mg/kg (M650F03) and 0.010 mg/kg (M650F04).

[c] Trials early in the growing season (last application in April, May) were field trials following a standard agronomic practice for the growth region. In these regions (Tift, GA, Seminole, FL) potatoes are grown nearly year with most of the crops being harvested in fall, early winter and spring [BASF, 2012b].

[d] Bulking is an agronomic term used to refer to the growth period between full bloom and senescence (vine death). Typically this period begins 8–14 weeks after planting and encompasses the time period when tuber growth is occurring until harvest. Acceptable harvest date is based on the maturity of the potato (based on size and skin firming). The application dates for these trials conformed to standard agricultural practices [BASF, 2012b].

[e] Exaggerated dose rates, used for processing

[Jordan, 2009b, 2009/7003273, 249259

No unusual weather conditions. Plot size 33–145 m2. Ground equipment (tractor mounted, backpack or handheld boom sprayers), spray volume 150–315 L/ha. One sample per plot of tubers (12–25 tubers from at least six plants, > 2 kg) were harvested by hand without bias when commercially acceptable. Samples were stored at –5 °C or lower for 302–452 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01

with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (95–105% for all analytes at 0.01–1 mg/kg; RSD 21% at 0.01 mg/kg parent, RSD 22–23% at 1 mg/kg M650F03 and M650F04). Since precision is only slightly higher than 20%, this is considered to have no impact on the selection of residues.

[Braun, 2008a, 2008/1022149]

No unusual weather conditions. Plot size 50 m2. Mobile plot sprayer with boom, spray volume 276–320 L/ha. Tubers (> 2 kg, number of plants not stated) were harvested at BBCH 91-97. Samples were stored at –18 °C or lower for 283–297 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, draft version June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries at 0.01–0.1 mg/kg (70–109% for each analyte, except 69–72% for parent). Since the recovery lies only slightly below 70%, this is considered to have no impact on the selection of residues.

Celery

Supervised residue trials on celery were conducted in Canada (2008) and the USA (2008). Results for a broadcast spray treatment in the field are shown in Table 68. Residue levels in the trials are for the whole commodity as usually marketed, after removal of obviously decomposed or withered leaves and after removal of adhering soil (i.e., leaves and stems = Codex RAC). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Only M650F03 was found in one out of nine trials (indicated with superscript d). In this trial, soil metabolites ranged from 0.030–0.040 mg/kg for M650F03 and < 0.01 mg/kg for M650F04, which amounts to 1.5–2.2% of the total residue.

The laboratory could not show adequate performance of the analytical method for celery at 0.01 mg/kg. In the absence of acceptable recovery data at levels between 0.01–1 mg/kg, the Meeting decided to utilize the level of 1 mg/kg as LOQ for parent in celery until suitable validation data are provided to define an appropriate LOQ for this commodity (see validation of analytical method section). Since all the residue values lie above 1 mg/kg, this has no impact on the selection of residue values.

Table 68 Residues of ametoctradin after pre-harvest treatment on celery

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Martin, FL USA, 2008 (AB52)	SC 300 [a] + adjuvant P Plus	3	6–5	0.30 0.30 0.30	0.11 0.11 0.11	vegetative 14–16" = 36–41 cm 27 May	0 1 3 7 10	5.1 1.2 0.58 0.64 0.70	5.2 1.2 0.61 0.66 0.73	330496 2009/7003324 RCN R080240 [b, d]
Seminole, FL, USA, 2008 (Utah)	SC 300 [a] + adjuvant Surfactant 90	3	5–4	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 49, 30 May	0 1 3 7 10	6.2 6.2 3.5 3.4 2.8	6.2 6.3 3.5 3.4 [c] 2.8 [d]	330496 2009/7003324 RCN R080241 [b, e]
Dane, WI, USA, 2008 (Tango)	SC 300 [a] + adjuvant Preference	3	5–4	0.30 0.30 0.30	0.11 0.10 0.11	BBCH 46, 19 Sept	0 1 3 7 10	5.5 5.0 4.4 2.5 2.0	5.5 5.0 4.4 2.5 2.0	330496 2009/7003324 RCN R080242 [b]
Vercheres, QC, Canada, 2008 (Victoria)	SC 300 [a] + adjuvant Agral 90	3	5–5	0.29 0.31 0.30	0.11 0.11 0.11	BBCH 49, 14 Aug	0 1 3 7 10	3.4 2.6 1.2 1.9 0.99	3.5 2.7 1.3 1.9 1.0	330496 2009/7003324 RCN R080243 [b]
Vercheres Canada, 2008 (XP 266)	SC 300 [a] + adjuvant Agral 90	3	5–5	0.30 0.31 0.30	0.11 0.11 0.11	BBCH 49, 14 Aug	0 1 3 7 10	4.7 3.9 1.2 2.4 1.2	4.7 4.0 1.3 2.4 1.2	330496 2009/7003324 RCN R080244 [b]

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Fresno, CA, USA, 2008 (Mission)	SC 300 [a] + adjuvant Induce	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 49, 21 June	0 1 3 7 10	11 9.5 6.0 7.3 3.9	11 9.5 6.0 7.3 3.9	330496 2009/7003324 RCN R080245 [b]
Fresno, CA, USA, 2008 (Mission)	SC 300 [a] + adjuvant Induce	3	5–5	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 49, 22 Nov	0 1 3 7 10	7.0 5.5 2.7 2.4 1.2	7.0 5.5 2.7 2.5 1.2	330496 2009/7003324 RCN R080246 [b, d]
Fresno, CA, USA, 2008 (G15)	SC 300 [a] + adjuvant Activator 90	3	4–6	0.31 0.31 0.30	0.10 0.11 0.10	BBCH 49, 9 June	0 1 3 7 10	2.6 4.2 1.2 0.60 0.48	2.6 4.2 1.3 0.62 0.50	330496 2009/7003324 RCN R080247 [b, d]
Monterey, CA, USA, 2008 (Sinora)	SC 300 [a] + adjuvant Pro 90	3	5–6	0.31 0.30 0.32	0.11 0.11 0.11	stalk elongation, 26 Sept	0 1 3 7 10	3.6 2.4 6.7 1.2 2.1	3.7 2.4 6.8 1.3 2.2	330496 2009/7003324 RCN R080248 [b]

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 225 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Soil metabolites were actually found at a level of 0.03–0.04 mg/kg M650F03 and < 0.01 mg/kg M650F04.

[d] Trials early and late in the growing season (last application in May, June and November) were field trials following a standard agronomic practice for the growth region. Because of the mild climate in these regions (Fresno, CA, Seminole, FL, Martin, FL) they have nearly year-round agriculture and celery can actually be "overwintered" in these regions [BASF, 2012b].

[White, 2010e, 2009/7003324, 330496]

No unusual weather conditions. Plot size 28–93 m2. Ground equipment (backpack or handheld boom sprayers), spray volume 270–301 L/ha. Two samples per plot of leaves and stems (12 plants, > 1 kg) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 178–581 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (72–103% for all analytes at 0.01, 1 and 10 mg/kg; RSD 24% at 0.01 mg/kg for parent).

Hops, dry

Supervised residue trials on hops were conducted in Germany (2008, 2009 and 2010) and the USA (2008 and 2011). Results for a foliar spray treatment in the field are shown in Table 69. Residue levels in the trials are for the whole commodity as prepared for wholesale or retail distribution (i.e., dried cones, RAC). Samples from the 2008, 2009 and 2011 trials were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were not found (< 0.01 mg/kg) in any of the 2008, 2009 or 2011 trials, while soil metabolites were not analysed in the 2010 trials.

Based on validation results, the LOQ for parent in dried hops was increased to 1 mg/kg for HPLC-MS-MS method L0078/01 and to 0.02 mg/kg for HPLC-MS-MS method L0117/01. Method L0078/01 was used in the German 2008 and 2009 trials, where all residue values were higher than 1 mg/kg. Method L0117/01 was used in the German 2010 and US 2008 and 2011 trials, where all residues were higher than 0.02 mg/kg. Therefore this is considered to have no impact on the selection of residue values.

Although full method validation results for parent were within limits (see analytical methods) concurrent recovery criteria were not met for parent for trials L100109 and L100110 (48–51% at 0.01, 1 and 100 mg/kg parent). Since the laboratory could not show adequate performance of the analytical method for dried hops at the time of sample analysis, the values from these trials were not selected.

Table 69 Residues of ametoctradin after pre-harvest foliar spray on hops (analysed as dried hops)

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	Parent mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Hohenebra, Thuringia, Germany, 2008 (Nordisher Brauer)	SC 300 [a]	3	8–7	0.19 0.85 0.86	0.0067 0.023 0.023	BBCH 87 28 Aug	11	19	19	308736 2011/1101445 L080354 [c]
Golzern, Saxony, Germany, 2008, (Nugget)	SC 300 [a]	3	7–8	0.18 0.88 0.86	0.0067 0.023 0.023	BBCH 75 27 Aug	9	32	32	308736 2011/1101445 L080355 [c]
Baalberge, Saxony-Anhalt, Germany, 2008 (Magnum)	SC 300 [a]	3	8–8	0.21 0.74 0.89	0.0067 0.023 0.023	BBCH 81 29 Aug	11	33	33	308736 2011/1101445 L080356 [c]
Simonshofen, Bavaria, Germany, 2008 (	SC 300 [a]	3	7–9	0.19 0.80 0.80	0.0067 0.023 0.023	BBCH 83 29 Aug	10	24	24	308736 2011/1101445 L080357 [c]
Golzern, Saxony, Germany, 2009 (Nugget)	SC 300 [a]	2	8	0.82 0.84	0.029 0.029	BBCH 77 25 Aug	10	31	31	308737 2010/1122090 L090336
Hohenebra, Thuringia, Germany, 2009 (Nordischer Brauer)	SC 300 [a]	2	8	0.86 0.86	0.029 0.029	BBCH 77 25 Aug	10	15	15	308737 2010/1122090 L090337
Hohenebra, Thuringia, Germany, 2010 (Nordischer Brauer)	SC 300 [a]	2	7	0.88 0.83	0.029 0.029	BBCH 85-87 20 Aug	10	8.6	–	371192 2011/1074835 L100109 [b]
Golzern, Saxony Germany, 2010 (Nugget)	SC 300 [a]	2	8	0.86 0.87	0.029 0.029	BBCH 75, 27 Aug	10	36	–	371192 2011/1074835 L100110 [b]
Canyon, ID, USA, 2008, (Zeus)	SC 200 [d] + R11	3	11–10	0.31 0.32 0.31	0.043 0.043 0.043	BBCH 87, 4 Sept	7	0.82 [e]	0.85	308890 2009/7003320 LR070313
Canyon, ID, USA, 2008, (Zeus)	SC 200 [d] + R11	3	11–10	0.30 0.30 0.30	0.021 0.021 0.021	BBCH 87, 4 Sept	7	0.96 [e]	0.98	308890 2009/7003320 LR070313
Polk, OR, USA, 2008, (Galena)	SC 200 [d] + R11	3	9–10	0.30 0.31 0.31	0.037 0.038 0.038	BBCH 89, 16 Sept	0 3 7 10 14	4.4 6.7 4.6 [e] 6.1 2.1	4.4 6.7 4.7 6.1 2.1	308890 2009/7003320 LR070313

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	Parent mg/kg	Total mg/kg	Study code; Doc ID; Trial no
Polk, OR, USA, 2008, (Galena)	SC 200 [d] + R11	3	9–10	0.32 0.30 0.30	0.015 0.015 0.015	BBCH 89, 16 Sept	0 3 7 10 14	2.5 4.1 2.4 <u>6.7</u> 2.2	2.5 4.1 2.4 6.7 2.2	308890 2009/7003320 LR070313
Yakima, WA, US, 2008, (Columbus)	SC 200 [d] + R11	3	9–10	0.30 0.30 0.30	0.043 0.043 0.043	BBCH 84-85, 8 Sept	7	<u>2.4</u>	2.4	308890 2009/7003320 LR070314
Yakima, WA, US, 2008, (Columbus)	SC 200 [d] + R11	3	9–10	0.30 0.30 0.30	0.021 0.021 0.021	BBCH 84-85, 8 Sept	7	1.6	1.7	308890 2009/7003320 LR070314
Silverton, OR, US, 2011 (Willamette)	SC 300 [a] + 0.25% activator 90	3	10–10	0.54 0.54 0.53	0.054 0.054 0.053	BBCH 88 2 Oct	8	<u>18</u>	18	410650 2011/7004998 R110163 (f)
Silverton, OR, US, 2011, (Super Galena)	SC 300 [a] + 0.25% activator 90	3	11–10	0.53 0.53 0.54	0.054 0.054 0.054	BBCH 86 22 Sept	6	<u>9.3</u>	9.3	410650 2011/7004998 R110165 (f)
Mt Shasta, CA, US, 2011 (Gold Nuggett)	SC 300 [a] + 0.25% activator 90	3	10–10	0.53 0.54 0.54	0.053 0.053 0.054	BBCH 88 1 Oct	8	<u>29</u>	29	410650 2011/7004998 R110164 (f)

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 225 g/L).

[b] Laboratory could not show adequate analytical method performance at the time of analysis (concurrent recovery 48–51% at 0.01, 1 and 100 mg/kg). Residue values cannot be selected for MRL derivation.

[c] Samples from this trial were also used for processing

[d] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[e] Results are the average of 2–3 replicate analyses on the same field sample.

[f] Results are the average of 2 replicate field samples.

[Braun, 2011, 2011/1101445]

No unusual weather conditions. Plot size 300 m2. Mist blower, spray volume 2700–3833 L/ha. One sample per plot of green cones (from four hop plants) was harvested at BBCH 87-88 by hand from inner rows. Green cones were kiln dried on the day of sampling for 7.5 hrs at 58 °C in a dry chamber (1.1–1.5 kg dried cones). Samples were stored at –18 °C for 296–311 days (collection to analysis). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01. Results were not corrected for control levels (< 0.1 mg/kg) nor for average concurrent method recoveries at 0.1–10 mg/kg (70–118% for each analyte).

[Harant, 2010a, 2010/1122090, 308737]

No unusual weather conditions. Plot size 300 m2. Mist blower, spray volume 2833–2967 L/ha. One sample per plot of green cones (from four hop plants) was harvested at BBCH 89 by hand from inner rows. Green cones were kiln dried on the day of sampling for 7.5 hrs at 58 °C in a dry chamber (1.3–2.6 kg dried cones). Samples were stored at –18 °C or lower for 79–112 days (collection to analysis). Samples were analysed for parent using HPLC-MS-MS method L0117/01 and for M650F03 and M650F04 using HPLC-MS-MS method L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for M650F03 and M605F03, 0.0029–0.0049 mg/kg for parent) nor for average concurrent method recoveries (88–100% for all analytes at 0.01, 0.1 and 10 mg/kg).

[Plier, 2011, 2011/1074835, 371192]

No unusual weather conditions. Plot size 240 m2. Mist blower, spray volume 2875–3042 L/ha. One sample per plot of green cones (from four hop plants) was harvested at BBCH 81-87 by hand from inner rows. Green cones were kiln dried on the day of sampling for 7.5 hrs at 58 °C in a dry chamber (2.0–3.2 kg dried cones). Samples were stored at –18 °C or lower for 152–172 days (collection to analysis). Samples were analysed for parent only using HPLC-MS-MS method L0117/01.

Results were not corrected for control levels (< 0.01 mg/kg) nor for average concurrent method recoveries (48–51% at 0.01, 1.0 and 100 mg/kg).

[Jordan, 2009c, 2009/7003320, 308890]

No unusual weather conditions. Plot size 39–70 m2. The applications were made to plots at each site using either concentrated (693–824 L/ha) or dilute (1405–2065 L/ha) spray volumes with ground equipment (airblast sprayers). A locally available adjuvant was added to the spray mixture for all applications. One sample per plot of green cones (from at least five hop plants) was harvested randomly when commercially acceptable. The hop cones were dried simulating commercial techniques to a moisture content targeting 8–10%. The dried hops cone RAC samples weighed 0.5 kg each. Samples were stored at –5 °C or lower for a maximum of 327 days (collection to analysis). Samples were analysed for parent using HPLC-MS-MS method L0117/01 with modifications and for M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with modifications. Results were not corrected for control levels (< 0.01 mg/kg) nor for average concurrent method recoveries (72–105% for all analytes at 0.01, 0.1 and 10 mg/kg).

[Schreier, 2011b, 2011/7004998, 410650]

No unusual weather conditions. Plot size 28–31 m2. The applications were made using ground equipment (982–1010 L/ha) spray volumes. An adjuvant was added to the spray mixture for all applications. Two samples per plot of green cones were harvested at maturity from at least 24 vines by hand. The hop cones were air dried to a moisture content targeting 10% (0.50–0.85 kg dried cones). Samples were stored at –10 °C or lower for a maximum of 41 days (collection to analysis). Samples were analysed for parent using HPLC-MS-MS method L0117/01 and for M650F03 and M650F04 using HPLC-MS-MS method L0078/01. Results were not corrected for control levels (< 0.01 mg/kg) nor for average concurrent method recoveries (70–122% for all analytes at 0.01, 0.1 and 10 mg/kg).

Fates of residues in storage and processing

In storage

Not relevant for the present intended use.

In processing

The Meeting received information on the nature of residues under conditions simulating pasteurisation, baking/brewing/boiling and sterilisation. In addition the Meeting received processing studies on grapes, bulb onions, gherkins, tomatoes, potatoes, and hops.

Study 1

The behaviour of BAS 650 F was studied under conditions simulating pasteurisation, baking/brewing/boiling and sterilisation [Hassink, 2008d, 2007/1057705]. Sterile pH 4, pH 5 and pH 6 citrate buffer solutions were prepared at a nominal concentration of 0.1 mg/L 2,7-^{14}C-ametoctradin (actual 0.071–0.105 mg/L). The buffer solutions were incubated for 20 minutes at 90 °C (pH 4), 60 minutes under reflux and in the dark at 100 °C (pH 5) or 20 minutes at 120 °C (pH 6). After incubation, test solutions were analysed directly without work-up. Initial and final test substance concentrations were determined by LSC and by reversed phase HPLC with radio detection.

The pH values ranged between 4.14–4.18, 5.03–5.05 and 6.23–6.43 at the beginning and end of the incubation period. Overall recoveries of radioactivity were 95.9% to 109.3% TAR (Table 70). The total amount of radioactive material (95.9–109.3% TAR) corresponded to parent only; no degradation products could be detected.

The study shows that ametoctradin is stable under conditions simulating pasteurisation, baking/brewing/boiling and sterilisation.

Table 70 Recovery and identification of radioactivity in 0.1 mg/L ametoctradin solutions under pasteurisation, baking/brewing/boiling and sterilisation simulating conditions.

	% of applied		
	pH 4 (90 °C, 20 min) (pasteurisation)	pH 5 (100 °C, 60 min) (baking/brewing/boiling)	pH 6 (120 °C, 20 min) (sterilisation)
prior to incubation (total) [a] ametoctradin, parent	100 100	100 100	100 100
post incubation (total) ametoctradin, parent	109.3 109.3	95.9 95.9	97.2 97.2

[a] Actual test concentration set to 100%

Study 2

Four field trials with grapes were conducted in Germany in 2007, at a treatment regime of four foliar spray applications using an airblast sprayer and an SC 200 g ai/L formulation [Braun, 2008c, 2008/1022152]. Further details can be found in the German trials from Table 48. Applications were performed at exaggerated nominal rates of 1.080 kg ai/ha each. Grapes, harvested from the field trial at 20–21 DAT, were processed to juice, red wine, rosé wine and raisins by simulating industrial processes. The specimens for processing were stored for 1–4 days at 4–8 ºC until the processing start.

Juice preparation from rosé wine process

Grape bunches (102.37 kg) were crushed in a grape mill (crusher). Subsequently the mash (stalks, flesh, skin, seed and juice) were pressed (0.25 MPa) to extract the must (76.49 kg) from the remaining wet pomace (23.99 kg). K2S2O5 was added to the must and the liquid was clarified resulting in raw juice (59.84 kg) and must deposit (15.31 kg). The raw juice divided in two fractions (40.00 kg and 18.79 kg) and the smaller fraction was pasteurized at 83–87 ºC for 2 minutes and was bottled as pasteurized juice.

Juice preparation from red wine process

Grape bunches (106.76 kg) were crushed in a stalk separator mill resulting in stalks (4.22 kg) and fresh crush (100.81 kg). $K_2S_2O_5$ was added to the fresh crush (flesh, skin, seed and juice). The crush was stirred and heated for 2 minutes at 60 ºC and then cooled down for 20 hrs. Subsequently the crush was pressed (0.25 MPa) to extract the must (84.50 kg) from the remaining wet pomace (11.09 kg). The must was clarified resulting in raw juice (65.31 kg) and must deposit (17.82 kg). The raw juice was divided in two fractions (40.00 kg and 24.28 kg) and the smaller fraction was pasteurized at 83–87 ºC for 2 minutes and was bottled as pasteurized juice.

Wine preparation

The raw juice from the rosé wine process (40.00 kg) or the red wine process (40.00 kg) was poured into glass vessels and pure culture yeast and nutrient salt were added to start fermentation at 20 ºC. After termination of the fermentation (after about 3 weeks) and clarification, $K_2S_2O_5$ was added and the intermediate was transferred into new vessels (1st racking) leaving the yeast deposit (1.75/2.36 kg) in the original vessels. Bentonite was added to the intermediate to absorb the proteins. Upon completion of the clarification the second transfer of wine (2nd racking) was carried out and $K_2S_2O_5$ was added. The young wine was filtered through filter pads after a resting time (clarification). The filtered young wine was then bottled for maturation and stored at approximately 12 ºC for approximately 5 months (25.50/24.50 kg).

Raisin preparation

Grape bunches (12.93 kg) were put in boiling water for 8–10 sec and were manually washed for 3 min in a vessel with cold tap water. The ratio of water to fruit was 1:1. The washed grape bunches were

dried in an oven at 66–74 ºC for 24 hrs until a moisture content of 10–14% was reached. After drying the raisins (2.68 kg) were manually removed from the stalks (0.11 kg).

Grapes and processed fractions of 1.00–1.20 kg must, wet pomace, raw juice, pasteurised juice, matured rose wine, matured red wine, and 0.07–0.42 kg must deposit, yeast deposit, fresh stalks, raisin stalks were stored at -18 °C for 22–284 days, prior to extraction. Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, draft version June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte and matrix, except 0.014–0.028 mg/kg parent in wet pomace, 0.017–0.026 mg/kg parent in juice). Results were not corrected for individual concurrent method recoveries at 0.01–80 mg/kg for parent and 0.01–0.1 mg/kg for metabolites (70–119% for each analyte and matrix).

Residue results and processing factors are shown in Table 71. Total residues in grapes ranged between 4.8–11 mg/kg at DAT 20–21. During the wine making processes (both rosé and red wine) increased residue concentrations are only found in waste fractions such as wet pomace which mainly consist of grape skins. In rosé and red wine, total residues are by far lower than in the RAC. The results show that the total residues are mainly located on the grape skins. In case of raisin production where the skins are not removed and the water content is reduced by about 90% a considerable concentration of total residues is observed.

Table 71 Residues and processing factors in grape and processed grape products

Location, year, (variety), dose rate, interval, DAT	Grape commodities	parent mg/kg	M650F03 mg/kg	M650F04 mg/kg	Total residue mg/kg (a)	PF parent	PF total
Trial 1, L070908 Traustadt, Bavaria, Germany, 2007, (Spätburgunder) application rate 1.2–1.2–1.2–1.2 kg ai/ha, interval 10–9–9 days, harvest DAT 21	grapes (RAC)	11	< 0.01	< 0.01	11		
	rose must	3.8	< 0.01	< 0.01	3.8	0.35	0.35
	rose wet pomace	27	< 0.01	< 0.01	27	2.5	2.5
	rose must deposit	2.3	< 0.01	< 0.01	2.3	0.21	0.21
	rose raw juice	2.6	< 0.01	< 0.01	2.6	0.24	0.24
	rose pasteurized juice	3.7	< 0.01	< 0.01	3.7	0.34	0.34
	rose yeast deposit	25	< 0.01	< 0.01	25	2.3	2.3
	rosé wine (matured 5 months)	< 0.01	< 0.01	< 0.01	< 0.036	< 0.001	< 0.003
	red wine fresh stalks	11	< 0.01	< 0.01	11	1.0	1.0
	red wine fresh crush	9.1	< 0.01	< 0.01	9.1	0.83	0.83
	red wine must	1.8	< 0.01	< 0.01	1.8	0.16	0.17
	red wine wet pomace	32	< 0.01	0.010	32	2.9	2.9
	red wine must deposit	15	< 0.01	< 0.01	15	1.4	1.4
	red wine raw juice	3.3	< 0.01	< 0.01	3.3	0.30	0.30
	red wine pasteurized juice	3.0	< 0.01	< 0.01	3.0	0.27	0.27
	red wine yeast deposit	24	< 0.01	< 0.01	24	2.2	2.2
	red wine (matured 5 months))	0.13	< 0.01	< 0.01	0.16	0.012	0.014
	raisins	21	< 0.01	< 0.01	21	1.9	1.9
	raisin stalks	48	< 0.01	< 0.01	48	4.4	4.4
Trial 2, L070909 Pfedelbach, Baden-Württemberg, Germany, 2007 (Lemberger) application rate 1.2–1.2–1.2–1.2 kg ai/ha, interval 10–9–9 days, harvest DAT 21	grapes (RAC)	6.1	< 0.01	< 0.01	6.1		
	rose must	5.9	< 0.01	< 0.01	5.9	0.97	0.97
	rose wet pomace	24	< 0.01	< 0.01	24	3.9	3.9
	rose must deposit	24	< 0.01	< 0.01	24	3.9	3.9
	rose raw juice	3.1	< 0.01	< 0.01	3.1	0.51	0.51
	rose pasteurized juice	4.7	< 0.01	< 0.01	4.7	0.77	0.77
	rose yeast deposit	72	< 0.01	< 0.01	72	12	12
	rosé wine (matured 5 months)	< 0.01	< 0.01	< 0.01	< 0.036	< 0.002	< 0.006
	red wine fresh stalks	20	< 0.01	0.020	20	3.3	3.3
	red wine fresh crush	14	< 0.01	< 0.01	14	2.3	2.3
	red wine must	4.2	< 0.01	< 0.01	4.2	0.69	0.69
	red wine wet pomace	31	< 0.01	< 0.01	31	5.1	5.1
	red wine must deposit	5.6	< 0.01	< 0.01	5.6	0.92	0.92
	red wine raw juice	3.5	< 0.01	< 0.01	3.5	0.57	0.58
	red wine pasteurized juice	3.9	< 0.01	< 0.01	3.9	0.64	0.64

Location, year, (variety), dose rate, interval, DAT	Grape commodities	parent mg/kg	M650F03 mg/kg	M650F04 mg/kg	Total residue mg/kg (a)	PF parent	PF total
	red wine yeast deposit	27	< 0.01	< 0.01	27	4.4	4.4
	red wine (matured 5 months))	0.12	< 0.01	< 0.01	0.15	0.020	0.024
	raisins	38	< 0.01	< 0.01	38	6.2	6.2
	raisin stalks	87	< 0.01	0.018	87	14	14
Trial 3, L070910, Höhnstedt, Saxony-Anhalt, Germany, 2007, (Portugieser), application rate 1.1–1.1–1.1– 1.1 kg ai/ha, interval 10–9–10 days, harvest DAT 20	grapes (RAC)	4.8	< 0.01	< 0.01	4.8		
	rose must	1.9	< 0.01	< 0.01	1.9	0.40	0.40
	rose wet pomace	13	< 0.01	< 0.01	13	2.7	2.7
	rose must deposit	32	< 0.01	< 0.01	32	6.7	6.6
	rose raw juice	2.9	< 0.01	< 0.01	2.9	0.60	0.61
	rose pasteurized juice	0.61	< 0.01	< 0.01	0.64	0.13	0.13
	rose yeast deposit	7.2	< 0.01	< 0.01	7.2	1.5	1.5
	rosé wine (matured 5 months)	0.043	< 0.01	< 0.01	0.069	0.009	0.014
	red wine fresh stalks	12	< 0.01	< 0.01	12	2.5	2.5
	red wine fresh crush	6.4	< 0.01	< 0.01	6.4	1.3	1.3
	red wine must	0.17	< 0.01	< 0.01	0.20	0.035	0.041
	red wine wet pomace	23	< 0.01	< 0.01	23	4.8	4.8
	red wine must deposit	3.9	< 0.01	< 0.01	3.9	0.81	0.81
	red wine raw juice	2.0	< 0.01	< 0.01	2.0	0.42	0.42
	red wine pasteurized juice	0.89	< 0.01	< 0.01	0.92	0.19	0.19
	red wine yeast deposit	0.43	< 0.01	< 0.01	0.46	0.090	0.094
	red wine (matured 5 months))	0.13	< 0.01	< 0.01	0.16	0.027	0.032
	raisins	23	< 0.01	< 0.01	23	4.8	4.8
	raisin stalks	48	< 0.01	< 0.01	48	10	10
Trial 4, L070911 Radebeul, Saxony, Germany, 2007, (Palas) dose rate 1.1–1.1–1.1– 1.1 kg ai/ha, interval 10–10–10 days, harvest DAT 20	grapes (RAC)	8.5	< 0.01	< 0.01	8.5		
	rose must	8.0	< 0.01	< 0.01	8.0	0.94	0.94
	rose wet pomace	15	< 0.01	< 0.01	15	1.8	1.8
	rose must deposit	44	< 0.01	< 0.01	44	5.2	5.2
	rose raw juice	1.2	< 0.01	< 0.01	1.2	0.14	0.14
	rose pasteurized juice	0.87	< 0.01	< 0.01	0.90	0.10	0.11
	rose yeast deposit	15	< 0.01	< 0.01	15	1.8	1.8
	rosé wine (matured 5 months)	0.055	< 0.01	< 0.01	0.081	0.006	0.009
	red wine fresh stalks	8.7	< 0.01	< 0.01	8.7	1.0	1.0
	red wine fresh crush	11	< 0.01	< 0.01	11	1.3	1.3
	red wine must	0.67	< 0.01	< 0.01	0.70	0.079	0.082
	red wine wet pomace	36	< 0.01	< 0.01	36	4.2	4.2
	red wine must deposit	5.1	< 0.01	< 0.01	5.1	0.60	0.60
	red wine raw juice	2.6	< 0.01	< 0.01	2.6	0.31	0.31
	red wine pasteurized juice	3.8	< 0.01	0.044	3.9	0.45	0.45
	red wine yeast deposit	15	< 0.01	< 0.01	15	1.8	1.8
	red wine (matured 5 months))	0.27	< 0.01	< 0.01	0.30	0.032	0.035
	raisins	17	< 0.01	< 0.01	17	2.0	2.0
	raisin stalks	32	< 0.01	< 0.01	32	3.8	3.8

[a] Total = sum of parent + 1.2449xM650F03 + 1.3292xM650F04 (i.e., expressed as parent).

Where residues of M650F03 and M650F04 were < 0.01 mg/kg, these were calculated as being at 0.01 mg/kg (expressed as metabolite) and then multiplied by the molecular weight conversion factor (1.2449 or 1.3292).

PF= processing factor

Study 3

Four field trials with bulb onions were conducted in Germany in 2009, at a treatment regime of two foliar spray applications using a plot sprayer and a tank mix containing SC formulations of 300 g/L ametoctradin and 225 g/L dimethomorph [Harant, 2010b, 2010/1093126]. Further details can be

found in the German trials from Table 49. Applications were performed at exaggerated nominal rates of 0.72 kg ai/ha each. Bulb onions, harvested from the field trial were processed to peeled onions, peels, and dried onions by simulating industrial processes. The specimens for processing were stored for 1–2 days at room temperature until the processing start.

Dried onions processing

Bulb onions (4.56 kg) were manually washed for 3 min with cold tap water in a vessel (ratio water:fruit = 1:1). First the green leaves were cut off. Subsequently the onions were peeled using a knife resulting in peel (0.55 kg) and peeled onions (4.09 kg). The peeled onions were cut in thin slices and dried in an oven according to the following programme: drying for 20 min at 90 ºC, cooling down for 20 min to 60 ºC, drying for 430 min at 60 ºC, cooling down for 20 min to 50 ºC, drying at 50 ºC until a dry weight of 4–6% is reached for dried onions (0.67 kg, corrected for subsampling). The drying factor peeled onions/dried onions is 4.09/0.67 = 6.1.

Bulb onions and processed fractions of 0.51–1.2 kg whole onions or peeled onions and 0.14–0.28 kg dried onions or peels were stored at –18 °C for a maximum of 174–210 days until analysis. Samples were analysed for parent alone using HPLC-MS-MS method, Method L0117/01. Results were not corrected for control levels (< 0.01 mg/kg parent for each matrix) nor for individual concurrent method recoveries at 0.01–1.0 mg/kg for parent (70–96% for each matrix).

Residue results and processing factors are shown in Table 72. Parent residues in onions at 7 DAT ranged between 0.011 and 0.48 mg/kg. Metabolite M650F03 and M650F04 were not quantified. The parent processing factors > 1 for onion peel indicate that the residues of ametoctradin are located on the surface of the onion bulbs. The parent processing factors were < 1 for dried and peeled onions, indicating that ametoctradin residues do not accumulate in any of the processed fractions destined for human consumption.

Table 72 Residues and processing factors in onion and processed onion products

Location, year, variety, dose rate, interval, DAT	Onion commodities	parent mg/kg	M650F03 mg/kg	M650F04 mg/kg	Total residue mg/kg	PF parent	PF total
Trial 1: L090306, Althen, Saxony, Germany, 2009, (Stuttgarter Riesen), dose rate 0.76–0.77 kg ai/ha, interval 7 days, DAT 7	Onion bulb (RAC)	0.48 [a]	na	na	na		
	Dried onions	0.031	na	na	na	0.065	na
	Peeled onions	0.011	na	na	na	0.023	na
	Peel	2.7	na	na	na	5.6	na
Trial 2: L090307, Nienburg, Saxony-Anhalt, Germany, 2009, (Stuttgarter Riesen), dose rate 0.73–0.75 kg ai/ha, interval 7 days, DAT 7	Onion bulb (RAC)	0.068 [a]	na	na	na		
	Dried onions	0.010	na	na	na	0.15	na
	Peeled onions	< 0.01	na	na	na	< 0.15	na
	Peel	0.99	na	na	na	15	na
Trial 3: L090308, Motterwitz, Saxony, Germany, 2009, (Stuttgarter Riesen), dose rate 0.73–0.76 kg ai/ha, interval 7 day, DAT 6	Onion bulb (RAC)	0.12 [a]	na	na	na		
	Dried onions	0.019	na	na	na	0.16	na
	Peeled onions	< 0.01	na	na	na	< 0.08	na
	Peel	1.2	na	na	na	10	na
Trial 4: L090309, Oderberg, Brandenburg, Germany, 2009, (Stuttgarter Riesen), dose rate 0.73–0.70 kg ai/ha, interval 7 days, DAT 8	Onion bulb (RAC)	0.011 [a]	na	na	na		
	Dried onions	< 0.01	na	na	na	< 0.9	na
	Peeled onions	< 0.01	na	na	na	< 0.9	na
	Peel	0.44	na	na	na	40	na

na = not analysed

[a] Results may differ from Table 49 because samples for processing were taken as a separate subsample and were analysed separately.

Study 4

Four field trials with gherkins were conducted in Germany in 2007 at a treatment regime of three foliar spray applications using a plot sprayer with boom and a mixed SC formulation containing 300 g/L ametoctradin and 225 g/L dimethomorph [Braun, 2008d, 2008/1022148]. Further details can be found in the German trials from Table 55. Applications were performed at exaggerated nominal rates of 0.72 kg ai/ha. Gherkins harvested from the field trial at 1 DAT were processed to pickled gherkins by simulating industrial processes. The specimens for processing were stored for 1 day at 5–8 ºC until the processing start.

Pickled gherkin processing

Fruits (9.71 kg) were manually washed in tap water for 3 minutes (ratio water:fruit = 1:1). The washed fruits (9.85 kg) were put in tins. Water (1 L/kg fruit), vinegar (0.4 L/kg fruit), salt (0.1 kg/kg fruit) and sugar (0.2 kg/kg fruit) were heated until cooking (30 seconds) and then added to the tins until 2 cm to the brim. The tins were closed and the content was pasteurised 1–20 min at 90–95 ºC, resulting in pickled gherkins (8.4 kg corrected for subsampling) and vegetable stock (i.e., the broth where the gherkins were preserved in, 18 kg, corrected for subsampling).

Gherkins and processed fractions of 1.0–2.6 kg were stored at –18 °C for a maximum of 340 days, prior to extraction. Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, draft version June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte and matrix) nor for individual concurrent method recoveries at 0.01–2.0 mg/kg for parent and 0.01–0.1 mg/kg for metabolites (70–103% for each analyte and matrix).

Residue results and processing factors are shown in Table 73. At DAT1 total residues ranged between 0.098 and 0.81 mg/kg. Fruit washing and pickle production result in a reduced level of total residues compared to the RAC. The results show that the residues do not accumulate in any of the gherkin processed fractions.

Table 73 Residues and processing factors in gherkins and processed gherkin products

Location, year, (variety), dose rate, interval, DAT	Gherkin commodities	parent mg/kg	M650F03 mg/kg	M650F04 mg/kg	Total residue mg/kg [a]	PF parent	PF total
Trial 1: L070841, Motterwitz, Saxony, Germany, 2007 (Nadine) dose rate 0.72–0.68–0.71 kg ai/ha, interval 6–8 days, DAT 1	gherkin (RAC)	0.091	< 0.01	< 0.01	0.12		
	washed gherkin	0.044	< 0.01	< 0.01	0.070	0.48	0.60
	pickled gherkin	0.051	< 0.01	< 0.01	0.077	0.56	0.66
	vegetable stock	0.023	< 0.01	< 0.01	0.049	–	–
Trial 2: L070842, Nienburg, Saxony-Anhalt, Germany, 2007 (Nadine) dose rate 0.67–0.72–0.70 kg ai/ha, interval 7–7 days, DAT 1	gherkin (RAC)	0.78	< 0.01	< 0.01	0.81		
	washed gherkin	0.10	< 0.01	< 0.01	0.13	0.13	0.16
	pickled gherkin	0.22	< 0.01	< 0.01	0.25	0.28	0.30
	vegetable stock	0.062	< 0.01	< 0.01	0.088	–	–
Trial 3: L070843, Klein Radden, Brandenburg, Germany, 2007	gherkin (RAC)	0.072	< 0.01	< 0.01	0.098		
	washed gherkin	0.071	< 0.01	< 0.01	0.097	0.99	0.99
	pickled gherkin	0.056	< 0.01	< 0.01	0.082	0.78	0.84

Location, year, (variety), dose rate, interval, DAT	Gherkin commodities	parent mg/kg	M650F03 mg/kg	M650F04 mg/kg	Total residue mg/kg [a]	PF parent	PF total
(Pasalimo) dose rate 0.69–0.67–0.67 kg ai/ha, interval 7–7 days, DAT 1	vegetable stock	0.022	< 0.01	< 0.01	0.048	–	–
Trial 4: L070844, Alitzheim, Bavaria, Germany, 2007 (Samona) dose rate 0.77–0.78–0.76 kg ai/ha, interval 7–7 days, DAT 1	gherkin (RAC)	0.24	0.012	< 0.01	0.27		
	washed gherkin	0.19	< 0.01	< 0.01	0.22	0.79	0.80
	pickled gherkin	0.14	< 0.01	< 0.01	0.17	0.58	0.62
	vegetable stock	0.039	< 0.01	< 0.01	0.065	–	–

[a] Total = Sum of parent + 1.2449× M650F03 + 1.3292× M650F04 (i.e., expressed as parent).

Where residues of M650F03 and M650F04 were < 0.01 mg/kg, these were calculated as being at 0.01 mg/kg (expressed as metabolite) and then multiplied by the molecular weight conversion factor (1.2449 or 1.3292).

PF= processing factor

Study 5

Four field trials with tomatoes were conducted in Germany in 2007, at a treatment regime of three foliar spray applications using a plot sprayer with boom and an SC 200 g ai/L formulation [Braun, 2008b, 2008/1022150]. Further details can be found in the German trials from Table 62. Applications were performed at exaggerated nominal rates of 0.900 kg ai/ha each. Tomatoes, harvested from the field trial at 1 DAT, were processed to canned tomatoes, tomato juice, tomato ketchup, and tomato paste by simulating industrial processes. The specimens for processing were stored for 1–4 days at 5–8 ºC until the processing start.

Canned tomatoes

Fruits (3.69 kg) were manually washed in tap water for 3 minutes (ratio fruit:water = 1:1) resulting in washed raw tomatoes (3.71 kg). Washed tomatoes were blanched for 1 min at 75–85 ºC and tomatoes were peeled manually, resulting in blanched peels (0.34 kg) and peeled raw tomatoes (3.19 kg). The peeled tomatoes were put in a tin. The tins were filled up just under the brim with tap water and were closed. The sterilisation was done in an autoclave for 5–20 min at 118–125 ºC. The tins were cooled, resulting in canned tomatoes (2.45 kg corrected for subsampling).

Tomato juice

Fruits (14.50 kg) were manually washed in tap water for 3 minutes (ratio fruit:water = 1:1) resulting in washed raw tomatoes (14.76 kg). Washed tomatoes were crushed to tomato mash and the tomato mash was heated for 30 min at 80–87 ºC. The heated mash was pressed and sieved resulting in raw juice (10.17 kg) and wet pomace (2.23 kg).The raw tomato juice was divided into two subsamples for ketchup and puree processing.

Tomato ketchup

Raw tomato juice (4.49 kg) was concentrated by using a concentration plant (vacuum, 50 ºC) until a dry matter content of 7–14% was achieved. Then vinegar (0.4% w/w), salt (15% w/w) and sugar (42% w/w) were added and pasteurisation was conducted for 1–20 min at 90–95 ºC. The mass was cooled down, resulting in 1.11 kg tomato ketchup.

Tomato paste

Raw tomato juice (4.93 kg) was concentrated by using a concentration plant (vacuum, 50 ºC) until a dry matter content of 18–24% was achieved. The raw paste was pasteurized for 1–20 min at 90–95 ºC. The mass was cooled down, resulting in 1.16 kg tomato paste.

Tomatoes and processed fractions of 2.0–2.3 kg fruits, 0.84–1.2 kg washed tomatoes, canned tomatoes, wet pomace, ketchup, puree, 0.52–0.67 kg peeled tomatoes, raw juice, 0.13–0.22 kg peels were stored at –18 °C for a maximum of 261–323 days, prior to extraction. Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, draft version June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte and matrix) nor for average concurrent method recoveries at 0.01–20 mg ai/kg parent or 0.01–0.1 mg/kg metabolites (70–116% for each analyte and matrix, except 68–105% for ametoctradin in whole tomatoes, and 60–105% for M650F04 in whole tomatoes).

Residue results and processing factors are shown in Table 74. At DAT1 total residues ranged between 1.0 and 2.2 mg/kg eq. The processing factor of peel > 1 indicates that residues are mainly located on the peel. This also explains the processing factor > 1 for wet pomace which mainly consist of tomato peels. A concentration of residues in portions destined for human consumption does not take place during tomato processing.

Table 74 Residues and processing factors in tomatoes and tomato processed products

Location, year, (variety), dose rate, interval, DAT	Tomato commodities	parent mg/kg	M650F03 mg/kg	M650F04 mg/kg	Total residue mg/kg (a)	PF parent	PF total
Trial 1: L070894, Cunnersdorf, Saxony, Germany, 2007 (Inkas F1) dose rate 0.91–0.90–0.97 kg ai/ha, interval 7–6 days, 1DAT	Fruit (RAC)	2.2	< 0.01	< 0.01	2.2		
	Canned tomatoes without peel	0.012	< 0.01	< 0.01	0.038	0.005	0.017
	Ketchup	0.53	< 0.01	< 0.01	0.56	0.24	0.25
	Peeled raw tomatoes	0.017	< 0.01	< 0.01	0.043	0.008	0.019
	Paste (18–24% DM)	0.98	< 0.01	< 0.01	1.0	0.44	0.45
	Raw juice	0.26	< 0.01	< 0.01	0.29	0.12	0.13
	Blanched peels	5.5	< 0.01	< 0.01	5.5	2.5	2.5
	Washed raw tomatoes	0.29	< 0.01	< 0.01	0.32	0.13	0.14
	Wet pomace	3.1	< 0.01	< 0.01	3.1	1.4	1.4
Trial 2: L070895, Nienburg, Saxony-Anhalt, Germany, 2007 (Rendita) dose rate 0.93–0.91–0.91 kg ai/ha, interval 7–7 days, 1DAT	Fruit (RAC)	1.0	< 0.01	< 0.01	1.0		
	Canned tomatoes without peel	0.022	< 0.01	< 0.01	0.048	0.022	0.047
	Ketchup	0.27	< 0.01	< 0.01	0.30	0.27	0.29
	Peeled raw tomatoes	0.014	< 0.01	< 0.01	0.040	0.014	0.039
	Paste (18–24% DM)	0.74	< 0.01	< 0.01	0.77	0.74	0.75
	Raw juice	0.14	< 0.01	< 0.01	0.17	0.14	0.16
	Blanched peels	1.5	< 0.01	< 0.01	1.5	1.5	1.5
	Washed raw tomatoes	0.079	< 0.01	< 0.01	0.10	0.079	0.10
	Wet pomace	1.1	< 0.01	< 0.01	1.13	1.1	1.1
Trial 3: L070896, Motterwitz, Saxony, Germany, 2007 (Rendita) dose rate 0.86–1.0–0.97 kg ai/ha, interval 7–6 days, 1DAT	Fruit (RAC)	2.1	< 0.01	< 0.01	2.1		
	Canned tomatoes without peel	0.015	< 0.01	< 0.01	0.041	0.007	0.019
	Ketchup	1.3	< 0.01	< 0.01	1.3	0.62	0.62
	Peeled raw tomatoes	0.033	< 0.01	< 0.01	0.059	0.016	0.028
	Paste (18–24% DM)	2.4	< 0.01	< 0.01	2.4	1.1	1.1
	Raw juice	0.7	< 0.01	< 0.01	0.73	0.33	0.34
	Blanched peels	15	< 0.01	< 0.01	15	7.1	7.1
	Washed raw tomatoes	0.94	< 0.01	< 0.01	0.97	0.45	0.45
	Wet pomace	2.9	< 0.01	< 0.01	2.9	1.4	1.4
Trial 4: L070897 Blankenhagen, Mecklenburg, Germany, 2007 (Rendita) dose rate 0.90–0.97–	Fruit (RAC)	1.0	< 0.01	< 0.01	1.0		
	Canned tomatoes without peel	0.032	< 0.01	< 0.01	0.058	0.032	0.056
	Ketchup	0.5	< 0.01	< 0.01	0.53	0.50	0.51
	Peeled raw tomatoes	0.040	< 0.01	< 0.01	0.066	0.040	0.064
	Paste (18–24% DM)	1	< 0.01	< 0.01	1.0	1.0	1.0

Location, year, (variety), dose rate, interval, DAT	Tomato commodities	parent mg/kg	M650F03 mg/kg	M650F04 mg/kg	Total residue mg/kg (a)	PF parent	PF total
0.92 kg ai/ha, interval 7–7 days, 1DAT	Raw juice	0.21	< 0.01	< 0.01	0.24	0.21	0.23
	Blanched peels	12	< 0.01	< 0.01	12	12	12
	Washed raw tomatoes	0.33	< 0.01	< 0.01	0.36	0.33	0.35
	Wet pomace	1.2	< 0.01	< 0.01	1.2	1.2	1.2

[a] Total = Sum of parent + 1.2449× M650F03 + 1.3292× M650F04 (i.e., expressed as parent).

Where residues of M650F03 and M650F04 were < 0.01 mg/kg, these were calculated as being at 0.01 mg/kg (expressed as metabolite) and then multiplied by the molecular weight conversion factor (1.2449 or 1.3292).

PF= processing factor

Study 6

Four field trials with potatoes were conducted in Germany in 2007 at a treatment regime of six foliar spray applications using a mobile plot sprayer with boom and an SC 200 g ai/L formulation [Braun, 2008a, 2008/1022149]. Further details can be found in Table 67. Applications were performed at exaggerated nominal rates of 0.72 kg ai/ha each. Potatoes, harvested from the field trial were processed to chips, flakes, microwave-boiled potatoes, deep-fried potatoes and cooked potatoes by simulating household and industrial processes. The specimens for processing were stored for 1–15 days at 5–8 ºC until the processing start.

Washing

Tubers (9.14 kg) were manually washed for 3 min with cold tap water in a vessel (ratio water to tuber 1:1), resulting in 8.92 kg washed potatoes. Washed potatoes were divided in two fractions for further processing: 1.13 kg for microwave boiling and 7.79 kg for peeling.

Microwave boiled potatoes

The washed tubers (1.13 kg) were put in a microwave glass container with water (100 mL/kg tubers). Tubers were microwave steamed for 11 min at 800 W. After steaming the potatoes stayed in the glass container for 2 min, resulting in 1.06 kg microwave boiled potatoes (with peel).

Peeling

The washed tubers (7.79 kg) were peeled manually resulting in 2.12 kg peels and 5.59 kg peeled potatoes. The peeled potatoes were divided in three fractions for further processing: 1.25 kg for cooking, 1.62 kg for deep frying and 1.62 kg for crisp production.

Cooked potatoes

The peeled potatoes (1.25 kg) were completely covered with water in a saucepan. Tubers were cooked for 20 min depending on the size of the tubers, resulting in 1.24 kg cooked potatoes (without peel).

Deep-fried potatoes (chips)

The peeled potatoes (1.62 kg) were cut in potato sticks (8 mm grid). The sticks were blanched for 3 min at 60–82 ºC. After blanching the potato sticks were deep fried in a deep fat fryer with pure vegetable fat (2.0 kg/kg potatoes) up to a golden brown colour at 175 ºC. This resulted in 0.80 kg deep fried potatoes (i.e., chips, French fries, without peel).

Crisps

The peeled potatoes (1.62 kg) were sliced in 1 mm potato discs. The potato discs were deep fried in a deep fat fryer with pure vegetable fat at 175 ºC. This resulted in 0.66 kg crisps (without peel).

Flakes

Tubers (26.10 kg) were manually washed for 3 min with cold tap water in a vessel (ratio water to tuber 1:1). The tubers were peeled using an industrial sheller for 3 min. The peeled potatoes were sliced by a slicing machine (10 mm disc). The sliced potatoes were washed with water at ambient temperature. The potato slices were blanched for 20 min at 75 ºC, cooled down in water for 15 min at 15 ºC, and steamed for 15 min at 100 ºC. This cooked intermediate was strained through a 10 mm sieve. The pulp was placed on a roller dryer for 25 sec at 142 ºC and subsequently crushed with a hammer resulting in 1.10 kg potato flakes.

Potatoes and processed fractions of 2.2–4.4 kg tubers, 1.0–1.4 kg flakes, microwave boiled potatoes, cooked potatoes, peeled potatoes, 0.51–0.80 kg crisps, deep fried potatoes, 0.23–0.38 kg peels, and were stored at –18 °C for a maximum of 274–297 days, prior to extraction. Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078, draft version June 2007 = L0078/01. Results were not corrected for control levels (< 0.01 mg/kg for each analyte and matrix) nor for average concurrent method recoveries at 0.01–0.1 mg/kg (70–109% for each analyte and matrix, except 69–72% for ametoctradin in peeled potatoes).

Residue results and processing factors are shown in Table 75. At DAT 7 total residues ranged between < 0.036 and 0.061 mg/kg eq. The processing factor of raw peel > 1 indicates that residues are mainly located on the peel. This also explains the processing factor (> 1) for microwave boiled potatoes because this fraction was prepared from unpeeled potatoes. A concentration of residues in portions destined for human consumption does not take place during potato processing.

Table 75 Residues and processing factors in potatoes and potato processed commodities

Location, year, (variety), dose rate, interval, DAT	Potato commodities	parent mg/kg	M650F03 mg/kg	M650F04 mg/kg	Total residue mg/kg [a]	PF parent	PF total
Trial 1: L070898, Motterwitz, Saxony, Germany, 2007, (Licara) dose rate 0.76–0.69–0.68–0.76–0.68–0.71 kg ai/ha, interval 5–5–4–5–3 days, 6DAT	Tuber (RAC)	< 0.01	0.030	< 0.01	0.061		
	Crisps	< 0.01	0.020	< 0.01	0.048	–	0.79
	Flakes	< 0.01	0.028	< 0.01	0.058	–	0.96
	Microwave-boiled potatoes with peel	< 0.01	0.050	0.010	0.086	–	1.4
	Raw peel	< 0.01	0.045	< 0.01	0.079	–	1.3
	Peeled raw potato	< 0.01	0.020	< 0.01	0.048	–	0.79
	Deep-fried potato (chips)	< 0.01	0.012	< 0.01	0.038	–	0.63
	Cooked potato without peel	< 0.01	0.013	< 0.01	0.039	–	0.65
Trial 2: L070899, Gerbitz, Saxony-Anhalt, Germany, 2007, (Melody) dose rate 0.75–0.75–0.73–0.73–0.70–0.74 kg ai/ha, interval 5–5–5–5–5 days 7DAT	Tuber (RAC)	< 0.01	< 0.01	< 0.01	< 0.036		
	Crips	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Flakes	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Microwave-boiled potatoes with peel	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Raw peel	< 0.01	0.013	< 0.01	0.039	–	–
	Peeled raw potato	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Deep-fried potato (chips)	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Cooked potato without peel	< 0.01	< 0.01	< 0.01	< 0.036	–	–
Trial 3: L070900, Kitzscher, Saxony, Germany, 2007, (Agria) dose rate 0.72–0.69–0.71–0.70–0.74–0.72 kg ai/ha, interval 5–4–5–7–4 days 7DAT	Tuber (RAC)	< 0.01	< 0.01	< 0.01	< 0.036		
	Crisps	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Flakes	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Microwave-boiled potatoes with peel	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Raw peel	< 0.01	0.010	< 0.01	0.036	–	–
	Peeled raw potato	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Deep-fried potato (chips)	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Cooked potato without peel	< 0.01	< 0.01	< 0.01	< 0.036	–	–
Trial 4: L070901 Blankenhagen, Mecklenburg, Germany, 2007, (Kalena) dose rate 0.70–0.73–0.74–	Tuber (RAC)	< 0.01	< 0.01	< 0.01	< 0.036		
	Crisps	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Flakes	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Microwave-boiled potatoes with peel	< 0.01	0.010	< 0.01	0.036	–	–
	Raw peel	< 0.01	0.033	< 0.01	0.064	–	–

Location, year, (variety), dose rate, interval, DAT	Potato commodities	parent mg/kg	M650F03 mg/kg	M650F04 mg/kg	Total residue mg/kg [a]	PF parent	PF total
0.78–0.75–0.73 kg ai/ha, interval 5–5–5–6–4 days, 7DAT	Peeled raw potato	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Deep-fried potato (chips)	< 0.01	< 0.01	< 0.01	< 0.036	–	–
	Cooked potato without peel	< 0.01	< 0.01	< 0.01	< 0.036	–	–

[a] Total Sum of parent + 1.2449× M650F03 + 1.3292× M650F04 (i.e., expressed as parent).

Where residues of M650F03 and M650F04 were < 0.01 mg/kg, these were calculated as being at 0.01 mg/kg (expressed as metabolite) and then multiplied by the molecular weight conversion factor (1.2449 or 1.3292).

PF= processing factor

Study 7

Three field trials with hops were conducted in Germany in 2008 at a treatment regime of three foliar spray applications using a mist blower and a mixed SC formulation containing 300 g/L ametoctradin and 225 g/L dimethomorph [Braun, 2011, 2011/1101445]. Further details can be found in the 2008 German trials in Table 69. Applications were performed at exaggerated nominal rates of 0.20–0.81 kg ai/ha. Green hops, harvested from the field trial at 10 DAT, were kiln dried for 7.5 hrs at 58 ºC in a dry chamber. Dried hop cones were processed to beer. Beer can be brewed using two different methods, one with dried hops and one with concentrated hop extract. The specimens for processing were stored for 48–52 days at 5–8 ºC until the processing start.

Processing to beer using dried hops

The brewing process consists of mashing, lautering, hop addition, wort cooking, fermentation and maturation. For mashing, the malt grain (10 kg) was dry milled in a special malt mill. The crushed malt was mixed with brew water at 48 ºC and a cycle of resting and heating was conducted: 5 min resting at 46 ºC, 5–10 min heating at 55 ºC, 15 min resting at 55 °C, 10 min heating at 62 ºC, 30 min resting at 62 °C, 20 min heating at 72 ºC, 20 min resting at 72 °C and 5 min heating at 76 ºC. For lautering the sweet wort was separated from the insoluble malt components (spent grains). The spent grains were than washed with hot water (first filter runnings) and the water extract was collected and mixed with the sweet wort. For hop addition, dried hops were milled with an impact cross mill and were added to the sweet wort (0.27–0.28 kg dried hops in 73–75 L sweet wort). For wort cooking & conditioning, the wort was boiled for 90 min at normal pressure. After boiling the flocs were separated in a whirlpool causing the sludge to deposit on the bottom (hops draff, 3.7 kg). For fermentation, an intra-plant circulation was used for adding oxygen, ventilating and cooling the wort to 7.5–9.0 °C. Then yeast was added to the wort and left to ferment for approximately 10 days. During the main fermentation the yeast deposited on the tank bottom and was sampled as Brewer's yeast (0.85 kg). For maturation, the young beer was stored at room temperature in casks for approximately 2 days. Then the young beer was stored for 3–4 weeks under pressure (0.8–1.2 bar) at 0–2 ºC. During the storing process sludge particles were separated and the final product beer (48 kg) was sampled.

Processing to concentrated hop extracts

Dried hops (0.30 kg) were dissolved with EtOH (1.35 kg) using a Soxhlet extractor for 3–4 hours. The intermediates were spent hops and miscella. The miscella was filtered and concentrated twice using a vacuum evaporator (> 50 °C, 0.5–1.0 bar). The resulting hop extract (0.049 kg) was cooled down until room temperature and was sampled. Further processing into beer was not conducted.

Dried hop cones (0.2 kg) and processed fractions of beer (1.2 kg), brewer's yeast (0.15 kg), hop extract (0.04–0.06 kg) and hops draff (0.55 kg) were stored at –18 °C for 209–311 days, prior to extraction. Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01. Results were not corrected for control levels (< 0.1 mg/kg for dried hops, < 0.01 mg/kg for all other commodities) nor for average concurrent method recoveries at 0.1–10 mg/kg for dried hops and 0.01–1.0 mg/kg for processed commodities (70–118% for each analyte and matrix, except 65% for hop extract at 0.01 mg/kg parent).

Residue results and processing factors are shown in Table 76. At DAT 10 parent ranged between 14.0–33.0 mg/kg in dried cone samples. No residues of M650F03 and M650F04 were found in any of the treated samples (< 0.01 mg/kg).

Parent residue processing factors, calculated from dried cones to beer, brewer's yeast, hop extract and hops draff, were < 1, indicating that residues did not concentrate in these processed fractions. In beer, the only relevant commodity for human consumption, parent was below LOQ (< 0.01 mg/kg).

Table 76 Residues and processing factors in hops and processed hop products

Location, year, (variety), dose rate, interval, DAT	Hop commodities	parent mg/kg	M650F03 mg/kg	M650F04 mg/kg	Total residue mg/kg [a]	PF parent	PF total
Trial 1: L080354, Hohenebra, Thuringia, Germany, 2008 (Nordisher Brauer) dose rate 0.19–0.85–0.86 kg ai/ha, interval 8–7 days, DAT11	Dried cones (RAC)	23 [b]	< 0.01	< 0.01	23		
	Beer	< 0.01	< 0.01	< 0.01	< 0.036	0.0004	0.0016
	Brewer´s yeast	0.24	< 0.01	< 0.01	0.27	0.010	0.012
	Concentrated hop extract	7.9	< 0.01	< 0.01	7.9	0.34	0.34
	Hops draff	6.1	< 0.01	< 0.01	6.1	0.27	0.27
Trial 2: L080355, Golzern, Saxony, Germany, 2008, (Nugget) dose rate 0.18–0.88–0.86 kg ai/ha, interval 7–8 days, DAT 9	Dried cones (RAC)	22 [b]	< 0.01	< 0.01	22		
	Beer	< 0.01	< 0.01	< 0.01	< 0.036	0.0005	0.0016
	Brewer´s yeast	0.40	< 0.01	< 0.01	0.43	0.018	0.019
	Concentrated hop extract	4.8	< 0.01	< 0.01	4.8	0.22	0.22
	Hops draff	4.1	< 0.01	< 0.01	4.1	0.19	0.19
Trial 3: L080356, Baalberge, Saxony-Anhalt, Germany, 2008 (Magnum) dose rate 0.21–0.74–0.89 kg ai/ha, interval 8–8 days, DAT 11	Dried cones (RAC)	14 [b]	< 0.01	< 0.01	14		
	Beer	< 0.01	< 0.01	< 0.01	< 0.036	0.0007	0.0025
	Brewer´s yeast	0.38	< 0.01	< 0.01	0.41	0.027	0.029
	Concentrated hop extract	7.4	< 0.01	< 0.01	7.4	0.53	0.53
	Hops draff	4.6	< 0.01	< 0.01	4.6	0.33	0.33

[a] Total residue = sum of parent + 1.2449× M650F03 + 1.3292× M650F04 (i.e., expressed as parent).

Where residues of M650F03 and M650F04 were < 0.01 mg/kg, these were calculated as being at 0.01 mg/kg (expressed as metabolite) and then multiplied by the molecular weight conversion factor (1.2449 or 1.3292).

[b] Results may differ from Table 69 because samples for processing were sampled and analysed separately.

PF= processing factor

Processing studies summary

Calculated processing factors for grapes, bulb onions, tomatoes, potatoes and hops are summarized in Table 77.

Table 77 Summary of calculated processing factors

Commodity	Processing factors (parent only)	Processing factor (median or best estimate) (parent only)	Processing factors (total residue)	Processing factor (median or best estimate) (total residue)
grape rose wine	< 0.001, < 0.002, 0.006, 0.009 (n = 4)	0.004	< 0.003, < 0.006, 0.009, 0.014 (n = 4)	0.0075
grape red wine	0.012, 0.020, 0.027, 0.032 (n = 8)	0.0235	0.014, 0.024, 0.032, 0.035 (n = 4)	0.028
grape pasteurised juice	0.10, 0.13, 0.19, 0.27, 0.34, 0.45, 0.64, 0.77 (n	0.305	0.11, 0.13, 0.19, 0.27, 0.34, 0.45, 0.64, 0.77 (n	0.305

Commodity	Processing factors (parent only)	Processing factor (median or best estimate) (parent only)	Processing factors (total residue)	Processing factor (median or best estimate) (total residue)
	= 8)		= 8)	
grape raisin (DM 10–14%)	1.9, 2.0, 4.8, 6.2 (n = 4)	3.4	1.9, 2.0, 6.2, 4.8 (n = 4)	4.1
grape wet pomace	1.8, 2.5, 2.7, 2.9, 3.9, 4.2, 4.8, 5.1 (n = 8)	3.4	1.8, 2.5, 2.7, 2.9, 3.9, 4.2, 4.8, 5.1 (n = 8)	3.4
bulb onions peeled	0.023, < 0.08, < 0.15, < 0.9 (n = 4)	0.023	–	–
bulb onions dried (DM 4–6%)	0.065, 0.15, 0.16, < 0.9 (n = 4)	0.15	–	–
gherkins pickled	0.28, 0.56, 0.58, 0.78 (n = 4)	0.57	0.30, 0.62, 0.66, 0.84 (n = 4)	0.64
tomato raw, without peel	0.008, 0.014, 0.016, 0.040 (n = 4)	0.015	0.019, 0.028, 0.039, 0.064 (n = 4)	0.0335
tomato canned, without peel	0.005, 0.007, 0.022, 0.032 (n = 4)	0.0145	0.017, 0.019, 0.047, 0.056 (n = 4)	0.033
tomato raw juice	0.12, 0.14, 0.21, 0.33 (n = 4)	0.175	0.13, 0.16, 0.23, 0.34 (n = 4)	0.195
tomato ketchup	0.24, 0.27, 0.50, 0.62 (n = 4)	0.385	0.25, 0.29, 0.51, 0.62 (n = 4)	0.40
tomato paste (DM 18–24%)	0.44, 0.74, 1.0, 1.1 (n = 4)	0.87	0.45, 0.75, 1.0, 1.1 (n = 4)	0.875
tomato wet pomace	1.1, 1.2, 1.4, 1.4 (n = 4)	1.3	1.1, 1.2, 1.4, 1.4 (n = 4)	1.3
potato raw, without peel	–	–	0.79 (n = 1)	0.79
potato, raw peels	–	–	1.3 (n = 1)	1.3
potato microwave boiled, with peel	–	–	1.4 (n = 1)	1.4
potato cooked, without peel	–	–	0.65 (n = 1)	0.65
potato deep-fried (chips, French fries), without peel	–	–	0.63 (n = 1)	0.63
potato crisps, without peel	–	–	0.79 (n = 1)	0.79,
potato flakes	–	–	0.96 (n = 1)	0.96
hop beer	0.0004, 0.0005, 0.0007 (n = 3)	0.0005	0.0016, 0.0016, 0.0025 (n = 3)	0.0016
hop concentrated extract	0.22, 0.34, 0.53 (n = 3)	0.34	0.22, 0.34, 0.53 (n = 3)	0.34

Total residue = Sum of parent + 1.2449× M650F03 + 1.3292× M650F04 (i.e., expressed as parent).

Residues in the edible portion of food commodities

The Meeting received information on the residues in the edible portion of head cabbages (heads without wrapper leaves).

Supervised residue trials on head cabbages were conducted in Canada (2008) and the USA (2008). Results for a broadcast spray treatment in the field are shown in Table 78. Residue levels in the trials are for the edible portion (i.e., heads without wrapper leaves). Samples were analysed for parent and two soil metabolites M650F03 and M650F04. Soil metabolites were < 0.01 mg/kg in all trials.

Table 78 Residues of ametoctradin after pre-harvest broadcast spray on head cabbages (heads without wrapper leaves)

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
Wayne, NY, USA, 2008	SC 200 [a] +	3	7–7	0.30 0.30	0.11 0.11	mature heads	0 1	0.12 0.060	0.15 0.086	308610 2009/70062

Location, year, (variety)	Form	No	Interval (days)	kg ai/ha	kg ai/hL	growth stage & date of last treatment	DAT	parent, mg/kg	Total, mg/kg	Study code; Doc ID; Trial no
(Rocket)	adjuvant LI 700			0.30	0.11	14 July	3 7 10	0.025 0.030 0.010	0.051 0.056 0.036	05 RCN R080068 [b]
Tift, GA, USA, 2008 (Early Thunder)	SC 200 [a] + adjuvant Induce	3	5–7	0.30 0.30 0.30	0.11 0.11 0.11	4–8" heads 24 Nov	0 1 3 7 10	0.35 0.40 1.1 0.16 0.16	0.38 0.43 1.2 0.19 0.19	308610 2009/70062 05 RCN R080069 [b, c]
Seminole, FL, USA, 2008 (White)	SC 200 [a] + adjuvant TT DWS 90	3	7–7	0.29 0.30 0.29	0.11 0.11 0.11	mature heads, 21 May	0 1 3 7 10	0.045 0.050 < 0.01 0.015 0.025	0.071 0.076 < 0.036 0.041 0.050	308610 2009/70062 05 RCN R080070 [b, c]
Freeborn, MN, USA, 2008 (Market Pride)	SC 200 [a] + adjuvant Preference	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	vegetative, 4 Aug	0 1 3 7 10	< 0.01 < 0.01 0.030 < 0.01 < 0.01	< 0.036 < 0.036 0.056 < 0.036 < 0.036	308610 2009/70062 05 RCN R080071 [b]
Le-Haut-Richelieu, QC, Canada, 2008 (Stonehead)	SC 200 [a] + adjuvant Agral 90	3	6–8	0.30 0.29 0.30	0.11 0.11 0.10	BBCH 409, 29 July	0 1 3 7 10	0.57 0.28 0.12 0.085 0.025	0.60 0.30 0.15 0.11 0.051	308610 2009/70062 05 RCN R080072 [b]
Dane, WI USA, 2008 (Artost)	SC 200 [a] + adjuvant Prefer (NIS)	3	8–7	0.29 0.30 0.31	0.11 0.11 0.11	BBCH 48, 26 Aug	0 1 3 7 10	0.10 0.080 0.035 0.065 0.035	0.13 0.11 0.061 0.091 0.061	308610 2009/70062 05 RCN R080073 [b]
Zalava, TX USA, 2008 (Pennant)	SC 200 [a] + adjuvant Kinetic	3	7–7	0.30 0.30 0.30	0.11 0.11 0.11	BBCH 49 15 Sept	0 1 3 7 10	0.090 0.12 0.12 0.050 0.080	0.12 0.15 0.14 0.076 0.11	308610 2009/70062 05 RCN R080074 [b]
Pawnee, KS USA, 2008 (Stonehead)	SC 200 [a] + adjuvant Spreader 90	3	7–7	0.29 0.30 0.31	0.11 0.11 0.11	BBCH 49 3 Nov	0 1 3 7 10	0.67 1.0 0.47 0.59 0.26	0.70 1.0 0.50 0.62 0.29	308610 2009/70062 05 RCN R080075 [b, c]
Tehama, CA USA, 2008 (Copenhagen)	SC 200 [a] + adjuvant R-11	3	7–9	0.31 0.31 0.31	0.11 0.11 0.11	mature, 8 June	0 1 3 7 10	0.10 0.090 0.030 0.035 0.060	0.13 0.12 0.056 0.061 0.086	308610 2009/70062 05 RCN R080076 [b]
Benton, OR USA, 2008 (Primo)	SC 200 [a] + adjuvant R-11	3	7–7	0.29 0.29 0.31	0.11 0.11 0.11	BBCH 49, 30 July	0 1 3 7 10	0.095 0.10 0.090 0.065 0.020	0.12 0.13 0.12 0.091 0.046	308610 2009/70062 05 RCN R080077 [b]

Total Sum of parent + 1.2449× M650F03 + 1.3292× M650F04 (i.e., expressed as parent).

Where residues of M650F03 and M650F04 were < 0.01 mg/kg, these were calculated as being at 0.01 mg/kg (expressed as metabolite) and then multiplied by the molecular weight conversion factor (1.2449 or 1.3292).

[a] Besides ametoctradin, the tank mix also contained dimethomorph (SC, 500 g/L).

[b] Results come from two replicate field samples; average result is used for MRL derivation if according to cGAP.

[c] Trials early or late in the growing season (last application in November or May) were field trials following a standard agronomic practice for the growth region In these regions (Tift, GA, Seminole, FL, Pawnee, KS) late fall and early spring planting are common and preferred for cool season crops [BASF, 2012b].

[White, 2010d, 2009/7006205, 308610]

No unusual weather conditions. Plot size 33–372 m2. Ground equipment (tractor mounted, backpack or handheld boom sprayers), spray volume 268–292 L/ha. Two samples per plot of heads with wrapper leaves (> 12 units, kg not stated) were harvested when commercially acceptable. Samples were stored at –5 °C or lower for 302–553 days (collection to extraction). Samples were analysed for parent, M650F03 and M650F04 using HPLC-MS-MS method L0078/01 with slight modifications. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (90–115% for all analytes at 0.01, 1 and 10 mg/kg).

RESIDUES IN ANIMAL COMMODITIES

Direct animal treatments

Not relevant for the present evaluation.

Farm animal feeding studies

The Meeting received information on feeding studies in dairy cows.

Dairy cows

Ametoctradin was administered to 14 lactating Holstein/Friesian cows over a period of 28 days. Group 1, 2 and 3 (0–2.5–7.5 ppm ai, dw feed) consisted of three cows, while group 4 (25 ppm ai, dw feed) consisted of five cows [MacDougall, 2011, 2011/1036848]. Ametoctradin was administered orally via gelatin capsules, once daily. Nominal dose levels are equivalent to 0, 0.0864, 0.218 and 0.862 mg ai/kg bw based on bodyweight at the start of the study and the assumption that a cow consumes 20 kg dw feed/day. Milk was collected twice daily during the dosing period and AM/PM samples were pooled. A skim milk and cream sample was prepared from day 21 milk by centrifugation. Cows were slaughtered within 25 hrs after the last dose. Two cows from the 25 mg ai/kg dw feed group, were used for depuration. These cows were slaughtered 48 hrs (2 days) and 168 hrs (7 days) after the last dose. Muscle, liver, kidney and fat were collected. Samples were stored at approximately –20 °C for a maximum of 5–34 days (milk) or 6–19 days (tissues). Samples of whole milk, skimmed milk, cream and tissues were analysed for parent, M650F01 and M650F06 using HPLC-MS-MS method L0104/01 with slight modifications. Average concurrent recoveries ranged from 69–96% for parent, 83–97% for M650F01 and 82–98% for M650F06 at 0.01 and 0.1 mg/kg in different matrices. Residues in control samples were < 0.01 mg/kg for each analyte.

All animals were in good general health, except cows 1, 2, 3 (group 1, control group), 10 and 14 (group 4, 25 mg/kg dw feed group). These cows suffered from dermatitis, mastitis or hoof problems and were treated with medication. Cow 10 had an infection in the urinary track and was sacrificed on welfare grounds on day 25. None of the health observations were considered to be the result of receiving ametoctradin.

Cows were 2–10 years of age, weighed 420–728 kg at study initiation. Average bodyweights during the dosing period were 649–585–704–601 kg for group 1, 2, 3 and 4 respectively. The average dw feed consumption was 19.3–16.4–19.6–16.6 kg for group 1, 2, 3 and 4 respectively. The actual dose levels of 0, 3.11, 7.83 and 30.3 mg ai/kg dw feed (0–1×–3×–10×) were calculated based on actual feed intake. Actual doses were equivalent to 0, 0.0852–0.0875, 0.202–0.236, and 0.727–1.07 mg/kg bw/d. Average milk yields were 14.8–16.4–16.9–13.7 kg/d for group 1, 2, 3 and 4 respectively. Milk yield for cow 10 (group 4, 25 mg/kg dw feed group) was significantly lower than all other cows in the study. This cow was sacrificed prematurely (day 25) on health grounds.

Parent was not found in milk or any of the tissues (< 0.01 mg/kg). Metabolites M650F01 and M650F06 were only found in liver and kidney samples. Mean and maximum total residues (parent + 1.10× M650F01+ 0.993× M650F06), expressed as parent equivalents, in tissues are shown in Table 79.

Table 79 Group mean (and maximum individual) total ametoctradin residues [a] in cow tissues

Group number (dosage)	Muscle	Liver	Kidney	Fat
1 (0×, control)	N/A	< 0.031 (< 0.031)	N/A	N/A
2 (1×, 2.5 mg ai/kg dw feed)	N/A	< 0.031 (< 0.031)	N/A	N/A
3 (3×, 7.5 mg ai/kg dw feed)	N/A	0.033 (0.036)	< 0.031 (< 0.031)	N/A
4 (10×, 25.0 mg ai/kg dw feed)	< 0.031 (< 0.031)	0.073 (0.096)	0.039 (0.048)	< 0.031 (< 0.031)
4 (10×, 25.0 mg ai/kg dw feed) 2 days withdrawal	N/A	< 0.031 (< 0.031)	< 0.031 (< 0.031)	N/A
4 (10×, 25.0 mg ai/kg dw feed) 7 days withdrawal	N/A	< 0.031 (< 0.031)	< 0.031 (< 0.031)	N/A

Total Sum of parent + 1.10× M650F01+ 0.993× M650F06 (i.e., expressed as parent equivalents)

Where residues of M650F01 and M650F06 were < 0.01 mg/kg, these were calculated as being at 0.01 mg/kg (expressed as metabolite) and then multiplied by the molecular weight conversion factor (1.10 or 0.993).

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

No longer required.

National residue definition

Within the US the compliance with the tolerance levels in plant commodities is to be determined by measuring only ametoctradin [Federal Register / Vol. 77, No. 90 / May 9, 2012]. Commodities of animal origin and rotational crops are not mentioned.

Within the EU, the residue definition for enforcement and risk assessment in plant commodities is parent ametoctradin. EFSA proposes to establish a provisional residue definition for enforcement and risk assessment in animal matrices as ametoctradin, M650F01 and M650F06, expressed as ametoctradin. In rotational crops the main residues are the soil metabolites M650F03 and M650F04. These metabolites have been considered as of no toxicological relevance and therefore are not included in the residue definition for enforcement and risk assessment. Instead EFSA advices member states to define restrictions to avoid residues in rotational crops [EFSA Journal, 2012; 10(6): 2771].

Within Australia, the residue definition for the purposes of dietary exposure assessment and for compliance and monitoring in commodities of plant origin is parent ametoctradin and for commodities of animal origin is the sum of ametoctradin and M650F06. The only authorised use of ametoctradin in Australia is for grapevines, a permanent crop, which should not result in rotational crop concerns [APVMA product number P63651, June 2012].

APPRAISAL

Residue and analytical aspects of ametoctradin were considered for the first time by the present Meeting. The residue evaluation was scheduled for the 2012 JMPR by the Forty-third Session of the CCPR.

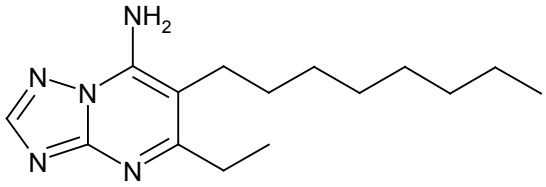
Ametoctradin is a fungicide of the chemical class triazolo-pyrimidylamines. Ametoctradin strongly inhibits zoospore differentiation within the zoosporangium, the release of zoospores from the zoosporangium, the motility of any released zoospores and the germination of encysted zoospores. The inhibition caused by ametoctradin reduces the ATP content in these stages of development by binding to and inhibiting complex III of the respiratory chain in mitochondria of Oomycetes.

The Meeting received information from the manufacturer on identity, metabolism, storage stability, residue analysis, use pattern, residues resulting from supervised trials on grapes, bulb vegetables, Brassica vegetables, fruiting vegetables, leafy vegetables, celery, potatoes and hops, fate of residue during processing, and livestock feeding studies.

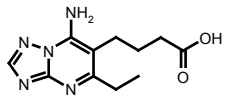
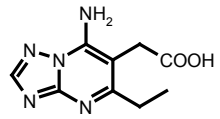
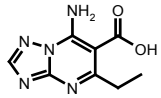
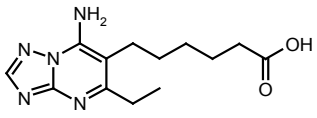
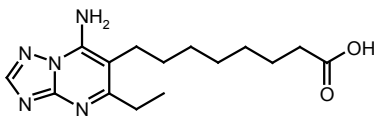
Chemical name:

Ametoctradin or IUPAC: 5-ethyl-6-octyl[1,2,4]triazolo[1,5-a]pyrimidin-7-amine

Structural formula:



Metabolites referred to in the appraisal by codes:

M650F01	4-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)butanoic acid or ω-hetarylbutanoic acid 
M650F03	(7-amino-5-ethyl [1,2,4]triazolo [1,5-a]pyrimidin-6-yl) acetic acid or hetarylacetic acid 
M650F04	7-amino-5-ethyl [1,2,4]triazolo [1,5-a]pyrimidine-6-carboxylic acid or hetarylcarboxylic acid 
M650F06	6-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)hexanoic acid or ω-hetarylhexanoic acid 
M650F09	8-(7-amino-5-ethyl[1,2,4]triazolo[1,5-a]pyrimidin-6-yl)octanoic acid or ω-hetaryloctanoic acid 

Animal metabolism

The Meeting received results of animal metabolism studies in lactating goats and laying hens. Experiments were carried out with [2,7-^{14}C]-ametoctradin.

Metabolism in laboratory animals was summarized and evaluated by the WHO panel of the JMPR in 2012. Oral administration of radiolabelled ametoctradin in rats results in a rapid absorption and high degree of biotransformation, as indicated by low amounts of parent compound found in urine and bile. A considerable part of the applied ametoctradin was excreted unchanged via faeces. In liver, kidneys, plasma and bile, several metabolites of ametoctradin were found, with metabolite M650F06 being the most abundant. The parent compound is metabolised by terminal oxidation of the octyl side chain to the respective carboxylic acid (M650F09) with subsequent degradation of the carboxylic side chain (M650F06 and M650F01). In addition, conjugation of the respective oxidised side chain with taurine and/or glucuronic acid occurs, leading to metabolites M650F10 (taurine conjugate of M650F09), M650F11 (glucuronic acid conjugate of M650F06), and M650F12 (taurine conjugate of M650F06), respectively. Also a minor metabolic step leads to the formation of M650F05 (ω-hetarylpentanoic acid).

Two lactating goats, orally treated once daily for 10 consecutive days with [2,7-^{14}C]-ametoctradin, were sacrificed 23 hours after the last dose. The two goats received an actual dose rate of 13 and 12 ppm dry feed (0.51 and 0.49 mg ai/kg bw, respectively). Total recovered radioactivity amounted to 64% of the administered dose in goat 1 and 88% in goat 2. Radioactivity recovered from urine, faeces and cage wash amounted to 61% of the administered dose in goat 1 (24% in urine; 36% in faeces) and 84% in goat 2 (26% in urine, 58% in faeces). In both animals, radioactivity amounted to 0.15–0.19% of the applied dose in milk and 0.05% in edible tissues and organs.

The total radioactive residues (TRR) in tissues and milk were 0.10 mg/kg eq (liver), 0.036 mg/kg eq (kidney), 0.016 mg/kg eq (fat), 0.010 mg/kg eq (muscle) and 0.028 mg/kg eq (pooled milk). Radioactivity levels in afternoon milk were higher than residue levels in morning milk (just before the next dosing). Radioactivity levels in milk did not reach a clear plateau, although a flattening of the curve started by day 5–8 (0.026–0.048 mg/kg eq).

Methanol and water extracted 98% TRR for milk, 53% TRR for liver, 63% TRR for kidney, 72% TRR for muscle and 82% TRR for fat. The parent compound was not found in any of the goat commodities. In goat milk, liver, kidney and fat, the metabolite M650F06 (ω-hetarylhexanoic acid) was the most abundant component of the residues (22–47% TRR or 0.006–0.021 mg/kg eq), followed by the metabolite M650F01 (ω-hetarylbutanoic acid, 14–26% TRR or 0.003–0.014 mg/kg eq) and the metabolite M650F09 (ω-hetaryloctanoic acid, 7.7–9.4% TRR or 0.002–0.003 mg/kg eq; not detected in liver). A total of 91% (milk), 36% (liver), 46% (kidney), and 57% (fat) of the TRR could be identified in the initial extracts. No metabolite was identified in muscle (total extractable residues: 0.002 mg/kg eq). The solids remaining after initial extraction in liver and kidney were treated with protease and microwave, resulting in a release of most of the radioactivity (38% TRR in liver and 30% TRR in kidney). This radioactivity could not be attributed to any of the known metabolites.

Nine laying hens, orally treated once daily for 10 consecutive days with [2,7-^{14}C]-ametoctradin, were sacrificed 23 hours after the last dose. Hens were treated at an actual dose rate of 12 ppm dry feed (equivalent to 0.81 mg ai/kg bw). The total recovery of the applied dose was 93%. Radioactivity from the excreta and cage wash amounted to 92.4% of the administered dose, while 0.03% was found in liver, 0.06% in muscle, 0.00% in fat and 0.09% in eggs.

Concentrations in eggs increased within the first 6 application days and reached a plateau from day 6 onwards (0.037–0.040 mg/kg eq). The highest radioactivity concentrations in edible tissues were found in liver (0.11 mg/kg eq), followed by muscle (0.026 mg/kg eq) and fat (0.014 mg/kg eq).

Radioactivity was characterized in liver, muscle, fat and eggs. Methanol and water extracted 82% TRR for eggs, 52% TRR for liver, 44% TRR for muscle, and 66% TRR for fat. In hens, only low levels of residues were identified (each compound < 0.01 mg/kg eq). The major compounds were metabolite M650F01 (ω-hetarylbutanoic acid) with 28%, 8.7%, 1.9% TRR in fat, liver, muscle,

respectively and parent compound with 22%, 11% TRR in eggs and fat, respectively. Metabolite M650F06 (ω-hetarylhexanoic acid) was only identified in liver and muscle at trace amounts (1.1–1.3% TRR) and metabolite M650F09 was not detected. A total of 22% (eggs), 10% (liver), 39% (fat) and 3.0% (muscle) of the TRR could be identified in the initial extracts. Other peaks and fractions individually ranged up to 12% TRR and 0.0083 mg/kg eq. All individual identified or characterized residues were at low levels (< 0.01 mg/kg eq). The solids remaining after initial extraction from eggs, liver, muscle and fat were subjected to sequential solubilisation procedures, resulting in a release of most of the radioactivity in eggs, liver and muscle (16%, 47%, 55% TRR respectively). This radioactivity could not be attributed to any of the known metabolites. In fat 33% TRR could not be solubilized.

Metabolism of ametoctradin in livestock involves oxidation of the aliphatic side chain to the respective terminal carboxylic acid (forming metabolite M650F09, ω-hetaryloctanoic acid) and subsequent stepwise oxidative cleavage of the side chain (loss of C_2H_4-units) analogous to the β-oxidation of fatty acids to form the metabolites M650F06 (ω-hetarylhexanoic acid) and M650F01 (ω-hetarylbutanoic acid). In goats metabolite M650F06 was the major metabolite found (22–47% TRR) in all tissues and milk, followed by M650F01 (14–26% TRR) and M650F09 (7.7–9.4% TRR). No parent compound was detected in goat tissues and milk. In hens, only low levels of residues were found (each < 0.01 mg/kg eq). The major compounds were metabolite M650F01 (1.9–28% TRR in liver, fat, muscle) and parent compound (22% in eggs and 11% in fat). Metabolite M650F06 was only identified in liver and muscle in trace amounts (1.1–1.3% TRR) and metabolite M650F09 was not detected.

The metabolic pathway in livestock is identical to the metabolic pathway in rats, although in rats more conjugation products are found.

Plant metabolism

The Meeting received plant metabolism studies for ametoctradin in/on fruits (tomatoes), leafy crops (lettuce) and root and tuber vegetables (potato) after foliar treatment.

Uptake and translocation studies with ^{14}C-labelled ametoctradin on leaves from tomato plants showed low uptake (5% TRR) and essentially no translocation of ametoctradin.

Uptake and translocation studies with tomato plants in nutrient solutions containing ^{14}C-labelled M650F03 or ^{14}C-labelled M650F04 soil metabolites showed that both soil metabolites are taken up by tomato plants via the root system concurrently with the stream of water. Both soil metabolites are equally distributed over the whole plants.

Indoor grown tomato plants were sprayed three times with an SC formulation of 2,7-^{14}C-radio labelled ametoctradin at an actual application rate of 3 × 0.30 kg ai/ha. Tomato plants were sampled at maturity 1 day after the last application (1DAT) and separated into leaves and fruit. Total radioactive residues (TRR) in tomato fruit and leaves at 1DAT were 0.36 mg/kg eq and 9.2 mg/kg eq. Residues could be extracted with methanol (99% TRR). The parent compound ametoctradin accounted for 99% TRR (0.036 mg/kg eq) in fruits and 99% TRR (9.0 mg/kg eq) in leaves. No other compounds were detected. The Meeting noted that since the plants were sampled only 1 day after the last application, it is to be expected that parent compound dominates the residue.

Indoor grown lettuce was sprayed three times with an SC formulation of 2,7-^{14}C-labelled ametoctradin at a concentration of 3 × 0.22 kg ai/ha. Plants were sampled at maturity at 7DAT. TRR in lettuce leaves were 8.5 mg/kg eq. Residues could be extracted with methanol (99% TRR). The parent compound accounted for 99% TRR (8.4 mg/kg eq). No other compounds were detected.

Indoor grown potato plants were sprayed three times with an SC formulation of 2,7-^{14}C-radio labelled ametoctradin at an actual concentration of 3 × 0.44 kg ai/ha. Immature plants were taken 14 days prior to the second application and mature plants 7 day after the last application. Plants were separated in tubers and leaves.

TRR in immature and mature tubers was 0.025 and 0.041 mg/kg eq, respectively. Residues in the tubers could be extracted with methanol (81–83% TRR) and water (4.1–7.7%) with 1.0–11% TRR remaining as solids. Ametoctradin was the main compound in immature tubers (0.017 mg/kg eq, 67% TRR), but represented only 3.6% TRR (0.001 mg/kg eq) in mature tubers. Identified metabolites were M650F03 (hetarylacetic acid, 13% and 40% TRR in immature and mature tubers, respectively, 0.003 and 0.016 mg/kg eq) and M650F04 (hetarylcarboxylic acid, 27% TRR in mature tubers only, 0.011 mg/kg eq).

TRR in immature and mature leaves was, respectively, 22 and 45 mg/kg eq. Residues in the leaves could be extracted with methanol (98% TRR). The parent ametoctradin was the main compound (95 and 85% TRR in immature and mature leaves, respectively). All metabolites detected were each ≤ 0.81 mg/kg eq (≤ 1.9% TRR) and in total < 5.0% TRR and thus of minor importance.

From these data it is concluded that in leafy vegetables and fruits parent ametoctradin is the only residue identified at significant quantities (99% TRR). In root and tuber vegetables (potatoes) considerable amounts of residues are found in/on leaves (22 or 45 mg/kg eq), while only low amounts of residues are found in the tubers (0.025 or 0.041 mg/kg eq). Parent compound is the major compound found in/on leaves (85–95% TRR), while varying amounts of parent compound are found in the tubers (67% in immature tubers and 3.6% TRR in mature tubers). In potato tubers two major metabolites are identified: M650F03 (13% and 40% TRR, respectively in immature and mature tubers) and M650F04 (27% TRR in mature tubers only).

Ametoctradin is hardly taken up, is not translocated via the leaves or fruits of plants and is hardly metabolised when sprayed on the leaves of fruits of plants. Since parent compound is found in potato tubers, it seems likely that the parent compound is taken up and translocated via the roots of the plants. The presence of small amounts of metabolites in potato leaves (total < 5.0% TRR) indicates that once the parent compound is inside the plant it can be metabolised.

The two major metabolites found in potato tubers, M650F03 and M650F04, were not found in rat or in livestock. Metabolites M650F03 and M650F04 were identified in soil degradation studies of ametoctradin, and were the only metabolites taken up by rotational crops (see environmental fate in soil). Metabolites M650F03 and M650F04 were also seen in a variety of supervised field trials after foliar application. In most instances these levels were too low to quantitate but in some supervised field trials, the residues exceeded the LOQ and were reported. Since the ametoctradin formulation was applied 3–4 times with intervals of 5–14 days in the supervised field trials, it seems likely that the spray from the early application(s) reached the soil because of incomplete soil coverage by the plants. It is likely that parent present in these early applications is degraded in the soil to the metabolites M650F03 and M650F04 and these metabolites are taken up by the plants in low levels and can be detected at harvest (7–35 days after the first application). Therefore it seems likely that metabolites M650F03 and M650F04 are the result of uptake from soil via the roots and translocation within the plant, although small amounts may be formed by degradation of the parent compound within the plant. However, since the contribution of the total identified metabolites in leaves is very low (total 3.3–4.4% TRR) and identified residue levels in potato tubers are very low (0.020–0.026 mg/kg eq), uptake from soil and subsequent metabolism within the plant is considered of minor importance in primary crops.

Environmental fate in soil

The Meeting received information on aerobic degradation in soil, soil photolysis and fate in rotational crops.

The half-life for 2,7-^{14}C-labelled-ametoctradin ranged from 1.5 to 3.2 days at 20 °C and 6.3 days at 10 °C in a study where three soils (sandy loam and loamy sand) were treated at 1.1 mg ai/kg dry soil (0.40 kg ai/ha). In a second study the half-life was 1.3 days in one sandy loam soil, treated at 1.9 mg ai/kg dry soil (0.72 kg ai/ha). The major metabolites in both studies were M650F01 (max. 54% TAR on day 10), M650F02 (max. 13% TAR on day 3), M650F03 (max. 57% TAR on day 10) and M650F04 (max. 55% TAR on day 120). A number of other degradation products were formed, but all < 5.5% TAR.

Using the data from these two soil degradation studies, the half-lives for the metabolites were estimated at 1–10 days for M650F01, 5–22 days for M650F02, 28–88 days for M650F03 and > 226 days for M650F04. Additional soil studies were performed with metabolites M650F03 and M650F04.

The half-life for [pyrimidine-5-^{14}C]-M650F03 ranged from 29–43 days at 20 °C in a study where three soils (loamy sand, sandy loam, sand) were treated at 0.51–0.55 mg ai/kg dry soil (0.20 kg ai/ha). The amount of the major metabolite M650F04 continuously increased in the course of the study with 31–44% TAR present at 120 days. A number of other degradation products were formed, but all < 6.1% TAR.

The half-life for [pyrimidine-5-^{14}C]-M650F04 was 228 days at 20 °C in a study where loamy sand was treated at an equivalent rate of 0.20 kg ai/ha. Two minor degradation products were formed (total < 7.0% TAR).

The half-life for [2,7-^{14}C] ametoctradin in non-sterile sandy loam soil treated with 2.7 mg ai/kg dry soil (0.40 kg ai/ha) during a 15 days exposure to artificial sunlight (DT_{50} 23 days) was longer than in the dark control (DT_{50} 7 days). Despite the expectation that photolysis contributes to the degradation of ametoctradin based on its significant absorption at 295 nm and moderate photolysis in sterile water, the study results showed that light has no effect on the degradation of ametoctradin in soil, probably because the degradation in aerobic soil is already very fast.

In a confined rotational crop study, [2,7-^{14}C]-ametoctradin was sprayed on a loamy sand soil at a rate of 1.44 kg ai/ha under greenhouse conditions. Rotational crops were sown 30, 120 and 365 days after application, representing first, second and third rotations. Total radioactivity was 0.080–1.2–0.030 mg/kg eq in immature lettuce leaves after first-second-third rotations, 0.060–0.064–0.016 mg/kg eq in mature lettuce leaves, 2.4–0.28–0.062 mg/kg eq in radish tops, 0.66–0.062–0.018 mg/kg eq in radish roots, 6.0–3.8–1.2 mg/kg in wheat straw, 5.2–2.7–1.7 mg/kg eq in wheat hay, and 1.8–1.2–0.84 mg/kg eq in wheat grain. Total radioactivity in wheat forage was only determined after second and third rotation, being 1.7 an 0.36 mg/kg eq. Except for radish root (second rotation) and mature lettuce leaves (first rotation) no significant amount of parent compound was detected in the various crop samples. Metabolite M650F03 was the major compound in lettuce leaves (30–42% TRR) at first rotation. At second and third rotation the major compound in lettuce leaves was the metabolite M650F04 (26–32% TRR). In radish roots and tops metabolite M650F03 remained the major compound (100 and 96% TRR, respectively) after first rotation followed by 67%TRR and 46% TRR, respectively at second and 39%TRR and 23% TRR, respectively at third rotation. Apart from wheat straw, where the metabolite M650F03 was the major compound (43% TRR) at first rotation, the metabolite M650F04 was the major component in all the wheat samples, 25% TRR in straw at first rotation and 44–98% TRR in all other fractions and different plant back intervals.

In a field rotational crop study at four different locations in Europe significant residues were found in rotational crop wheat after a single treatment of the bare soil with 0.96 kg ai/ha and a plant back interval of 120 days. The parent ametoctradin was not detected in wheat commodities. Metabolite M650F03 was detected between < 0.01 and 0.092 mg/kg and M650F04 between < 0.01 and 0.30 mg/kg in wheat forage and grain. Relatively high metabolite residues were found in wheat straw: 0.016–0.14 mg/kg for M650F03 and 0.040–1.0 mg/kg for M650F04.

In a second field rotational crop study at four different locations in Europe significant residues were found in rotational crops wheat, carrot, cauliflower and head lettuce after a single treatment of the bare ground with 0.96 kg ai/ha at plant back intervals of 30, 120 and 365 days. The parent compound ametoctradin was found in only two samples at the 30 day plant back interval; 0.038 mg/kg in wheat straw and 0.020 mg/kg in cauliflower inflorescence. The two soil metabolites M650F03 and M650F04 formed the majority of the residues in rotational crops. Residues were highest in the animal feed commodities immature carrot plants, carrot tops, wheat forage and wheat straw, moderate in the edible food commodities wheat grain and carrot root and low in lettuce and cauliflower inflorescence. Residues were highest after a plant back interval of approximately 30 days and decreased at longer plant back intervals.

- After a plant back interval of 30 days, metabolite M650F03 and M650F04 were found between < 0.01–0.92 mg/kg eq and < 0.01–0.35 mg/kg eq in animal feedstuff and between < 0.01–0.056 mg/kg eq and < 0.01–0.12 mg/kg eq in wheat grain, carrot roots, cauliflower inflorescence and head lettuce, respectively. Residues were found in all commodities.
- After a plant back interval of 120 days, metabolites M650F03 and M650F04 were found between < 0.01–0.054 mg/kg eq and < 0.01 mg/kg eq in animal feedstuff, respectively. No residues above the LOQ were found in wheat grain, carrot roots, cauliflower inflorescence and head lettuce.
- After a plant back interval of 365 days, metabolites M650F03 and M650F04 were found between < 0.01–0.038 mg/kg eq and < 0.01–0.056 mg/kg eq in animal feedstuff and between < 0.01–0.015 mg/kg eq and < 0.01–0.016 mg/kg eq in wheat grain and cauliflower inflorescence, respectively. No residues above the LOQ were found in carrot roots and head lettuce.

In a third field rotational crop study undertaken at two different locations in the USA, bare soil was treated with ametoctradin at a rate of 3 × 0.30 kg ai/ha with a 5 (± 1) day interval . Radish, lettuce and winter wheat were planted at 4 different plant back intervals (PBI: 1, 2, 3 and 4 months). No quantifiable residues (< 0.01 mg/kg) of the parent ametoctradin were observed in any of the rotational crops. Quantifiable residues of the metabolite M650F03 were observed in all rotational crops planted up to 4 months after the last application, with the exception of radish root, where M650F03 residues (0.01 mg/kg) were last observed at the 3 month PBI and lettuce leaves, with non–quantifiable residues at all PBIs. In wheat samples from the 4 month PBI maximum residue levels of M650F03 were 0.07 mg/kg (forage), 0.07 mg/kg (hay), 0.02 mg/kg (grain) and 0.33 mg/kg (straw). Quantifiable residues of the metabolite M650F04 were also observed in all rotational crops planted up to 4 months after the last application, with the exception of radish root and lettuce leaves, were M650F03 residues were non-quantifiable throughout the study. In wheat samples from the 4 month PBI, the maximum M650F04 residues were 0.13 mg/kg (forage), 0.12 mg/kg (hay), 0.19 mg/kg (grain) and 0.29 mg/kg (straw).

From these data it is concluded that the aerobic degradation in soil proceeds primarily via stepwise oxidative cleavage of the n-octyl side chain. Ametoctradin is transformed to M650F01 (ω-hetarylbutanoic acid), M650F02 (ω-hetarylpropanoic acid) and subsequently to M650F03 (hetarylacetic acid) and M650F04 (hetarylcarboxylic acid) by oxidation. Metabolites underwent further metabolisation by mineralisation to CO_2 or incorporation in humins, humic acids or fulvic acids. Metabolite M650F04 has a very long dissipation time in soil and metabolites M650F03 and M650F04 can be taken up by primary crops and rotational crops.

Methods of Analysis

The Meeting received description and validation data for analytical methods of ametoctradin, M650F03 and M650F04 in plant commodities or ametoctradin, M650F01 and M650F06 in animal commodities.

As ametoctradin and its soil metabolites M650F03 and M650F04 were shown not to be compatible with existing GC or HPLC-fluorescence multiresidue methods, only single residue methods were submitted to the Meeting. Three single residue analytical methods were proposed to the Meeting.

Macerated samples were extracted with methanol/water. The extract was cleaned up by solvent partition and/or solid phase extraction, if necessary. The final residue could then be determined by HPLC-MS-MS. The Meeting considers validation sufficient for commodities with high water, high acid content, high starch content, dried hops and animal commodities. LOQs were in the 0.01–0.1 mg/kg range for parent and its metabolites in plant and animal commodities.

Methanol/water extraction on samples with incurred radioactive residues from metabolism studies on goat (liver and kidney), wheat (forage, grain), potato leaves and tomato fruits showed that the methanol/water mixture extracted similar amounts of total radioactive residues as the combined

methanol extracts in the metabolism studies and resulted in comparable HPLC patterns. Therefore the extraction solvent used in the HPLC-MS-MS methods is sufficiently able to extract the analytes defined.

Stability of pesticide residues in stored analytical samples

The Meeting received information on the stability of ametoctradin, M650F03 and M650F04 in plant commodities as well as ametoctradin, M650F01 and M650F06 in animal commodities stored frozen.

Storage stability studies in plant commodities had variable results. In a study where plant commodities were fortified with a mixture of parent, M650F03 and M650F04 and samples were stored at -20 °C, degradation of parent was found for some commodities (tomatoes) but not in others. In a second study where tomatoes and lettuce with incurred residues from a metabolism study were stored at -18 ºC it was shown that parent was stable for at least 3 and 2 years.

Considering both storage stability studies on plant commodities, the Meeting considers parent, M650F03, M650F04 stable for at least 2 years in all plant commodities investigated: commodities with high water content, high acid content, high starch content, high protein content and straw.

Based on storage stability studies at -18 °C in fortified milk samples, the Meeting considers parent and metabolite M650F01 stable for at least 41 days and M650F06 for at least 34 days in milk. Milk samples within the feeding study were analysed within this period. Storage stability studies in animal tissues are not available. Since the tissue samples from the animal feeding study were analysed within 30 days after slaughter and ametoctradin and its metabolites were shown to be stable in various other commodities, storage stability studies are not considered necessary for the purpose of this evaluation.

Definition of the residue

The parent compound ametoctradin was only present in egg and fat of hen (22% and 11% TRR or 0.008 and 0.001 mg/kg eq), and in hen fat it was the only compound identified. Metabolites M650F01, M650F06 were found in significant quantities in other animal tissues in varying amounts. In goat milk, liver, kidney and fat, the metabolite M650F06 (ω-hetarylhexanoic acid) is the most abundant component of the residues (22–47% TRR or 0.006–0.021 mg/kg eq), followed by the metabolite M650F01 (ω-hetarylbutanoic acid, 14%–26% TRR or 0.003–0.014 mg/kg eq). The major metabolite in hens was M650F01 (ω-hetarylbutanoic acid) with 28%, 8.7%, 1.9% TRR in fat, liver, muscle, respectively. For this reason, parent and the metabolites M650F01 and M650F06 are the candidate compounds for inclusion in the residue definition for animal commodities.

Metabolites M650F01 and M650F06 are found in the rat and are therefore covered by the toxicity studies on parent. Since M650F01 and M650F06 are major components of the residue and valid analytical methods are available to quantitate parent and its metabolites in animal commodities, the Meeting decided to include the metabolites M650F01 and M650F06 in the residue definition for animal commodities.

Fat solubility of the parent compound is indicated by the log Kow of 4.18–4.40 and its presence in hen fat and eggs only. Metabolites M650F01 and M650F06 are amphoteric compounds and they are not fat soluble. Since the metabolites M650F01 and M650F06 are the major components of the residue, the sum of parent, M650F01 and M650F06 is considered not fat soluble.

In primary crops, parent compound ametoctradin is the only compound found in significant quantities (> 95% TRR). Therefore parent should be included in the residue definition for plant commodities. However, in rotational crops uptake of residues proceeds via the soil and the main metabolites taken up from the soil are M650F03 (30–100% TRR) and M650F04 (26–98% TRR), while parent is found in trace amounts. The level of the metabolites found in the various rotational crops is significant, even after a plant back interval of 365 days (up to 0.056 mg/kg eq for M650F04).

Metabolites M650F03 and M650F04 are not found in the rat. In 90 day dietary toxicity studies, no adverse effects were observed after exposure to either M650F03 or M650F04 up to the

limit dose (about 1000 mg/kg bw per day). This is comparable to ametoctradin which showed no adverse effects were observed at or near the limit dose of approximately 1000 mg/kg bw per day in an extensive set of repeated-dose toxicity studies.

The Meeting noted that the parent compound alone is a good marker for compliance with GAP. Although metabolites M650F03 and M650F04 have a similar lack of toxicity and the same core structure as the parent compound, the metabolites M650F03 and M650F04 are only found at significant levels in rotational crops. Since an ADI or ARfD is not considered necessary for the parent compound, there is no dietary intake concern for parent compound or metabolites M650F03 and M650F04. For these reasons, the Meeting decided not to include the metabolites M650F03 and M650F04 in the residue definition and to refrain from setting a residue definition for estimation of the dietary intake of ametoctradin.

The Meeting recommended the following residue definition for ametoctradin:

Definition of the residue for compliance with the MRL for plant commodities: *ametoctradin.*

Definition of the residue for compliance with the MRL for animal commodities: *sum of ametoctradin, ω-hetarylbutanoic acid (M650F01) and ω-hetarylhexanoic acid (M650F06), expressed as ametoctradin.*

The Meeting considers the residue is not fat soluble

Results of supervised trials on crops

The Meeting received supervised trials data for ametoctradin on grapes, bulb onions, green onions, broccoli, head cabbage, cucumbers, melons, pumpkins, summer squash, sweet peppers, chilli peppers, tomatoes, head lettuce, leaf lettuce, mustard greens, spinach, potatoes, celery, and dried hops.

All plant commodities from supervised residue trials were analysed within 4–24 months, although storage temperatures varied. Since ametoctradin, M650F03 and M650F04 are shown to be stable for a long period of time, trials where samples were stored for a few days at +5 °C before being frozen and trials where temperatures of frozen samples increased to -1 °C were considered acceptable.

Trials conducted at the same location and at the same kg ai/ha dose rate, where only the spray concentration was different, were not considered as independent trials. Trials conducted at the same location, where only the crop variety was different, were not considered as independent trials. The maximum value from each location was selected for maximum residue level recommendations.

As an ADI and ARfD were considered not necessary, no STMR and no HR values are reported as a long and short term exposure assessment is not needed.

The OECD MRL calculator was used as a tool in the estimation of the maximum residue level from the selected residue data set obtained from supervised field trials conducted according to the critical GAP. For those trials where the outcome of the OECD MRL calculator was different from the recommendation made by the Meeting, a rationale is provided for this deviation.

Grapes

Field trials involving grapes were performed in Canada, USA, Germany, France, Spain, Italy and Greece.

Critical GAP for grapes in the USA is for 4 foliar spray applications (interval 7 days) at 0.31 kg ai/ha and PHI 14 days with adjuvant recommended. Trials from USA and Canada (4 × 0.29–0.32 kg ai/ha, interval 6–8 days, PHI 14–15 days, adjuvant added) matched this GAP. Trials from USA and Canada were conducted at two spray concentrations per location (0.0086–0.032 and 0.042–0.065 kg ai/hL); both far lower than indicated in the GAP (0.13–0.16 kg ai/hL). The highest residue value from each location was selected: 0.21, 0.33, 0.34, 0.87, 0.89, 0.92, 0.97, 1.3, 1.4, 1.4, 1.9 and 2.2 mg/kg (n=12).

Critical GAP for grapes in the Former Yugoslav Republic of Macedonia is for 3 foliar spray applications (interval 10 days) at 0.075 kg ai/hL and PHI 35 days. In trials performed in Southern

France, Spain, Italy and Greece (3 × 0.060 kg ai/hL, interval 10 days, PHI 34–36 days) matching this GAP parent residues were: 0.15, 0.22, 0.37, 0.72, 1.1, 1.1, 2.7 and 3.1 (n=8).

The Meeting noted that the US and Southern European dataset for grapes resulted in similar residues (Mann-Whitney U test). However, since the GAPs are different, the Meeting agreed that the Southern European dataset for grapes matching Former Yugoslav Republic of Macedonia GAP could be used to support a grape maximum residue level recommendation and estimated a maximum residue level of 6 mg/kg on grapes. For the purpose of livestock dietary burden calculation, the Meeting estimated an STMR of 0.605 mg/kg.

Bulb vegetables

Field trials involving bulb onions were performed in Canada and the USA.

Critical GAP for bulb vegetables (includes bulb onions) in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In trials from USA and Canada (3 × 0.29–0.34 kg ai/ha, interval 4–8 days, PHI 0 days, adjuvant added) matching this GAP parent residues were: 0.095, 0.095, 0.14, 0.19, 0.21, 0.22, 0.25, 0.43, 0.46, 0.84 mg/kg (n = 10).

The Meeting agreed that the USA and Canadian datasets for bulb onions matching USA GAP could be used to support a bulb onion maximum residue level recommendation and estimated a maximum residue level of 1.5 mg/kg on bulb onions and decided to extrapolate the recommendation for bulb onions to garlic and shallots.

Field trials involving spring onions were performed in the USA.

Critical GAP for bulb vegetables (includes green onions) in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from USA and Canada (3 × 0.29–0.34 kg ai/ha, interval 4–8 days, PHI 0 days, adjuvant added) matching this GAP parent residues were: 3.4, 4.3, 9.1 mg/kg (n = 3).

The Meeting agreed that the USA and Canadian datasets for spring onions matching USA GAP could be used to support a green onion maximum residue level recommendation and estimated a maximum residue level of 20 mg/kg on spring onions.

Brassica vegetables

Field trials involving broccoli were performed in Canada and the USA.

Critical GAP for brassica vegetables (includes broccoli) in the USA is for 3 foliar spray applications (interval 7 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from USA and Canada (3 × 0.29–0.31 kg ai/ha, interval 6–9 days, PHI 0 days, adjuvant added) matching this GAP parent residues in broccoli heads and stems were 1.2, 1.2, 1.3, 1.6, 1.7, 2.5, 2.9, 3.2 mg/kg (n=8).

Field trials involving head cabbage were performed in Canada and USA.

Critical GAP for brassica vegetables (includes head cabbage) in the USA is for 3 foliar spray applications (interval 7 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from USA and Canada (3 × 0.29–0.31 kg ai/ha, interval 5–9 days, PHI 0 days, adjuvant added) matching this GAP parent residues in head cabbage with wrapper leaves (as marketed) were 0.35, 1.1, 1.4, 1.6, 1.8, 2.2, 3.1, 3.2, 3.3, 7.5 mg/kg (n = 10).

The Meeting noted that the datasets for broccoli and head cabbage resulted in similar residues (Mann-Whitney U test). Since the GAPs are the same and there is a GAP for brassica vegetables, the Meeting agreed to combine the data to propose a group maximum residue level for brassicas. This resulting in the following residues: 0.35, 1.1, 1.2, 1.2, 1.3, 1.4, 1.6, 1.6, 1.7, 1.8, 2.2, 2.5, 2.9, 3.1, 3.2, 3.2, 3.3, 7.5 (n=18).

The Meeting agreed that the combined datasets for broccoli and head cabbage matching USA GAP could be used to support a maximum residue level recommendation for brassica (cole or

cabbage) vegetables, Head cabbages, Flowerhead cabbages and estimated a maximum residue level of 9 mg/kg. For the purpose of livestock dietary burden calculations the Meeting estimated a highest residue of 7.5 mg/kg for brassicas.

Fruiting vegetables, Cucurbits

Supervised residue trials on outdoor and indoor grown cucumbers were conducted in Canada, USA, the UK, the Netherlands, France, Greece and Spain.

Critical GAP for fruiting vegetables, cucurbits in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and a PHI of 0 days, with adjuvant recommended. In field trials from USA and Canada (3 × 0.29–0.30 kg ai/ha, interval 6–8 days, PHI 0 days, adjuvant added) matching this GAP parent residues in cucumber were: 0.060, 0.08, 0.090, 0.12, 0.12, 0.16, 0.16, 0.24 mg/kg (n=8).

Critical GAP for cucumbers in the Former Yugoslav Republic of Macedonia (Southern Europe) is for 4 foliar spray applications (interval 10 days) at 0.30 kg ai/ha and PHI 1 days. In field trials from Southern France and Greece and greenhouse trials from Europe (3 × 0.24 kg ai/ha, interval 7 days, PHI 1 day) matching this GAP parent residues in cucumber were 0.038, 0.09, 0.11 and 0.17 mg/kg (n=4) for field trials and 0.024, 0.037, 0.15 and 0.18 mg/kg (n=4) for greenhouse trials. As the datasets for outdoor and indoor grown cucumbers resulted in similar residues (Mann-Whitney U test), the datasets were combined: 0.024, 0.037, 0.038, 0.09, 0.11, 0.15, 0.17 and 0.18 mg/kg (n=8) for outdoor and indoor grown cucumbers.

The Meeting noted that datasets for USA and Former Yugoslav Republic of Macedonia resulted in similar datasets (Mann-Whitney U test). However, since the GAPs are different, the Meeting decided to take only the USA dataset into account in making estimations.

Field trials involving melons were performed in the USA.

Critical GAP for fruiting vegetables, cucurbits in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from USA (3 × 0.29–0.31 kg ai/ha, interval 6–8 days, PHI 0 days, adjuvant added) matching this GAP, parent residues in melons with peel were: 0.18, 0.49, 0.59, 0.60, 0.72, 0.80, 1.3, 1.7 mg/kg (n=8).

Field trials involving pumpkins were performed in the USA.

Critical GAP for fruiting vegetables cucurbits in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from the USA (3 × 0.29–0.30 kg ai/ha, interval 7 days, PHI 0 days, adjuvant added) matching this GAP, parent residues in pumpkins with peel were: 0.10, 0.14, 0.34, 0.47, 1.3 mg/kg (n=5).

Field trials involving summer squash (i.e., courgette/zucchini) were performed in the USA.

Critical GAP for fruiting vegetables cucurbits in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from the USA (3 × 0.28–0.31 kg ai/ha, interval 6–8 days, PHI 0 days, adjuvant added) matching this GAP, parent residues in summer squash with peel were: 0.13, 0.22, 0.36, 0.98, 1.1 mg/kg (n=5).

The Meeting noted that the datasets for melons, pumpkins and summer squash were similar (Kruskal-Wallis test). Since the GAP is the same for each of these commodities, the Meeting agreed to propose a group maximum residue level for cucurbits, except cucumbers, based on the combined residue data for melons, pumpkins and summer squash and agreed to propose a separate maximum residue level for cucumbers.

The combined dataset for melons, pumpkins and summer squash resulted in the following residues: 0.10, 0.13, 0.14, 0.18, 0.22, 0.34, 0.36, 0.47, 0.49, 0.59, 0.60, 0.72, 0.80, 0.98, 1.1, 1.3, 1.3, 1.7 mg/kg (n=18). The Meeting agreed that the combined dataset matching the GAP of the USA could be used to support a maximum residue level recommendation for cucurbits, except cucumber, and estimated a maximum residue level of 3 mg/kg in/on cucurbits, except cucumber, based on the combined data.

The Meeting agreed that the dataset for cucumbers matching the US GAP could be used to support a maximum residue level recommendation for cucumbers, and estimated a maximum residue level of 0.4 mg/kg for cucumbers.

Fruiting vegetables other than cucurbits

Field trials involving sweet peppers were performed in Canada, the USA, Greece, Italy, Spain, France, Germany, the Netherlands and Belgium.

Critical GAP for fruiting vegetables other than cucurbits (includes sweet peppers) in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 4 days with adjuvant recommended. In field trials from the USA and Canada (3 × 0.29–0.32 kg ai/ha, interval 6–8 days, PHI 4 days, adjuvant added) matching this GAP, parent residues in sweet peppers were: 0.050, 0.080, 0.085, 0.14, 0.16, 0.22, 0.84 mg/kg (n=7).

The GAP for peppers in Former Yugoslav Republic of Macedonia (Southern Europe) is for 4 foliar spray applications (interval 10 days) at 0.30 kg ai/ha and a 1 day PHI. In greenhouse trials from Europe (3 × 0.23–0.25 kg ai/ha, interval 7 days, PHI 1 day) matching this GAP, parent residues in sweet peppers were: 0.20, 0.21, 0.28, 0.34, 0.37, 0.47, 0.79, 0.90 mg/kg (n=8).

Field trials involving chili peppers were performed in USA.

The GAP for fruiting vegetables, other than cucurbits (includes chili peppers), in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 4 days with adjuvant recommended. In field trials from the USA (3 × 0.29–0.31 kg ai/ha, interval 7 days, PHI 4 days, adjuvant added) matching this GAP none of the residue values could be selected, as the laboratory was unable to show adequate performance of the analytical method.

Field trials involving tomatoes were performed in Canada and the USA.

Critical GAP for fruiting vegetables other than cucurbits (includes tomatoes) in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 4 days with adjuvant recommended. In field trials from the USA and Canada (3 × 0.28–0.32 kg ai/ha, interval 6–8 days, PHI 4 days, adjuvant added) matching this GAP, parent residues in tomatoes (including two trials on cherry tomatoes) were: 0.050, 0.10, 0.11, 0.12, 0.15, 0.16, 0.16, 0.18, 0.20, 0.20, 0.22, 0.22, 0.25, 0.32, 0.60, 0.70, 0.76 mg/kg (n=17).

The Meeting noted that the sweet pepper dataset corresponding to the GAP of the Former Yugoslav Republic of Macedonian (3 × 0.30 kg ai/ha PHI 1 days) resulted in higher residues than the dataset corresponding to the US GAP (3 × 0.30 kg ai/ha, PHI 4 days) (Mann-Whitney U test). However, both datasets would result in the same maximum residue level recommendation (1.5 mg/kg). The sweet pepper dataset, matching USA GAP, resulted in similar residues as the tomato dataset, matching USA GAP, (Mann-Whitney U test). The Meeting concluded that these datasets could be combined to allow a commodity group recommendation for fruiting vegetables other than cucurbits. This resulted in the following dataset: 0.050, 0.050, 0.080, 0.085, 0.10, 0.11, 0.12, 0.14, 0.15, 0.16, 0.16, 0.16, 0.18, 0.20, 0.20, 0.22, 0.22, 0.22, 0.25, 0.32, 0.60, 0.70, 0.76 and 0.84 mg/kg (n=24).

The Meeting estimated a maximum residue level of 1.5 mg/kg fruiting vegetables other than cucurbits, except sweet corn and mushrooms, based on the combined dataset. For the purpose of livestock dietary burden calculations, the Meeting estimated an STMR of 0.16 mg/kg in/on fruiting vegetables other than cucurbits.

The FAO Manual (section 6.9.2) describes how a generic concentration factor may be used for conversion of HR residue values from fresh peppers to dried chili peppers. A concentration factor of 10 is used for the estimation of parent residue levels of pesticides in dried chili peppers.

The Meeting agreed to apply the concentration factor of 10 for dried chili peppers to the maximum residue level for sweet peppers (1.5 mg/kg) and estimated a maximum residue level in peppers, chili, dried of 15 mg/kg.

Leafy vegetables

Field trials involving head lettuce were performed in Canada and the USA.

Critical GAP for leafy vegetables (includes head lettuce) in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from the USA and Canada (3 × 0.29–0.32 kg ai/ha, interval 4–7 days, PHI 0 days, adjuvant added) matching this GAP none of the residue values could be selected as the analytical laboratory could not demonstrate adequate performance of the analytical method.

Field trials involving leaf lettuce were performed in Canada and the USA.

Critical GAP for leafy vegetables (includes leaf lettuce) in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from the USA and Canada (3 × 0.30–0.31 kg ai/ha, interval 4–6 days, PHI 0 days, adjuvant added) matching this GAP none of the residue values could be selected as the laboratory could not demonstrate adequate performance of the analytical method.

Field trials involving mustard greens were performed in USA.

Critical GAP for leafy vegetables (includes mustard greens) in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from the USA (3 × 0.28–0.31 kg ai/ha, interval 6–8 days, PHI 0 days, adjuvant added) matching this GAP, parent residues in mustard greens were: 9.2, 13, 13, 16, 19, 24, 28 mg/kg (n=7).

Field trials involving spinach were performed in Canada and the USA.

Critical GAP for leafy vegetables (includes spinach) in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from USA and Canada (3 × 0.29–0.33 kg ai/ha, interval 4–8 days, PHI 0 days, adjuvant added) matching this GAP in spinach were: 6.0, 11, 12, 13, 13, 20, 21, 35 mg/kg (n=8).

The Meeting noted that the datasets for mustard greens and spinach are similar (Mann-Whitney U-test), confirming the experience of the JMPR that residues in leafy vegetables at DAT=0 are similar. Since the GAPs are the same for mustard greens and spinach, the Meeting agreed to combine the data to propose a group maximum residue level for leafy vegetables, based on the combined residue dataset for mustard greens and spinach. The combination of the two datasets resulted in the following residues: 6.0, 9.2, 11, 12, 13, 13, 13, 13, 16, 19, 20, 21, 24, 28 and 35 mg/kg (n=15).

The Meeting agreed that the combined dataset for mustard greens and spinach, matching US GAP, could be used to support a maximum residue level recommendation for leafy vegetables and estimated a maximum residue level of 50 mg/kg in/on leafy vegetables based on the combined dataset. For the purpose of livestock dietary burden calculations, the Meeting estimated a highest residue of 35 mg/kg for leafy vegetables, based on the combined residue dataset.

Potatoes

Field trials involving potatoes were performed in Canada and the USA.

Critical GAP for root and tuber vegetables (includes potatoes) in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 4 days with adjuvant recommended. In field trials from the USA (3–4 × 0.28–0.31 kg ai/ha, interval 4–8 days, PHI 4 days, adjuvant added) matching this GAP parent residues in potato tubers were: < 0.01 (12), 0.010 (5), 0.020, 0.025 (2), 0.035 mg/kg (n=21).

The Meeting agreed that the dataset for potatoes matching US GAP could be used to support a maximum residue level recommendation for potatoes, and estimated a maximum residue level of 0.05 mg/kg in/on potatoes. For the purpose of livestock dietary burden calculations the Meeting estimated a highest residue of 0.035 mg/kg for potatoes.

Celery

Field trials involving celery were performed in Canada and the USA.

Critical GAP for leafy vegetables (includes celery) in the USA is for 3 foliar spray applications (interval 5 days) at 0.31 kg ai/ha and PHI 0 days with adjuvant recommended. In field trials from the USA and Canada (3 × 0.29–0.32 kg ai/ha, interval 4–6 days, PHI 0 days, adjuvant added) matching this GAP were: 4.2, 4.7, 5.1, 5.5, 6.2, 6.7, 7.0, 11 mg/kg (n=8).

The Meeting agreed that the dataset for celery matching US GAP could be used to support a maximum residue level recommendation for celery, and estimated a maximum residue level of 20 mg/kg in/on celery.

Hops, dry

Field trials involving dried hops were performed in Germany and the USA.

Critical GAP for hops in the USA is for 3 foliar spray applications (interval 7 days) at 0.31 kg ai/ha and PHI 7 days with adjuvant recommended. Trials from USA (3x 0.30–0.31 kg ai/ha, interval 10–11 days, PHI 7 days, adjuvant added) matched this GAP. Trials from the USA were conducted at two spray concentrations per location (0.015–0.021 and 0.037–0.043 kg ai/hL); both far lower than indicated in the GAP (0.13–0.16 kg ai/hL). The highest residue from each location could be selected: 0.96, 2.4, 6.7 mg/kg (n=3). The Meeting agreed that 3 trials were insufficient to estimate a maximum residue level recommendation for dried hops.

Additional trials performed in the USA at higher dose rate (0.53–0.54 kg ai/ha, interval 10–11 days, PHI 6–8 days) could be matched to the USA GAP by using the proportionality approach by multiplying by 0.31/0.54 = 0.57. Parent residues in dried hops were 0.57 × (9.3, 18, 29) mg/kg (n=3). After applying the proportionality factor this results in the following dataset: 5.3, 10, 17 mg/kg (n=3). When combining the two datasets this resulted in the following dataset: 0.96, 2.4, 5.3, 6.7, 10, 17 mg/kg (n=6).

The Meeting agreed that the normal and scaled dataset for dried hops matching US GAP could be used to support a maximum residue level recommendation for dried hops, and estimated a maximum residue level of 30 mg/kg in/on dried hops.

Residues from rotational crops

Parent residues above 0.01 mg/kg are not expected in rotational crops.

Fate of residues during processing

Information on the fate of residues during processing by radioactivity studies showed that ametoctradin is stable (96–109%) under standard conditions used to simulate food processing operations (pH 4 and 90 °C, pH 5 and 100 °C, pH 6 and 120 °C).

Processing studies with ametoctradin were undertaken for grapes, bulb onions, gherkins, tomatoes and hops. Since no long or short term exposure assessments are considered necessary, only the processing factors that lead to maximum residue level proposals or the processing factors that are needed for livestock dietary burden calculations are listed in the table below.

Using the $STMR_{RAC}$ obtained from ametoctradin use, the Meeting estimated STMR-Ps for processed commodities as listed below. The Meeting considered the appropriate STMR-P to be used in the livestock dietary burden calculation or dietary intake calculation.

Commodity	Processing factors (parent only)	Processing factor (median or best estimate) (parent only)	STMR-P = $STMR_{RAC}$xPF mg/kg
grape raisin	1.9, 2.0, 4.8, 6.2 (n=4)	3.4	not necessary
grape wet pomace	1.8, 2.5, 2.7, 2.9, 3.9, 4.2, 4.8, 5.1 (n=8)	3.4	0.605 × 3.4 = 2.1
tomato wet pomace	1.1, 1.2, 1.4, 1.4 (n=4)	1.3	0.16 × 1.3 = 0.21 (based on fruiting vegetables other than cucurbits)

Based on a maximum residue level of 6 mg/kg for grapes and a processing factor of 3.4, the Meeting estimated a maximum residue level of 20 mg/kg for raisins.

Residues in animal commodities

The Meeting estimated the dietary burden of ametoctradin residues on the basis of the livestock diets listed in the FAO manual Appendix IX (OECD feedstuff table). Calculation from highest residue, STMR (some bulk commodities) and STMR-P values provides the levels in feed suitable for estimating MRLs. Since no long or acute dietary exposure assessment is needed, STMR values for animal commodities are not needed and therefore no mean dietary burden is calculated.

All plant commodities used in the dietary burden calculation are listed below. Residues in plant commodities were based on parent only.

Crop	Feedstuff	Highest Residue	STMR or STMR-P	DM (%)
Forages				
Cabbage	heads, leaves	7.5	not needed	15
Kale	leaves	35	not needed	15
Rape	forage	35	not needed	30
Roots & Tubers				
Potato	culls	0.035	not needed	20
Byproducts				
Grape	pomace, wet		2.1	15
Tomato	pomace, wet		0.21	20

Dietary burden calculations for beef cattle, dairy cattle, broilers and laying poultry are provided in Annex 6. A mean and maximum dietary burden for livestock, based on ametoctradin use, is shown in the table below.

Animal dietary burden for ametoctradin parent, expressed as ppm of dry matter diet

	US	EU	AU	JP	overall
	max	max	max	max	max
beef cattle	0.053	46.72	116.7	-	116.7 [a]
dairy cattle	11.68	46.72	96.15	-	96.15 [b]
poultry broiler		0.018			0.018
poultry layer		17.52			17.52 [c d]

[a] Highest maximum beef or dairy cattle dietary burden suitable for maximum residue level for mammalian meat.

[b] Highest maximum dairy cattle dietary burden suitable for maximum residue level for milk.

[c] Highest maximum poultry broiler or poultry layer dietary burden suitable for maximum residue level for poultry meat.

[d] Highest maximum poultry layer suitable for maximum residue level for eggs.

Livestock feeding studies

The Meeting received a feeding study on lactating cows.

Four groups of three lactating Holstein-Friesian cows were dosed once daily via capsules at levels of 0.0, 2.5, 7.5 and 25 ppm parent compound in dry weight feed for 28 consecutive days. Milk was collected throughout the study and tissues were collected on day 28 within 25 hours after the last

dose. Parent was not found in milk or any of the tissues (< 0.01 mg/kg). Metabolites M650F01 and M650F06 were only found in liver and kidney samples. Mean and maximum total residues (parent + 1.10 × M650F01 + 0.993 × M650F06), expressed as parent equivalents, are shown in the table below.

Animal commodity	Dose level (ppm feed)	Mean Residue (mg/kg)	Highest Residue (mg/kg)
Liver	2.5	< 0.031	< 0.031
	7.5	0.033	0.036
	25	0.073	0.096
Kidney	2.5	< 0.031	< 0.031
	7.5	< 0.031	< 0.031
	25	0.039	0.048
Fat	2.5	< 0.031	< 0.031
	7.5	< 0.031	< 0.031
	25	< 0.031	< 0.031
Muscle	2.5	< 0.031	< 0.031
	7.5	< 0.031	< 0.031
	25	< 0.031	< 0.031
Milk	2.5	< 0.031	< 0.031
	7.5	< 0.031	< 0.031
	25	< 0.031	< 0.031

Residues in animal commodities

In a feeding study where lactating cows were dosed at 25 ppm ametoctradin in the dry feed, total residues (sum of parent, M650F01 and M650F06) were 0.073–0.096 mg/kg eq in liver and 0.039–0.048 mg/kg eq in kidney. No residues were found in muscle, fat and milk (each < 0.031 mg/kg eq). However, since the estimated maximum dietary burden in ruminants is much higher (116.7 ppm in beef cattle and 96.15 ppm in dairy cattle, based on parent only in feed commodities), the feeding study cannot be used to estimate residues in ruminant commodities. Therefore the data are insufficient to propose maximum residue levels in ruminants.

No feeding study is available for poultry. In a metabolism study, where laying hens were dosed at 12 ppm ametoctradin in the dry feed, total residues were 0.0088 mg/kg eq in eggs (22% × 0.040 mg/kg), 0.0055 mg/kg eq in fat (11% + 28% × 0.014 mg/kg), in 0.011 mg/kg eq in liver (8.7% + 1.3% × 0.11 mg/kg) and 0.00078 mg/kg in muscle (1.9% + 1.1% × 0.026 mg/kg). Since the estimated maximum dietary burden in poultry is in the same order of magnitude (17.52 ppm in poultry, based on parent only in feed commodities), the metabolism study can be used to estimate residues in poultry commodities. After extrapolation to a dietary burden of 17.52 ppm, residues in poultry commodities all lie below the limit of quantification of 0.031 mg/kg eq (total residues) of the available analytical method.

The Meeting was unable to estimate maximum residue levels in ruminant commodities, because of insufficient data. The Meeting estimated a maximum residue level for ametoctradin total residues of 0.03* mg/kg for eggs, poultry meat and poultry edible offal. The total residue in animal commodities is not considered fat soluble.

RECOMMENDATIONS

On the basis of the data from supervised trials the Meeting concluded that the residue levels listed below are suitable for establishing maximum residue limits

Definition of the residue for compliance with the MRL for plant commodities: *ametoctradin.*

Definition of the residue for compliance with the MRL for animal commodities: *sum of ametoctradin, ω-hetarylbutanoic acid (M650F01) and ω-hetarylhexanoic acid (M650F06), expressed as ametoctradin.*

The Meeting considers the residue is not fat soluble.

Summary of recommendations

Commodity name		Recommended MRL mg/kg		STMR or STMR-P (mg/kg)	HR or HR-P (mg/kg)
CCN	Name	New	Previous		
VB 0040	Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead brassicas	9		nn	7.5 (ldb)
VS 0624	Celery	20		nn	nn
VC 0424	Cucumber	0.4		nn	nn
DF 0269	Dried grapes (=currants, raisins and sultanas)	20		4.1	
PE 0112	Eggs	0.03*		nn	nn
VC 0045	Fruiting vegetables, cucurbits, except cucumber	3		nn	nn
VO 0050	Fruiting vegetables, other than cucurbits, except sweet corn and except mushroom	1.5		0.16 (ldb)	nn
VA 0381	Garlic	1.5		nn	nn
FB 0269	Grapes	6		0.605 (ldb)	nn
DH 1100	Hops, dry	30		nn	nn
VL 0053	Leafy vegetables	50		nn	35 (ldb)
VA 0385	Onion, bulb	1.5		nn	nn
HS 0444	Peppers, Chili, dried	15		nn	nn
VR 0589	Potato	0.05		nn	0.01 (ldb)
PF 0111	Poultry fats	0.03*		nn	nn
PM 0110	Poultry meat	0.03*		nn	nn
PO 0111	Poultry, edible offal of	0.03*		nn	nn
VA 0388	Shallot	1.5		nn	nn
VA 0389	Spring onion	20		nn	nn

Nn: not needed

Ldb: STMR or HR are needed for livestock dietary burden calculation

DIETARY RISK ASSESSMENT

Since no ADI and no ARfD is considered necessary, no long-term or short-term intake assessment is considered necessary. However, to get an impression of the margins of exposure, the International Estimated Daily Intake (IEDI) for ametoctradin was calculated. The results are shown in Annex 3 of the 2012 JMPR Report.

As a conservative approach, the crop with the highest residues (leafy vegetables) was used to estimate the total median residue of ametoctradin of individual crops. When the highest median residue for leafy vegetables from the presented field trials (i.e., 13 mg/kg) is used for all possible plant commodities and the highest median residue for animal commodities from the presented feed studies (i.e., 0.031 mg/kg for poultry commodities) is used for all possible animal commodities, the IEDI was in the range of 0.232–0.477 mg/kg bw/d. This IEDI also accommodates possible contributions from metabolites M650F03 and M650F04 in rotational crops. Considering the absence of adverse effects at or near the limit dose of approximately 1000 mg/kg bw/day in an extensive set of repeated-dose toxicity studies, the margins of exposure ranged between 2100–4300.

When the highest maximum residue level proposed for plant commodities (i.e., 50 mg/kg for leafy vegetables) is used for all possible plant commodities and the highest maximum residue level proposed for animal commodities (i.e. 0.031 mg/kg for poultry commodities), the IEDI was in the range of 0.893–1.836 mg/kg bw/d. The margins of exposure ranged between 540–1100.

The Meeting concluded that the long-term and short-term intake of residues of ametoctradin from uses considered by the Meeting, or from possible future uses is unlikely to present a public health concern.

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1 All studies were conducted according to GLP except those indicated