THIAMETHOXAM (245)

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EXPLANATION

Thiamethoxam and clothianidin (including CGA322704 as a metabolite of thiamethoxam) were evaluated for toxicology and residues as a new compound in 2010, resulting in a number of MRL recommendations. Additional residue data for both compounds were evaluated in 2011 and 2012. The residue definition for thiamethoxam in plant commodities for enforcement is thiamethoxam, while the residue definition for dietary risk assessment is thiamethoxam and the metabolite CGA322704 (clothianidin), considered separately. The residue definition for clothianidin in plant commodities for enforcement and dietary risk assessment is clothianidin.

For the current evaluation the Meeting received data on analytical methods, use patterns, and supervised residue trials in support of the use on avocado, hops, legume vegetables and mint (USA IR-4 programme) and persimmon (Republic of Korea, (RoK)). Summaries of the trials have been provided to support MRL recommendations for thiamethoxam and clothianidin on the respective crops.

RESIDUE ANALYSIS

The Meeting received descriptions of analytical methods used for analysis of thiamethoxam and CGA322704 in mango, persimmon, avocado, fresh beans, mint and hop samples from the trials.

Method AG-675 (used for avocado, mint and hop samples) has been evaluated previously for other animal and plant commodities by the JMPR in 2010. Crop specific modifications are described below. Method REM 197.03 was used on the trials in beans. This method has also been evaluated by the JMPR in 2010. The current Meeting received additional validation data, based on historical findings, for the analytical method REM 179.06 of thiamethoxam and clothianidin. The results are summarized below. The two analytical methods LC-MS/MS Method 954/2010 and Method HPLC/DAD to determine thiamethoxam and CGA322704 (clothianidin) in mango and persimmon, respectively, were not previously evaluated by the JMPR and are described below.

Validation results are required for every 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, 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 5 recovery experiments per level were conducted on at least 2 levels (LOQ and 10× LOQ) and average recovery per level was shown to be between 70–120% and the relative standard deviation (RSDr 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 and
- the calibration was conducted with at least 5 single points or at least 3 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, high starch content);
- at least 3 recovery experiments per level were conducted on at least 2 levels (LOQ and 10× LOQ) and the average recovery per level was shown to be between 70–120% and the relative standard deviation (RSDr 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 5 single points or at least 3 duplicate points and was shown to be linear (only relevant for matrix matched standards; standards in solvent are already covered by full validation).

LC-MS/MS Method 054/2010

For the trials on mango [Thirion, 2013a-c, A9795B_11446, 11447 and 11448] performed in 2012/2013 the SABS In-house method was used with reference 054/2010.

Dried mango samples (processing study) were first soaked in water. Subsamples of (fresh) mango (10 g) were extracted with water/methanol (1:1) and filtered through a funnel with Celite. The extract was diluted with water and adjusted to pH with a 10% NH_3 solution. Clean-up was performed by elution with water and methanol over a SPE cartridge and evaporated to dryness. The residue was redissolved in methanol/water (1:1 v/v) and filtered for LC-MS/MS analysis using m/z 292 to 211 for thiamethoxam and m/z 250 to 132 for CGA322704.

The LC-MS/MS SABS In-House method 054/2010 was validated for determination of thiamethoxam and CGA322704 (clothianidin) residues in mango and whole fruit (peel and flesh together, peel and dried mango in the range of 0.01 mg/kg-1.0 mg/kg with a limit of quantification of 0.1 mg/kg. Acceptable concurrent recovery data were obtained for thiamethoxam (66–102, 9–10% RSD) and CGA322704 (clothianidin) (60–96, 7–13% RSD) in each matrix at 0.01–1 mg/kg. The specificity of the method was demonstrated by analysing control samples of each matrix. No background interference was experienced at the limit of quantification of 0.01 mg/kg. Linearity was demonstrated by using linear regression analysis of the detector response area of both compounds against the compounds in the calibration standard (calibration curves existed of at least four different concentrations of the two compounds).

HPLC/DAD method (persimmon), further to be referred to as Method MFDS201304

In the residue trials for persimmon [Kim, 2012, MFDS201304] a HPLC/DAD analytical method, not previously described in JMPR 2010, 2011, or 2012, was used. Fresh persimmon (25 g) was extracted with acetone and filtered over filter paper. The flask and filter cake were rinsed again with acetone. The combined filtrate and rinsate was partitioned with a mixture of water, NaCl and dichloromethane (100:50:100 v/v). The organic layer was filtered through an anhydrous Na_2SO_4 layer (20 g). The filter cake was rinsed with dichloromethane. The pooled organic extract was evaporated to dryness at 40 °C by rotary vacuum evaporation. The residue was redissolved with 5 mL of methanol:water (50:50 v/v) solution. Samples were analysed by HPLC with diode array detector (DAD) with a mobile phase of methanol:water of 30:70 (first experiment) or 25:75 (second experiment). The reported LOQ was 0.02 mg/kg for both parent and CGA322704 (clothianidin).

There was no interference with other substances observed at the retention times of thiamethoxam and CGA3220704 (clothianidin) above 30% of the LOQ. Acceptable concurrent recovery data were obtained for each analyte (85.9–99.4%) at 0.02, 0.2, and 2 mg/kg spike levels. Linearity was demonstrated by using linear regression analysis of the detector response area of both compounds against the compounds in the calibration standard (calibration curves existed of at least four different concentrations of the two compounds).

Method AG-675

For the trials on avocado [Syngenta, 2008, 464507, T010202-06], hops [Syngenta, 2013a, A9549C_50012, TK0053990 and Starner, 2006, CGA293343/2850, 08451] and mint and mint oil [Syngenta, 2001, 406892, 07362] LC-MS/MS method AG-675 was used. This method has been evaluated by the JMPR in 2010 for various animal and plant matrices (e.g. apple, cotton seed, sorghum forage), but not yet for avocado, mint and hop.

Avocado samples (fruits without stones) were extracted with acetonitrile/water (80:20 v/v), filtered through Celite under vacuum, and the diluted extracts analysed directly by LC-MS/MS using m/z 292 to 211 for thiamethoxam and m/z 250 to 132 for CGA322704.

Mint top samples (leaves and stems) were extracted with acetonitrile/water (80:20 v/v), filtered under vacuum, and the filter cake re-extracted. The combined filtered extracts were cleaned-up by liquid/liquid partition followed by GPC. The resulting extracts were analysed directly by LC-MS/MS using m/z 292 to 211 for thiamethoxam and m/z 250 to 132 for CGA322704.

For mint oil, the extraction procedure was not necessary. The mint oil was diluted with the GPC mobile phase (ethyl acetate/cyclohexane, 50:50 v/v) and cleaned-up by GPC. The resulting extract was analysed directly by LC-MS/MS using m/z 292 to 211 for thiamethoxam and m/z 250 to 132 for CGA322704.

Hop samples (dry cones) were extracted with acetonitrile/water (80:20 v/v), filtered through Celite under vacuum, and the filter cake re-extracted. Aliquots of the combined filtered extracts were concentrated, buffered with 50 mM sodium phosphate, filtered and cleaned-up by solid phase extraction (SPE) using phenyl sorbent cartridges. The resulting extracts were diluted and analysed by LC-MS/MS using m/z 292 to 211 for thiamethoxam and m/z 250 to 132 for CGA322704.

Method REM 179.06

For the trials on fresh beans [Kang, 2005a, CGA293343/2217, CEMR-2185, Kang 2005b, CGA293343/2218, CEMR-2186, Rawle, 2005a, CGA293343/2203,CEMR-2011 , Rawle, 2005b, CGA293343/2204, CEMR-2202, Kang, 2005c, CGA293343/2633, CEMR- 2322] method REM 179.06 was used to establish the residue levels. This method has been evaluated JMPR evaluation 2010. For the current evaluation, the Meeting received an independent method validation for this method.

Independent method validation REM 179.06

Method REM 179.06 was subject to an independent laboratory validation for residue analysis of several crops. The validation consists of a collation of data retrieved for the commodity crops as specified in the OECD Guidance on pesticide Residue Analytical Methods and an additional dry matrix [Anderson and Crook, 2013, CGA293343_11624, TK0122383]. The recovery data are included in tables 1 (thiamethoxam) and 2 (GA322704 (clothianidin)). Sufficient recovery data are available for the majority of the described crops (high water content crops, high protein content crops, high starch content crops, high acid content crops and dry content crops for both thiamethoxam as well as for CGA322704 (clothianidin). The method has however been used only on a limited number and range of high oil content crops. At present insufficient recovery data are available to permit extrapolation to all high oil content crops. The LOQ of the method is 0.02 mg/kg for each analyte for all crops tested. Linearity was sufficiently demonstrated.

Table 1 Analytical recoveries for spiked thiamethoxam in various substrates using method REM 179.06 LC-MS/MS

Commodity	Spike con, mg/kg	n	Mean recov%	Range recov%	RSD (%)	Ref
High water content crops						
Pome fruit						
Apple fruit	0.02	5	99.8 (109, 97, 92, 99, 102[a])	92-109	6.3	CEMR-3520, CEMR-2324, CEMR-2323, CEMR-3521, T010193-05
	0.20-2.0	6	95.2 (101, 92 98, 97, 96, 87[a,b])	87-101	5.2	
Stone fruit						
Cherry fruit	0.02	13	94.2 (79, 101, 100, 80, 96, 78, 94, 112, 88, 84, 109, 103, 100)	79-112	12.1	T000641-06, T000642-06, CEMR-2330, CEMR-2329, CEMR-2444, CEMR-2331, 05-0416, 05-0506, 05-0417,
	0.2-2.0	15	94.6 (93, 91, 96, 86, 88, 96, 84, 88, 109, 103, 101,	84-109	8.9	

Commodity	Spike con, mg/kg	n	Mean recov%	Range recov%	RSD (%)	Ref
			108, 84, 94, 88)			05-0406
Peach fruit	0.02	4	91.8 (91, 95, 98, 83)	83-98	7.1	T001232-06
	0.20	4	96.8 (95, 103, 99, 90)	90-103	5.7	
Plum fruit	0.02	12	92 (101, 93, 102, 79, 100, 95, 96, 83, 81, 88, 91, 95)	79-102	8.5	05-0522, 03-5067, 03-5068, 03-1029, 03-1028, CEMR-2328, 05-0702
	0.20	12	98.8 (107, 101, 101, 107, 124, 97, 100, 88, 90, 87, 85, 92)	85-124	11.0	
Bulb vegetables						
Bulb onions	0.02	2	83 (81, 84)			FSGD-106
	0.05	2	110 (97, 122)			
Fruiting vegetables and cucurbits						
Tomato fruit	0.02	18	93.7 (101, 95, 99, 86, 91, 81, 106, 76, 90, 108, 97, 100, 72, 86, 105, 98, 98)	72-108	10.8	CEMR-3518, CEMR-3519, 03-1030, 03-1006, 03-1020, CEMR-2321, CEMR2320, T000796-06, T001231-06, T000803-06
	0.04-0.2	16	95.4	77-109	9.2	
Pepper fruit	0.02	3	99.7 (101, 86, 112)	86-112	13.1	03-1008, CEMR-2318, CEMR-2319
	0.10-0.20	3	100.3	90-113	11.6	
Cucumber	0.02	4	104.3 (105, 102, 107, 103)	102-107	2.1	CEMR-2204, CEMR-2317, CEMR-2316, T002058-06
	0.20	4	101.8 (107, 104, 101, 95)	95-107	5.0	
Melon and squash	0.02	5	102.6 (99, 105, 103, 102, 104)	99-105	2.2	CEMR-2206, T000807-06, CEMR-3471
	0.20	5	101.4 (106, 90, 105, 105, 101)	90-106	6.6	
Brassica vegetables						
Broccoli inflorescence	0.02	13	95 (98, 94, 104, 91, 108, 96, 111, 89, 74, 86, 90, 95, 94)	74-111	10.2	CEMR-2199, CEMR-2200, CEMR-2315, 05-0504, S08-00739, T001198-09, S11-00619, FSGD-102
	0.20-1.0	13	98 (99, 98, 101, 112, 97, 95, 109, 111, 87, 70, 100, 97, 96)	70-112	11.1	
Broccoli whole plant	0.02	3	98 (92, 102, 101)	92-102	5.6	05-0504
	0.20	3	101 (111, 96, 95)	95-111	8.9	
Sprout buttons	0.02	7	99 (105, 96, 80, 110, 106, 95, 103)	80-110	10.1	T011024-06, S11-00620, FSGD-103
	0.2	7	86 (99, 100, 76, 84, 79, 83, 82)	76-100	11	
Cabbage head/plant	0.02	13	94 (79, 105, 80, 105, 102, 81, 96, 100, 90, 99, 103, 80)	79-105	11.4	05-0701, 05-0507, S09-01595, FSGD-099, FSDG-105, S10-0214, S11-00621
	0.2-0.4	13	96 (95, 85, 90, 101, 101, 101, 92, 93, 107, 87, 98, 98, 87)	85-107	7.0	
Cauliflower inflorescence	0.02	12	92 (91, 100, 87, 102, 96, 76, 91, 106, 79, 87, 102, 84)	76 - 106	10.5	05-0521, 05-0703, S09-01604, S08 00745, T000558-08, T001200-09, FSGD-104, S10-00965, S11-00622
	0.2-2.0	14	95 (100, 95, 93, 92, 95, 87, 82, 111, 101, 91, 103, 87, 98, 89)	82-111	8.0	
Cauliflower	0.02	3	93	84-106	12.2	05-0521, 05-0703

Commodity	Spike con, mg/kg	n	Mean recov%	Range recov%	RSD (%)	Ref
whole plant			(84, 106, 90)			
	0.2-2.0	3	93 (92, 84, 103)	84-103	10.3	
Kale leaves	0.02	1	106	106		FSGD-141
	0.2-2.0	1	89	89		
Leafy vegetables						
Lettuce	0.02	33	97 (99, 110, 105, 99, 92, 109, 93, 97, 97, 98, 96, 85, 82, 95, 91, 88, 99, 89, 108, 93, 112, 108, 112, 81, 110, 88, 110, 73, 86, 110, 86)	73-112	10.8	03-1018, 03-1016, 05-0428, 05-0902, T000805-06, T000804-06, T001230-06, CEMR-3516, CEMR-3517, CEMR-2191, CEMR-2194, 03-4007, 03-4002, 03-4008, 03, 4001, 03-4005, gel515103
	0.1-5.0	33	96 (99, 104, 100, 96, 106, 100, 104, 103, 92, 92, 95, 94, 99, 92, 99, 96, 84, 106, 98, 105, 77, 97, 88, 97, 105, 88, 103, 88, 103, 67, 82, 103, 89)	67-106	9.4	
Forage crops and seedlings						
Alfalfa	0.02	13	96 (99, 99, 110, 89, 87, 119, 96, 75, 95, 96, 101, 105, 75)	75-119	13.0	03-4011, 03-4012, T011008-06, 05-0612, VEMR-2313, CEMR-2314, S08-00735
	0.2-2.0	13	92 (109, 96, 85, 95, 93, 89, 72, 69, 9, 92, 97, 99, 111)	69-111	12.7	
Seedlings (carrot and lettuce)	0.02	8	100 (103, 94, 107, 96, 98, 99, 100, 99)	94-107	4.1	S09-02707, S09-01605, S09-01607
	0.2-25	10	97 (90, 94, 99, 91, 96, 110, 95, 96, 98, 100)	91-110	5.8	
Stem vegetables						
Artichoke flower heads	0.02-0.2	2	108 (113, 102)	102-113	7.2	S08-00742
Fresh legume vegetables						
Beans and peas with and without pods	0.02	27	92 (95, 86, 69, 100, 105, 95, 91, 87, 107, 104, 92, 91, 99, 92, 103, 92, 99, 94, 100, 95, 78, 7, 86, 95, 72, 73)	69-107	11.1	CEMR-2186, CEMR-2185, CEMR-2202, CEMR-2322, 03-8005, 04-8005, 04-8000, 05-0520, FSGD-095, FSGD-098. FSGD-097
	0.2-0.4	27	91 (93, 87, 95, 94, 86, 99, 93, 93, 95, 92, 91, 90, 90, 88, 90, 97, 100, 88, 91, 88, 91, 86, 78, 95, 83, 83)	78-100	5.5	
Beans and peas, remaining plant	0.02	20	91 (91, 98, 94, 102, 116, 104, 92, 72, 76, 75, 107, 84, 98, 100, 64, 91, 95, 109, 64, 91)	64-116	16	CEMR02322, 05-0520, FSGD-095, FSGD-098, FSGD-097
	0.2-0.4	20	85 (83, 97, 99, 86, 90, 92, 84, 93, 71, 71, 89, 79, 97, 79, 76, 75, 90, 92, 76, 75)	71-99	16.6	
High oil content crops						
OSR seeds and maize kernels	0.02	4	90 (82, 89, 80, 108)	80-108	14.2	05-0418, 03-4016
	0.2	4	98 (91, 72, 124, 105)	72-124	22.4	
High protein content crops						
Dry pea and bean seed	0.02	5	86 (97, 95, 86, 68, 82)	68-97	13.6	FSGD-094-REG
	0.2	5	105 (110, 106, 106, 102, 101)	101-110	3.4	
High starch content crops						
Carrot root	0.02	5	95 (99, 85, 111, 89, 90)	85-111	11.0	CEMR-3470, FSGD-096, S11-00615
	0.05-0.2	5	95 (97, 84, 110, 91, 92)	84-110	10.2	
Potato tuber	0.02	7	98 (102, 96, 98, 92, 101, 87, 108)	87-108	7.1	CEMR-2326, 05-0407, 05-0408, CEMR-2325,

Commodity	Spike con, mg/kg	n	Mean recov%	Range recov%	RSD (%)	Ref
	0.2-0.5	7	98 (104, 99, 97, 92, 105, 91, 99)	91-105	5.5	T014228-05, S08-00750
Wheat grain	0.2	1	105	105	-	S08-00736
	0.5	1	102	102	-	
High acid content crops						
Citrus (mandarin, orange)	0.02	7	99 (96, 96, 105, 104, 100, 96, 97)	96-105	4.0	03-1001, 03-1004
	0.1	7	102 (103, 99, 110, 102, 100, 97, 100)	97-110	4.1	
Kiwi	0.02	8	97 (78, 95, 104, 96, 101, 100, 103, 100)	78-104	8.6	T014177-05, T011091-06
	0.2-0.5	6	102 (93, 101, 110, 117, 94, 96)	93-117	9.5	
Grapes	0.02	8	88 (83, 93, 83, 86, 99, 80, 93, 89)	80-99	7.3	05-0901
	0.2	8	95 (96, 101, 90, 96, 98, 85, 98, 93)	85-101	5.4	
Berries; rasp- and strawberry	0.02	19	94 (104, 93, 80, 94, 87, 85, 92, 109, 90, 88, 100, 90, 102, 103, 83, 80, 100, 100, 100)	80-109	9.2	055-0307, -5-0308, 05-0423, 05-0422, 05-0421, 05-0420, T014214-05, T014215-05, S09-01598, S11-01604
	0.10-2.0	20	99 (105, 97, 103, 96, 100, 102, 107, 110, 104, 110, 86, 105, 104, 89, 81, 92, 98, 95, 98, 102)	81-110	7.8	
Dry crops						
Wheat straw (2), maize plant (1), dry pulse haulm (5)	0.02	8	95 (82, 92, 94, 95, 102, 88, 107, 100)	82-107	8.4	S08-00736, CEMR-2198, FSGD-094-REG
	0.2-0.5	8	91 (90, 77, 90, 96, 96, 95, 94, 93)	77-96	6.9	

[a] Wax apple (T010193)
[b] One value at fortification level 2.0 mg/kg

Table 2 Analytical recoveries for spiked CGA322704 (clothianidin) in various substrates using method REM 179.06 LC-MS/MS

Commodity	Spike con, mg/kg	n	Mean and individual recoveries %	Recovery Range %	RSD (%)	Ref
High water content crops						
Pome fruit						
Apple fruit	0.02	7	97 (108, 105, 87, 87, 94, 93, 105)	87-108	9.2	CEMR-3520, CEMR-2324, CEMR-2323, CEMR-3521, T010193-05
	0.20-2.0	4	92 (102, 89, 92, 86)	86-102	7.5	
Stone fruit						
Cherry fruit	0.02	13	90 (78, 74, 81, 72, 99, 72, 86, 109, 102, 92, 107, 99, 96)	72-109	14.9	T000641-06, T000642-06, CEMR-2330, CEMR-2329, CEMR-2444, CEMR-2331, 05-0416, 05-0506, 05-0417, 05-0406
	0.2-2.0	15	92 (89, 74, 88, 91, 93, 93, 80, 85, 108, 93, 96, 102, 93, 96, 94)	74-108	8.9	
Peach fruit	0.02	4	94 (90, 101, 94, 92)	90-101	5.1	T001232-06
	0.20	4	96 (92, 104, 94, 95)	92-104	5.5	
Plum fruit	0.02	12	91 (99, 80, 99, 98, 92, 85, 92, 73, 94, 92, 89, 97)	73-99	8.8	05-0522, 03-5067, 03-5068, 03-1029, 03-1028, CEMR-2328, 05-0702
	0.20	12	97 (120, 106, 98, 95, 86, 91, 83, 101,	83-120	10.1	

Commodity	Spike con, mg/kg	n	Mean and individual recoveries %	Recovery Range %	RSD (%)	Ref
			99, 100, 101)			
Bulb vegetables						
Bulb onions	0.02	2	93 (104, 81)	-	-	FSGD-106
	0.05	2	90 (96, 83)	-	-	
Fruiting vegetables and cucurbits						
Tomato fruit	0.02	18	93 (100, 105, 117, 92, 86, 79, 89, 105, 71, 93, 100, 93, 98, 87, 82, 92, 96, 97)	71-117	11.4	CEMR-3518, CEMR-3519, 03-1030, 03-1006, 03-1020, CEMR-2321, CEMR-2320, T000796-06, T001231-06, T000803-06
	0.04-0.2	16	94 (124, 97, 78, 75, 82, 105, 72, 105, 105, 92, 102, 103, 93, 90, 101, 86)	72-124	14.5	
Pepper fruit	0.02	3	94 (94, 82, 106)	82-106	12.8	03-1008, CEMR-2318, CEMR-2319
	0.10-0.20	3	98 (99, 89, 105)	89-105	8.3	
Cucumber	0.02	4	104 (110, 107, 104, 93)	93-110	7.2	CEMR-2204, CEMR-2317, CEMR-2316, T002058-06
	0.20	4	101 (103, 104, 105, 91)	91-105	6.5	
Melon and squash	0.02	5	98 (103, 102, 79, 103, 102)	79-103	10.8	CEMR-2206, T000807-06, CEMR-3471
	0.20	5	99 (103, 99, 97, 100, 97)	97-103	2.5	
Brassica vegetables						
Broccoli inflorescence	0.02	13	98 (115, 106, 113, 85, 104, 102, 108, 111, 80, 105, 78, 105, 87, 81)	78-115	14.0	CEMR-2199, CEMR-2200, CEMR-2315, 05-0504, S08-00739, T001198-09, S11-00619, FSGD-102
	0.20-1.0	14	94 (103, 115, 111, 92, 95, 93, 102, 111, 79, 70, 98, 84, 75, 81)	70-115	15.2	
Broccoli whole plant	0.02	3	88 (74, 83, 107)	74-107	19.4	05-0504
	0.20	3	92 (87, 94, 96)	87-96	5.1	
Sprout buttons	0.02	7	88 (104, 102, 90, 83, 72, 72, 95)	72-104	14.9	T011024-06, S11-00620, FSGD-103
	0.2	7	80 (99, 107, 87, 70, 61, 68, 69)	61-107	22	
Cabbage head/plant	0.02	13	98 (93, 91, 82, 104, 111, 106, 92, 93, 107, 87, 117, 104, 80)	80-117	11.8	05-0701, 05-0507, S09-01595, FSGD-099, FSDG-105, S10-0214, S11-00621
	0.2-0.4	13	91 (88, 77, 93, 104, 99, 96, 85, 81, 81, 83, 102, 95, 103)	77-104	10.2	
Cauliflower inflorescence	0.02	14	93 (84, 94, 102, 101, 87, 103, 87, 83, 86, 98, 106, 80)	80-106	9.8	05-0521, 05-0703, S09-01604, S08 00745, T000558-08, T001200-09, FSGD-104, S10-00965, S11-00622
	0.2-2.0	13	93 (97, 87, 94, 87, 99, 86, 107, 100, 80, 98, 98, 91, 84)	80-107	8.4	
Cauliflower whole plant	0.02	3	93 (78, 106, 95)	78-106	15.2	05-0521, 05-0703
	0.2-2.0	3	98 (90, 95, 107)	90-107	9.0	
Kale leaves	0.02	2	84 (84, 83)	-	-	FSGD-141
	0.2-2.0	2	80 (80, 79)	-	-	
Leafy vegetables						

Commodity	Spike con, mg/kg	n	Mean and individual recoveries %	Recovery Range %	RSD (%)	Ref
Lettuce	0.02	33	93 (99, 102, 93, 107, 111, 93, 97, 97, 86, 93, 99, 97, 90, 77, 92, 96, 88, 80, 94, 84, 111, 108, 105, 103, 84, 104, 85, 83, 85, 79, 81, 85, 75)	75-111	10.9	CEMR-2190, CEMR-2188, 05-0428, 05-0902, T000805-06, T000804-06, T001230-06, CEMR-3516, CEMR-3517, CEMR-2191, CEMR-2194, 03-4007, 03-4002, 03-4008, 03, 4001, 03-4005, gel515103
	0.1-5.0	30	92 (108, 105, 99, 99, 103, 99, 100, 100, 92, 89, 94, 94, 97, 86, 99, 100, 100, 91, 83, 80, 80, 96, 107, 80, 81, 80, 70, 81, 80, 80)	70-108	11.1	
Forage crops and seedlings						
Alfalfa	0.02	12	84 (87, 100, 106, 72, 67, 76, 76, 72, 85, 87, 82, 101)	67-106	15.0	03-4011, 03-4012, T011008-06, 05-0612, VEMR-2313, CEMR-2314, S08-00735
	0.2-2.0	13	86 (103, 99, 89, 103, 97, 71, 73, 91, 70, 79, 85, 73, 83)	70-103	14.2	
Seedlings (carrot and lettuce)	0.02	6	102 (107, 109, 103, 93, 99, 100)	99-109	5.7	S09-02707, S09-01605, S09-01607
	0.2-5.0	7	98 (100, 98, 94, 89, 104, 97, 101)	89-104	5.1	
Stem vegetables						
Artichoke flower heads	0.02-0.2	2	108 (111, 105)	-	3.9	S08-00742
Fresh legume vegetables						
Beans and peas with and without pods	0.02	26	90 (117, 79, 76, 87, 93, 92, 90, 99, 101, 96, 99, 108, 105, 92, 92, 91, 100, 97, 95, 92, 70, 93, 85, 84, 56, 47)	47-117	16.7	CEMR-2186, CEMR-2185, CEMR-2202, CEMR-2322, 03-8005, 04-8005, 04-8000, 05-0520, FSGD-095, FSGD-098. FSGD-097
	0.2-0.4	27	89 (97, 76, 92, 99, 83, 100, 74, 98, 95, 99, 91, 92, 94, 92, 95, 96, 95, 96, 100, 95)	67-100	10.8	
Beans and peas, remaining plant	0.02	12	85 (82, 93, 85, 105, 101, 96, 89, 87, 78, 79, 47, 79)	47-105	17.5	CEMR02322, 05-0520, FSGD-095, FSGD-098, FSGD-097
	0.2-0.4	12	81 (91, 93, 94, 97, 94, 97, 94, 76, 63, 62, 55, 57)	55-97	21	
High oil content crops						
OSR seeds (3) and maize kernels (1)	0.02	4	83 (73, 87, 95, 77)	73-95	12.0	05-0418, 03-4016
	0.2	4	94 (95, 89, 77, 115)	77-115	16.9	
High protein content crops						
Dry pea and bean seed	0.02	5	90 (98, 83, 96, 78, 94)	78-98	9.8	FSGD-094-REG
	0.2	5	87 (95, 87, 82, 79, 91)	79-95	7.5	
High starch content crops						
Carrot root	0.02	5	93 (100, 90, 104, 87, 84)	90-100	9.2	CEMR-3470, FSGD-096, S11-00615
	0.05-0.2	5	92 (96, 89, 99, 89, 89)	89-99	5.2	
Potato tuber	0.02	7	98 (99, 87, 96, 109, 105, 82, 108)	82-102	10.6	CEMR-2326, 05-0407, 05-0408, CEMR-2325, T014228-05, S08-00750
	0.2-0.5	7	98 (101, 97, 93, 100, 102, 90, 98)	93-102	4.5	
Wheat grain	0.2	1	105	105	-	S08-00736
	0.5	1	107	107	-	
High acid content crops						

Commodity	Spike con, mg/kg	n	Mean and individual recoveries %	Recovery Range %	RSD (%)	Ref
Citrus (mandarin, orange)	0.02	7	96 (93, 83, 101, 103, 95, 92, 102)	83-103	7.4	03-1001, 03-1004
	0.1	7	101 (100, 103, 99, 109, 99, 101, 99)	99-101	3.6	
Kiwi	0.02	8	91 (71, 79, 92, 101, 105, 96, 92, 90)	71-105	12.3	T014177-05, T011091-06
	0.2-0.5	6	98 (86, 93, 110, 116, 96, 85)	85-116	13.0	
Grapes	0.02	8	90 (80, 91, 78, 89, 98, 82, 105, 99)	78-105	10.9	05-0901
	0.2	8	96 (97, 99, 96, 95, 100, 81, 105, 95)	81-105	7.2	
Berries; rasp- and strawberry	0.02	19	95 (102, 93, 113, 74, 96, 103, 100, 86, 105, 96, 95, 102, 82, 99, 82, 89, 94, 103, 93)	74-113	9.9	055-0307, -5-0308, 05-0423, 05-0422, 05-0421, 05-0420, T014214-05, T014215-05, S09-01598, S11-01604
	0.10-2.0	20	96 (100, 97, 94, 93, 95, 100, 98, 96, 97, 100, 95, 98, 102, 88, 78, 98, 99, 90, 101)	78-102	5.8	
Dry crops						
Wheat straw (2), maize plant (1), dry pulse haulm (5)	0.02	8	90 (81, 104, 75, 82, 92, 90, 103, 93)	75-104	11.5	S08-00736, CEMR-2198, FSGD-094-REG
	0.2-0.5	8	88 (95, 77, 77, 91, 91, 90, 91, 89)	77-95	7.7	

[a] Wax apple (T010193)

Stability of pesticide residues in stored analytical samples

The freezer storage stability of thiamethoxam and metabolite CGA322704 (clothianidin) at residue concentrations was already established for by the JMPR 2010 evaluation of thiamethoxam in apples, tomatoes, potato tubers, rape seed, maize grain, cranberries, hops, barley grain, barley hay, barley straw, pearled barley and barley flour. Thiamethoxam, and metabolites CGA322704 (clothianidin) and CGA265307 were apparently stable at residue concentrations in the various substrates tested at the freezer temperatures and test durations. The durations of test were mostly 1–2 years, but some were less. Test temperatures were mostly approximately -18 °C to -20 °C, but other storage temperatures were used in some storage stability tests, e.g., between -26 °C and -4 °C. The JMPR 2010 evaluation of clothianidin has established that parent clothianidin was stable when stored at temperatures of -10 °C or lower for at least 24 months in crops with high water content (apple, Japanese pear, apricot, peach, cauliflower, head cabbage, cucumber, tomato, lettuce, maize and forage), for at least 18 months in crops with high acid content (cranberries and grapes), for at least 24 months in crops with high oil content (dry soya beans, cottonseed, rape and seed), for at least 24 months in crops with high starch content (maize grain, rice grain, sugar beet roots and potatoes), for at least 10 months in dry tea leaves, for at least 24 months in maize straw, for at least 2 months in tomato paste, for at least 4 months in cotton meal, and for at least 4 months in cotton oil. The storage stability data as provided in the different residue trials submitted for the current evaluation have been summarized in Table 3.

Table 3 Storage stability data of thiamethoxam and CGA322704 (clothianidin)

Commodity	Residue	Storage time (days)	% remaining mean range RSD_r	concurrent recovery	reference, method
persimmon	Thiamethoxam Fresh	31-52	95.1%, RSD 2.1 (n=5)	89.2-94.8% (fortification level 0.02, 0.2, 2.0 mg/kg)	Kim 2012, MFDS201304, HPLC/DAD 2011 data
	Thiamethoxam Freezer	31-52	92.7%, RSD 1.8 (n=5)		

Commodity	Residue	Storage time (days)	% remaining mean range RSD_r	concurrent recovery	reference, method
	CGA322704 Fresh	31-52	85.9%, RSD 3.1 (n=5)	85.9-99.4% (fortification level 0.02, 0.2, 2.0 mg/kg)	
	CGA322704 Freezer	31-52	87.1%, RSD 3.4 (n=5)		
persimmon	Thiamethoxam Fresh	14-35	85.3%, RSD 4.0 (n=5)	83.1-93.5% (fortification level 0.032, 0.2, 0.05, 2.0 mg/kg)	Kim 2012, MFDS201304, HPLC/DAD 2012 data
	Thiamethoxam Freezer	14-35	85.0%, RSD 5.6 (n=5)		
	CGA322704 Fresh	14-35	82.0%, RSD 4.2 (n=5)	81.5-85.5% (fortification level 0.02, 0.2, 0.5, 2.0 mg/kg)	
	CGA322704 Freezer	14-35	81.2%, RSD 5.1 (n=5)		
avocado	Thiamethoxam	290	85%, s.d. 2 (n=3)	77.3 ± 3% (n=5, fortification levels 0.01-0.10 mg/kg)	Syngenta 2008, 464507, Method AG-675
	CGA322704	290	98%, s.d. 3 (n=3)	93 ± 5% (n=5, fortification levels 0.01-0.10 mg/kg)	
mint, tops	Thiamethoxam	452	90, 91, and 102% of 0.5 mg/kg	77-85% (means of fortification levels 0.05, 0.5, and 5.0 (n=4, 7, 4))	Syngenta, 2001, 406892, Method AG-675
	CGA322704	452	113, 114, and 121% of 0.05 mg/kg	83.9-96.5 % (means of fortification levels 0.05, 0.5, and 5.0 (n= 4, 7, 4))	
mint, oil	Thiamethoxam	465	98, 103, and 109% of 0.05 mg/kg	92-116% (means of fortification levels 0.05, 0.5, and 5.0 mg/kg (n=5, 6, 4))	
	CGA322704	465	118, 125, and 125% of 0.05 mg/kg	92-111% (means of fortification levels 0.05, 0.5, Ans 5.0 mg/kg (n= 5, 6, 4))	

USE PATTERN

Copies or English translations of thiamethoxam labels from the following countries were made available to the Meeting from USA, Portugal, South Africa and Korea.

Table 4 Registered uses of thiamethoxam

Crop	Country	Form	Application				PHI, days
			Method	Rate kg ai/ha	Spray conc, kg ai/hL	Number (max rate/season)	
avocado	USA	(25%) WG	Foliar	0.070	0.015	3[a] (max 0.21 kg ai/ha)	0
fresh beans	Portugal	(25%) WG	Foliar [b]	0.100	0.010	1-2 (max 0.200 kg ai/ha/crop season)	3
fresh beans	Portugal	(25%) WG	Drip irrigation [c]	0.100-0.200		1-2 (max 0.200 ai/ha)[c]	3
hops	USA	(75%) SG	Soil	0.140[d]		1	65
mango	South Africa	(240 g/L) SC	Soil	1.44 g ai/tree (6 ml/tree)	0.144	1	130
mint	USA	(25%) WG	Foliar [e]	0.0263-0.0525	0.028-0.112	4-8 (max 0.210 kg ai/ha)	7
mint	USA	(25%) WG	Foliar [e]	0.0525-	0.056-0.149	3-4	7

Crop	Country	Form	Application				PHI, days
			Method	Rate kg ai/ha	Spray conc, kg ai/hL	Number (max rate/season)	
				0.0700		(max 0.210 kg ai/ha)	
Persimmon (Japanese)	Korea	(10%) WG	Foliar	-[f]	0.005	3 (interval 10 days)	7

[a] Do not exceed 0.21 kg ai/ha (equiv. to 0.188 lbs ai/acre) per growing season. Minimum of 7 days interval. Do not use less than 467 L/ha (50 GPA) for ground application. Use sufficient water volume to cover all foliage.
[b] Indoor and outdoor use, according to Portuguese label. Interval of 7 days. For outdoor use only apply after flowering.
[c] Only indoor use according to Portuguese label.
[d] Apply specified dosage in sufficient water volume to ensure uniform application and incorporation into the soil using one of the following methods: 1. Apply a surface band on each side of the row out to the plant canopy drip line or within the vegetation free herbicide strip, followed by sufficient irrigation to incorporate the product into the plants root zone. 2. apply by chemigation into the root zone through low-pressure microsprinkler, trickle or drip type irritation systems. 3. hill drench in sufficient water to ensure incorporation into the root zone followed by irrigation.
[e] 0.11-0.21 and 0.21-0.28 kg product/ha (equiv. to 1.5-3.0 or 3.0-4.0 oz product/A) for peppermint and spearmint. Max of 0.21 kg ai/ha (equiv. to 0.188 lb ai/A) per growing season. Do not use less than 467 L/ha (50 GPA) for ground application. Use sufficient water volume to cover all foliage. Minimum interval 14 days.
[f] The spray application is commonly conducted until the fluid is dripping down the leaves.

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

The Meeting received information on supervised residue trials of thiamethoxam for avocado, mango, fresh common beans, hops, mint, and persimmon. The commodities are grouped into Codex commodity groups.

Crop group	Commodities	Table No.
Pome fruit	Persimmon: Korea	Table 5
Assorted tropical fruits – inedible peel	Avocado: USA	Table 6
Assorted tropical fruits – inedible peel	Mango: South Africa	Table 7
Legume vegetables	Fresh beans: Portugal	Table 8
Fresh herbs	Mint: USA	Table 9
Dried herbs	Hops: USA	Table 10

Application rates and spray concentrations have been rounded to three figures; residues 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.

The residues presented in the tables are given as individual compounds (parent and CGA322704, separately).

Pome fruits

Japanese persimmon

Six supervised residue field trials were conducted on Japanese persimmon in the 2011–2012 growing season in the Korea [Kim, 2012, MFDS201304].

Small plots (80 m^2) of 12–32 year old persimmon trees were treated three times with a WG formulation at a nominal rate of 156–438 g ai/ha (all with spray concentrations of 0.005 kg ai/hL) with a 10–11 days interval at growth stage BBCH 77–79. The plots were treated as indicated in Table 5 using a hand sprayer.

Samples of persimmon (6–51 kg) were taken at maturity at six time points after the final application, Growth stages were not reported. Seeds and stalk were removed from the persimmon before preparation. Subsequently, the samples were chopped and thoroughly mixed. All samples were stored frozen for 31–52 days (2011 trials) and 14–35 days (2012 trials) at -20 °C. The stability of thiamethoxam and clothianidin (CGA322704) during storages was tested (recovery was 85.9–95.1% for the 2011 trials and 81–85% for 2012 trials).

Samples were analysed for parent and clothianidin (CGA322704) with a HPLC/DAD method (Method MFDS201304) with an LOQ of 0.02 mg/kg. The method is described in the analytical section of the evaluation.

Concurrent recoveries were 89.2–94.8% and 85.9-99.4% for parent and CGA322704, respectively at fortification levels of 0.02, 0.2 and 2.0 mg/kg in the 2011 trials and 83.1–93.5% and 81.5–85.5% for parent and CGA322704, respectively at fortification levels of 0.02, 0.2, 0.5 and 2.0 mg/kg in the 2012 trials.

Note: The analytical method is considered valid in the range 0.02–2.0 mg/kg for the determination of thiamethoxam and CGA322704 in persimmon.

Table 5 Residues of thiamethoxam and metabolite CGA322704 (clothianidin) after pre-harvest treatment of Japanese persimmon (fruits)

Location, year, (variety) Soil type	Form	No	Interval (days)	g ai/ha	L/ha	method, last application	DAT	parent, mg/kg [a]	CGA322704 mg/kg [a]	Author, Report, Trial
Woodong-ri[b], Gyeongnam province, Republic of Korea (Fuyu Persimmon), Sandy loam	WG	3	10 10	210 214 211	4200 4275 4225	Foliar spray, 26 Sept, 2011 BBCH 77-79	0 1 3 7 14 21	0.27 0.22 0.20 0.15 0.09 0.08	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02 < 0.02	Kim, 2012, MFDS201304, Field 1
Mosan-ri[b], Gyeongnam province, Republic of Korea (Fuyu Persimmon), Loam	WG	3	10 10	300 275 280	6000 5500 5600	Foliar spray, 26 Sept, 2011 BBCH 77-79	0 1 3 7 14 21	0.24 0.21 0.13 <u>0.14</u> 0.13 0.08	< 0.02 < 0.02 < 0.02 <u>< 0.02</u> < 0.02 < 0.02	Kim, 2012, MFDS201304, field 2
Hwacheon-ri[b], Gyeongnam province, Republic of Korea (Fuyu Persimmon), Sandy loam	WG	3	10 10	156 156 158	3125 2110 3150	Foliar spray, 26 Sept, 2011 BBCH 77-79	0 1 3 7 14 21	0.25 0.28 0.19 0.13 0.12 0.08	0.02 0.02 0.02 0.02 0.02 0.03	Kim, 2012, MFDS201304, Field 3
Noyeon-ri[b], Gyeongnam province, Republic of Korea (Fuyu Persimmon), Sandy clay loam	WG	3	10 11	437 438 438	8740 8750 8765	Foliar spray, 08 Oct, 2012 BBCH 77-79	0 1 3 7 14 21	0.29 0.25 0.25 <u>0.19</u> 0.10 0.04	< 0.02 < 0.02 < 0.02 <u>< 0.02</u> < 0.02 < 0.02	Kim, 2012, MFDS201304, Field 4
Masan-ri[b], Gyeongnam province, Republic of	WG	3	10 11	400 385 388	8000 7700 7750	Foliar spray, 08 Oct, 2012 BBCH 77-	0 1 3 7	0.27 0.25 0.22 0.18	< 0.02 < 0.02 < 0.02 < 0.02	Kim, 2012, MFDS201304, Field 5

Location, year, (variety) Soil type	Form	No	Inter val (days)	g ai/ha	L/ha	method, last application	DAT	parent, mg/kg [a]	CGA322704 mg/kg [a]	Author, Report, Trial
Korea (Fuyu Persimmon), Sandy clay loam						79	14 21	0.13 0.07	< 0.02 < 0.02	
Gamgye-ri, Gyeongnam province[b], Republic of Korea (Fuyu Persimmon), Sandy clay loam	WG	3	10 11	360 350 368	7200 7000 7350	Foliar spray, 08 Oct, 2012 BBCH 77-79	0 1 3 7 14 21	0.28 0.24 0.16 0.14 0.12 0.05	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02 < 0.02	Kim, 2012, MFDS201304, Field 6

[a] Results are mean values of 4 replicate samples.
[b] Trials were performed in the same region (<10 km apart)

Assorted (sub) tropical fruits with inedible peel

Avocado

Supervised residue field trials were conducted on avocado in the 2006–2007 growing seasons in the USA and Mexico [Syngenta, 2008, 464507, T010202-06]. Plots (size not reported) of avocado trees were treated thrice with a 25 WG formulation at an application rate of approximately 70 g ai/ha (0.0625 lbs ai/A) using boom sprayers using 93–3738 L/ha (10–400 GPA).

Avocados were harvested at two time points after the final application at maturity (growth stages not reported). Samples were collected from (24 fruits from at least 4 separate trees) reaching at least 2 kg. Stems and pits were removed at time of sampling. All samples were stored frozen for a maximum of 9 months at -20 ºC. This storage period is covered by the storage stability studies (24 months).

Samples were analysed for parent and its metabolite CGA322704 using HPLC-MS/MS method Syngenta Analytical Method AG-675, with an LOQ of 0.01 mg/kg for parent and metabolite. Residues of thiamethoxam and CGA322704 from the trials are summarised in Table 6. Residues of each of these analytes from untreated plots were less than the LOQ (0.01 mg/kg). Average concurrent recoveries at 0.01 and 0.14 mg/kg were within 70–120% for each analyte (range 72–99%).

Note: The analytical method is considered valid in the range 0.01–0.14 mg/kg for the determination of thiamethoxam and CGA322704 in avocado.

Table 6 Residues of thiamethoxam and metabolite CGA322704 (clothianidin) after pre-harvest treatment of avocado in RAC and (fruits without pits)

Location, year, (variety) Soil type	Form	No	Inter val (days)	g ai/ha	kg ai/hL	method, last application	DAT	parent, mg/kg[a]	CGA322704 mg/kg[a]	Ref, trial
Irvine CA, USA, 2007 (Hass), fine sandy loam	SC	3	7 6	70.1 70.1 70.1	18.7 18.4 18.5	Backpack spraying, 19 March, 2007, Fruit ripening	0 3	0.03 (0.04) <u>0.06</u> (0.08)	< 0.01 <u>< 0.01</u>	Syngenta 464507, 2008, 09607.06-CA116
Porterville, CA, USA, 2006 (Zutano), clay	SC	3	7 7	70.1 70.1 70.1	5.2 5.2 5.1	Airblast spraying, 14 November, 2006, fruiting	0 3	0.03 (0.04) <u>0.03</u> (0.04)	< 0.01 <u>< 0.01</u>	Syngenta 464507, 2008, 09607.06-CA117
Homestead, FL, USA, 2006	SC	3	7 7	70.7 70.7	7.3 7.3	Tractor mounted	0 3	< 0.01 <u>< 0.01</u>	< 0.01 <u>< 0.01</u>	Syngenta 464507,

Location, year, (variety) Soil type	Form	No	Interval (days)	g ai/ha	kg ai/hL	method, last application	DAT	parent, mg/kg[a]	CGA322704 mg/kg[a]	Ref, trial
(Booth 7), loam				70.7	7.3	spraying, 22 September, 2006, fruiting				2008, 09607.06-FL51
Los Reyes, Mexico, 2006 (Hass), loamy sand	SC	3	7 6	64.1 70.2 71.1	75.4 75.5 69.7	Backpack spraying, 03 November, 2006, mature	0 3	0.24 (0.30 0.13 (0.16)	0.01 (0.01) 0.02 (0.02)	Syngenta 464507, 2008, 01-IR-06-7255
Los Reyes, Mexico, 2006 (Hass), sandy loam	SC	3	6 6	67.6 68.4 68.1	7.2 7.4 7.4	Backpack spraying, 03 November 2006, mature	0 3	0.10 (0.12) 0.08 (0.10)	< 0.01 0.02	Syngenta 464507, 2008, 01-IR-06-7256

[a] Results are the average of two replicate analytical samples. Original data × 0.80 conversion factor to represent the RAC whole fruit (original data representing the fruit without the stone).

Mango

The Meeting received information on supervised residue trials on mango conducted in South Africa in the growing seasons 2003/2004 and 2011/2012. The data from 2003/2004 were already evaluated by the JMPR in 2010. The data from 2011/2012 were submitted to supplement the original studies [Thirion, 2013a, Syngenta A9795B_11446, 2418/F787] and the results are presented in Table 7. In addition residue data for thiamethoxam after an exaggerated application (3X) were generated for determining processing factors for thiamethoxam and CGA322704 in mango [Thirion, 2013b, and c, Syngenta A9795B_11447, 2418/F788 and Syngenta A9795B_1148, 2418/G676]. These results are summarized in the section on processing.

Plots (462–1111 trees/ha, 5–8 trees/plot) of mango trees were treated once with a 240 SC formulation at an application rate of 6 or 12 ml diluted in 1 or 2 litre of water and poured around the tree with a jug at a rate of , respectively 1.4 or 2.9 g/tree.

Mangoes were harvested at maturity at one or more time points after the treatment. Samples were collected (8–24 fruits from at least 8 separate trees) ranging from 1.3 to >6 kg. Despite picking more than 12 items (21 to 24) in trial ZA13 RMG 001-2012, the samples sizes were < 2 kg at BBCH 75 and 76 (DAT 61 and 74, respectively). The samples sizes at DAT 118 and more were ≥ 3.4 kg. In addition, at DAT 89, 79 and 81 in the same trail only 8 items were picked instead of the required 12. In the other three trials the weight of the sample and the number of picked fruits was sufficient. All samples were stored frozen at <-18 ºC and processed and analysed within one year. This storage period is covered by the storage stability studies (24 months).

Samples were analysed for parent and its metabolite CGA322704 using SABS in-house Method No 054/2010 with an LOQ of 0.01 mg/kg for both parent and metabolite. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (72–92% for each analyte at 0.01, 0.03, 0.05 and 0.10 mg/kg). Residues of thiamethoxam and CGA322704 from the trials are summarised in Table 7.

Table 7 Residues of thiamethoxam and metabolite CGA322704 (clothianidin) after pre-harvest treatment of mango (whole fruits)

Location, year, (variety)	Form	No	g ai/tree	method, last application	DAT	Portion analyzed[a]	parent, mg/kg	CGA322704 mg/kg	Author, Study number, Trial
Schagen, Nelspruit Mpumalanga, South Africa, 2011-2012	SC	1	1.44 (6 ml/tree)	Jug pouring, 15 Sept,	61 74 89	whole fruit	0.02 0.02 0.02	< 0.01 < 0.01 < 0.01	Thirion, 2013a, 11/787,

Location, year, (variety)	Form	No	g ai/tree	method, last application	DAT	Portion analyzed[a]	parent, mg/kg	CGA322704 mg/kg	Author, Study number, Trial
(Tommy Atkins), soil type not reported				2011 BBCH 67	105 118		0.02 0.02	< 0.01 < 0.01	ZA13 RMG 001 2012
					61 74 89 105 118	peel and flesh	0.03 0.03 0.03 0.03 0.03	0.01 0.01 0.01 0.01 0.02	
Schagen, Nelspruit Mpumalanga, South Africa, 2011-2012 (Tommy Atkins), soil type not reported	SC	1	2.88 (12 ml/tree)	Jug pouring, 15 Sept, 2011, BBCH 67	61 74 89 105 118	whole fruit	0.07 0.06 0.04 0.04 0.04	0.01 0.01 0.01 0.01 0.01	Thirion, 2013a, 11/787, ZA13 RMG 001 2012
					61 74 89 105 118	peel and flesh	0.08 0.06 0.04 0.05 0.05	0.01 0.01 0.01 0.02 0.02	
Welgelegen,Nelspruit Komatipoort, Mpumalanga Mooketsi, South Africa, 2011-2012 (Kent), sandy loam	SC	1	1.44 (6 ml/tree)	Jug pouring, 16 Sept, 2011, BBCH 67	118	whole fruit	0.02	0.01	Thiron, 2013a, 11/787, ZA13 RMG 002 2012
					118	peel and flesh	0.02	0.01	
Welgelegen,Nelspruit Komatipoort, Mpumalanga Mooketsi, South Africa, 2011-2012 (Kent), sandy loam	SC	1	2.88 (12 ml/tree)	Jug pouring, 16 Sept, 2011, BBCH 67	118	whole fruit	0.03	0.01	Thiron, 2013a, 11/787, ZA13 RMG 002 2012
					118	peel and flesh	0.03	0.01	
Jonkmanspruit, Hoedspruit, Limpopo, 2011-2012, South Africa (Tommy Atkins), soil type not reported	SC	1	1.44 (6 ml/tree)	Jug pouring, 14 Sept, 2011, BBCH 65-67	61 75 90 105 119	whole fruit	0.03 0.03 0.03 0.02 0.02	0.01 0.01 0.01 0.02 0.02	Thirion 2013a, 11/787, ZA14 RMG 003 2012
					61 75 90 105 119	peel and flesh	0.03 0.03 0.03 0.03 0.03	0.01 0.01 0.01 0.02 0.02	
Jonkmanspruit, Hoedspruit, Limpopo, 2011-2012, South Africa (Tommy Atkins), soil type not reported	SC	1	2.88 (12 ml/tree)	Jug pouring, 14 Sept, 2011, BBCH 65-67	61 75 90 105 119	whole fruit	0.15 0.13 0.14 0.11 0.13	0.03 0.03 0.04 0.04 0.05	Thirion 2013a, 11/787, ZA14 RMG 003 2012
					61 75 90 105 119	peel and flesh	0.16 0.15 0.18 0.15 0.15	0.03 0.04 0.06 0.06 0.06	
Mahuka Block 3A, Tzaneen, Limpopo, South Africa, 2011-2012 (Keitt), soil type not reported	SC	1	1.44 (6 ml/tree)	Jug pouring, 14 Sept, 2011, BBCH 65	119	whole fruit	0.01	0.01	Thirion 2013a, 11/787, ZA14 RMG 004 2004
					119	peel and flesh	0.01	0.02	
Mahuka Block 3A, Tzaneen, Limpopo, South Africa, 2011-2012 (Keitt), soil type not reported	SC	1	2.88 (12 ml/tree)	Jug pouring, 14 Sept, 2011, BBCH 65	119	whole fruit	0.03	0.03	Thirion 2013a, 11/787, ZA14 RMG 004 2004
					119	peel and flesh	0.03	0.04	

n.a. = not applicable

[a] In accordance with OECD Guideline Test No. 509 (crop field trial) the residues were determined in flesh and skin after removal of the stone and calculated to and expressed as whole fruit.

Legume vegetables

Fresh beans with pods

Eight residue trials were conducted on fresh beans in the 2003 and 2004 in Spain [Kang, 2005a, CGA293343/2217, CEMR-2185, Kang 2005b, CGA293343/2218, CEMR-2186, Rawle, 2005a, CGA293343/2203, CEMR-2201, Rawle, 2005b, CGA293343/2204, CEMR-2202, Kang, 2005c, CGA293343/2633, CEMR- 2322]. Beans were treated with a WG formulation at a nominal rate of 100 g ai/ha at growth stage BBCH 65–89 and again 6–7 days later (BBCH 71–89). Small plots (23–46 m^2) were treated as indicated in table 8 using boom sprayers with a spray volume of approximately 1000 L/ha.

Samples of fresh beans with pods (1.0–2.4 kg) were taken at maturity at three time points after the final application within growth stages BBCH 71–78. In the 2004 trials also samples of remaining plant (5.7–14 kg) were taken at the same stages. Samples were collected at random from the whole plot. Plant samples were collected without roots. All samples were stored frozen at -18 °C. No data on storage duration were submitted. As the study was completed within a year, the storage duration is <365 days and sufficiently covered by the storage stability studies performed in a large variety of crops.

Samples were analysed for parent and CGA322704 with LC-MS/MS analytical method REM 179.03 with an LOQ of 0.02 mg/kg. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent recoveries (69–95% and 76–117% for parent and CGA322704, respectively at fortification levels of 0.02 and 0.20 mg/kg) in the different studies. Residues of thiamethoxam and CGA322704 from the trails are summarized in Table 8.

Table 8 Residues of thiamethoxam and metabolite CGA322704 (clothianidin) after pre-harvest treatment of fresh (common) beans (pods with seeds)

Location, year, (variety) Soil type	Form	No	Interval (days)	g ai/ha	L/ha	method, last application	DAT	BBCH at sampling[b]	parent, mg/kg	CGA322704 mg/kg	Author, Study number, Trial
El Ejido, Almeria, Spain, 2003 (Oriente), Sandy gravelly	WG	2	6	102 103	1020 1025	Foliar spray, 27 May, 2003 BBCH 75	0 1 3 7 14	75 75 75 77 79	0.32 0.22 <u>0.08</u> < 0.02 < 0.02	0.06 0.08 <u>0.07</u> 0.05 < 0.02	Kang 2005a, CEMR-2185, trial 03-1012
El Matagorda, Almeria, Spain, 2003 (Dona), sandy	WG	2	6	100 102	1004 1023	Foliar spray, 03 December, 2003 BBCH 71	0 1 3 8 14	71 72 72 75 77	0.20 0.12 <u>0.09</u> < 0.02 < 0.02	0.06 0.07 <u>0.10</u> 0.07 < 0.02	Kang, 2005b, CEMR-2186, trial 03-1013
Sanlúcar de Barrameda, Spain, 2003 (Dulce), sandy	WG	2	6	97 98	967 984	Foliar spray, 29 April, 2003 BBCH 73-74	0 1 3 7 14	73-74 73-74 74 75 76	0.14 0.11 <u>0.08</u> < 0.02 < 0.02	0.05 0.07 <u>0.08</u> 0.03 < 0.02	Rawle, 2005a, CEMR-2201, trial 03-1011
Puntalon, Granada, Spain, 2003 (Maite), sandy	WG	2	6	101 101	1007 1006	Foliar spray, 10 March, 2003 BBCH 78	0 1 3 7 14	78 78 78 78 78	0.18 0.12 <u>0.08</u> 0.02 < 0.02	0.04 0.05 <u>0.04</u> 0.04 < 0.02	Rawle, 2005b, CEMR-2202, trial 03-1014
Lora der Rio, Seville,	WG	2	7	96 93	957 926	Foliar spray, 23	0 1	71-75 71-75	0.30 0.23	0.06 0.04	Kang, 2005c,

Location, year, (variety) Soil type	Form	No	Interval (days)	g ai/ha	L/ha	method, last application	DAT	BBCH at sampling[b]	parent, mg/kg	CGA322704 mg/kg	Author, Study number, Trial
Spain, 2004 (Oriente), loam						Nov, 2004 BBCH 71-75	3 7 16	≤77 ≤77 ≤77	0.16 0.03[a] < 0.02	0.06 0.05[a] < 0.02	CEMR-2322, trial ES-IR-04-0054
Penaflor, Seville, Spain, 2004 (Oriente), silt clay	WG	2	7	69 93	996 978	Foliar spray, 12 July, 2004 BBCH 73-74	0 1 3 8 14	73-74 73-74 74 75 77-79	0.20 0.20 0.18 0.03[a] < 0.02	0.04 0.05 0.04 0.04[a] < 0.02	Kang, 2005c, CEMR-2322, trial ES-IR-04-0055
El Mareny de Barraquetes, Sueca, Valencia, Spain, 2004 (Perona), sandy	WG	2	8	113 99	1127 990	Foliar spray, 07 Sept, 2004 BBCH 85-89	0 1 3 7 13	85-89 85-89 89 89 89	0.16 0.14 0.08[b] 0.02[b] < 0.02	0.10 0.12 0.09[b] 0.08[b] < 0.02	Kang, 2005c, CEMR-2322, trial ES-IR-04-0056
Matagorda, Almeria, Spain, 2004 (Festival), sandy	WG	2	7	104 105	1042 1052	Foliar spray, 05 Oct, 2004 BBCH 74	0 1 3 8 14	74 74 75 77 77	0.21 0.09[a] 0.03[a] < 0.02[a] < 0.02	0.09 0.11[a] 0.09[a] 0.03[a] < 0.02	Kang, 2005c, CEMR-2322, trial ES-IR-04-0057

[a] Mean of three values
[b] BBCH growth stage is included to demonstrate that the samples were collected at the green stage of the beans. BBCH 79 is before ripening of the fruit (beans get hard). This process starts at BBCH 81 to 89.

Fresh herb

Mint

Five supervised residue field trials were conducted on mint in 2000–2001 in the USA [Syngenta, 2001, 406892, 07362]. The trials were not previously evaluated by the JMPR.

Plots (61–293 m^2) of mint received three foliar applications at an interval of 13–15 days and a rate of approximately 70 g ai/ha (0.066 lbs ai/A, with a total of 0.198 lb ai/A) per treatment with a WG formulation, using 245–300 L water/ha (20–50 GPA). At two sites one additional plot received three applications at an intended rate of 370 g ai/ha (5×) each for a total of 1.1 kg ai/ha with an interval of 13–14 days. Six or 7 days after the last treatment at least 1.8 kg of mature mint tops (leaves and stem) were harvested. Mint oil was distilled from additional tops (sample size 0.9 kg) collected from the 5X tops (see section on processing).

All samples were stored frozen for a maximum of 482 days (tops) or 502 days (oil) at < 0 ºC. This storage period is covered by the storage stability (452 days for tops and 465 days for oil).

Samples were analysed for parent and its metabolite CGA322704 using LC-MS/MS Method No AG-675 with an LOQ of 0.05 mg/kg for both parent and metabolite (see analytical section). Results were not corrected for control levels (< 0.05 mg/kg for each analyte) nor for average concurrent method recoveries (77–85% (parent) and 92–96% CGA322704) for each analyte at 0.05, 0.50 and 5.0 mg/kg). Residues of thiamethoxam and CGA322704 from the trial are summarised in Table 9.

Table 9 Residues of thiamethoxam and metabolite CGA322704 (clothianidin) in mint after pre-harvest treatment (tops)

Location, year, (variety)	Form	No (interval)	g ai/ha	water L/ha	method, timing	DAT	residues, mg/kg[a]		Reference, Study number, Trial
							Parent	CGA322704	
Sullivan, WI, USA, (Murray mitchem) Sand, silt clay 42, 17, 41 (clay muck)	WG	3 (13-15 d)	73.9 74.2 73.9	287 297 291	Foliar backpack, 26 July, 1999, crop stage: bud	7	0.24	0.06	Syngenta, 2001, 07362, 99-WI25
	WG	3 (13-15 d)	377 371 381	291 297 300		7	1.82	0.20	
Marshall, WI, USA (Scotch spearmint) Sand, silt clay 42, 17, 41 (clay muck)	WG	3 (13-15 d)	72.7 72.7 73.9	289 286 287	Foliar backpack, 29 June, 1999, crop stage: vegetative	6	0.28	0.07	Syngenta, 2001, 07362, 99-WI26
Prosser, WA, USA, 1999 (native spearmint), Sand, silt clay 58.7, 38.1, 3.2 (sandy loam)	WG	3 (13-15 d)	72.9 74.9 72.6	265 247 292	Foliar backpack, 17 June, 1999, crop stage: vegetative	7	0.36	0.12	Syngenta, 2001, 07362, 99-WA*18
	WG	3 (13-15 d)	372 383 361	271 253 290	Foliar backpack, 17 June, 1999, crop stage: vegetative	7	1.54	0.26	
Prosser, WA, USA, 1999 (Native spearmint), Sand, silt clay 58.7, 38.1, 3.2 (sandy loam)	WG	3 (13-15 d)	72.3 74.2 72.9	263 245 292	Foliar backpack, 18 June, 1999, crop stage: vegetative, early bud	6	0.34	0.11	Syngenta, 2001, 07362, 99-WA*51
Paterson, WA, USA, 1999, (Black Mitchem), Sand, silt clay 65, 29.5, 5.5 (sandy loam)	WG	3 (13-15 d)	72.3 74.3 73.1	271 283 277	Foliar backpack, 08 July, 1999, crop stage: bud	6	0.86	0.11	Syngenta, 2001, 07362, 99-WA*52

[a] Results are mean of 2 replicates.

Dried herbs

Hops

Supervised residue field trials were conducted on hops in 2006 and 2011 in the USA [Syngenta, 2013a, A9549C_50012, TK0053990]. The trials conducted in 2006 were evaluated by the JMPR 2010 and not further addressed in this evaluation.

In the newly submitted study [Syngenta, 2013a, A9549C_50012, TK0053990] plots (size not reported) of hop were treated once with a SG formulation at an application rate of approximately 140 g ai/ha (0.125 lbs ai/A) by soil surface band application, using 187–467 L/ha (20–50 GPA). Sixty five days after treatment the hop was harvested and dried (confirmed in personal communication with manufacturer, Syngenta 08092014).

Samples of at least 0.45 kg (1 lb) of dry cones were collected. All samples were stored frozen for a maximum of 8.5 months at -10 to -20 ºC. This storage period is covered by the storage stability studies (24–40 months) already evaluated by the JMPR in 2010.

Samples were analysed for parent and its metabolite CGA322704 using LC-MS/MS Syngenta Method No AG-675 with an LOQ of 0.01 mg/kg for both parent and metabolite. Results were not corrected for control levels (< 0.01 mg/kg for each analyte) nor for average concurrent method recoveries (79.9–92.4% for each analyte at 0.01 and 1.0 mg/kg). Residues of thiamethoxam and CGA322704 from the trial are summarised in Table 10.

Table 10 Residues of thiamethoxam and metabolite CGA322704 (clothianidin) in hops after pre-harvest treatment (cones, dried)

Location, year, (variety)	Form	No	kg ai/ha	water L/ha	method, timing	DAT	residues, mg/kg		Reference, trial
							Parent	CGA322704	
Ephrata, WA, USA (Cascade), sandy loam	SG	1	0.14	187-467	Soil surface treatment, 02 Aug, 2011, BBCH 61	65	0.029[a]	0.027[a]	Syngenta, 2013a, TK0053990-01

[a] Results are mean of 2 replicates.

Legume vegetables animal feeds

Several residue trials were conducted on fresh beans in Spain. These have been summarized in the relevant residue section. In four of these residue trials [Kang, 2005c, Syngenta CGA293343/2633, CEMR-2322] residue data in remaining plant material, after removal of beans with pods and roots, was also reported. Details of the trials are provided under legume vegetables: fresh beans with pods. The residue data relevant to bean forage are summarized in Table 11.

Table 11 Residues of thiamethoxam and metabolite CGA322704 (clothianidin) after pre-harvest treatment of fresh (common) beans (remaining plant)

Location, year, (variety) Soil type	Form	No	Interval (days)	g ai/ha	L/ha	method, last application	DAT	BBCH at sampling [a]	parent, mg/kg	CGA322704 mg/kg	Reference, Study number, Trial
Lora der Rio, Seville, Spain, 2004 (Oriente), loam	WG	2	7	96 93	957 926	Foliar spray, 23 Nov, 2004 BBCH 71-75	16	65-77	0.82	0.06	Kang, 2005c, CEMR-2322, trial ES-IR-04-0054
Penaflor, Seville, Spain, 2004 (Oriente), silt clay	WG	2	7	69 93	996 978	Foliar spray, 12 July, 2004 BBCH 73-74	14	77-79	1.4	0.07	Kang, 2005c, CEMR-2322, trial ES-IR-04-0055
El Mareny de Barraquetes, Sueca, Valencia, Spain, 2004 (Perona)[b], sandy	WG	2	8	113 99	1127 990	Foliar spray, 07 Sept, 2004 BBCH 85-89	13	89	0.56	0.08	Kang, 2005c, CEMR-2322, trial ES-IR-04-0056

Location, year, (variety) Soil type	Form	No	Interval (days)	g ai/ha	L/ha	method, last application	DAT	BBCH at sampling [a]	parent, mg/kg	CGA322704 mg/kg	Reference, Study number, Trial
Matagorda, Almeria, Spain, 2004 (Festival), sandy	WG	2	7	104 105	1042 1052	Foliar spray, 05 Oct, 2004 BBCH 74	14	77	0.93	0.11	Kang, 2005c, CEMR-2322, trial ES-IR-04-0057

[a] BBCH growth stage is included to demonstrate that the samples were collected at the green stage of the beans. BBCH 79 is before ripening of the fruit (beans get hard). This process starts at BBCH 81 to 89.
[b] Perona beans is a Spanish variety of flat pod beans (vining variety).

FATE OF RESIDUES IN STORAGE AND PROCESSING

In processing

The Meeting received processing studies on the magnitude of residues in processing studies with mangoes and mint.

The processing factors (residue processed commodity divided by residue RAC) were calculated separately for parent thiamethoxam and metabolite CGA322704 (clothianidin).

Mango processing

A field trial was conducted in the South Africa in 2001/2012 [Thirion, 2013b and c, Syngenta A9795B_11447, 2418/F788 and Syngenta A9795B_11448, 2418/G676] to measure the magnitude of thiamethoxam residues in mango processed commodities. The mango trees were treated once with the thiamethoxam formulated product, Actara 240 SC (Code No A9795B), at a rate of 18 ml product/tree or 4.32 g ai/tree. The applications were done when the trees were in the flowering state early in the season. The fruit was harvested when they were commercially ready for processing (BBCH 85–87). Mango pulp and dried mangoes were processed from the fruit, analysed and the processing factors were calculated. The residues in the whole fruit as well as in the peel were also determined. SABS In-house Method No. 054/2010 viz *The determination of Residues of Thiamethoxam and CGA 322 704 in Crops by LC-MS/MS*.

Dried fruit: Three samples were taken from each plot, one sample for determination of residues in the whole fruit (> 2.5–5 kg), one (< 2.5–5 kg) sample serving as for a contingency sample, and one sample (34–42 kg) for processing of pulp and drying. From the bulk 5 kg samples were taken for processing of pulp and drying, respectively. For processing the fruit was peeled and the flesh removed from the stones. The stone was discarded. Flesh and peel were kept for further analyses. The flesh of the fruit was preserved with sodium metabisulphite and dried in an automatic electrical drying oven by using the following temperature and humidity program: 60 °C at 40% relative humidity for 360 min; 57 °C at 27% relative humidity for 60 minutes; 55 °C at 18% relative humidity for 360 minutes. The moisture content after processing ranged between 9.1 and 9.9% in both studies.

Table 12 Residues of thiamethoxam and CGA322704 after processing of mangoes

Location, year, (variety)	Treatment	DAT	processed products	parent		CGA322704 mg/kg		Reference, Study number, Trial
				residues (mg/kg)	PF	residues (mg/kg)	PF	
Nelspruit, South Africa, 2011/2012 (Tommy Atkins)	Soil treatment, 4.32 g ai/tree (18 ml/tree), 15 Sept, 2011	131	Peel + flesh	0.09	-	0.03	-	Thirion, 2014b, 2418/G676, ZA RMG 005 2012 (5)
		144	Flesh (pulp)	0.05	0.56	0.02	0.67	
		144	Peel	0.10	n.a.	0.03	n.a.	
		145	Dried fruit	0.36	4.00	0.17	5.67	

Location, year, (variety)	Treatment	DAT	processed products	parent		CGA322704 mg/kg		Reference, Study number, Trial
				residues (mg/kg)	PF	residues (mg/kg)	PF	
Jonkmanspruit, Hoedspruit, Limpopo, South Africa, 2011/2012 (Tommy Atkins)	Soil treatment, 4.32 g ai/tree (18 ml/tree), 14 Sept, 2011	119	Peel + flesh	0.11	-	0.05	-	Thirion, 2014b, 2418/G676, ZA RMG 006 2012 (6)
		130	Flesh (pulp)	0.11	1.00	0.06	1.20	
		130	Peel	0.12	n.a.	0.08	n.a.	
		132	Dried fruit	0.74	6.73	0.42	8.40	
Mpumalanga, South Africa, 2012/2013 (Keitt)	Soil treatment, 4.32 g ai/tree (18 ml/tree), 14 Sept, 2011	122	Peel + flesh	0.03	-	0.06	-	Thirion, 2014b, 2418/G676, ZA RMG 009 2013 (9)
		134	Flesh (pulp)	0.02	0.67	0.05	0.83	
		134	Peel	0.03	n.a.	0.05	n.a.	
		136	Dried fruit	0.22	7.33	0.42	7.00	
Mpumalanga, South Africa, 2012/2013 (Kent)	Soil treatment, 4.32 g ai/tree (18 ml/tree), 14 Sept, 2011	122	Peel + flesh	0.04	-	0.03	-	Thirion, 2014b, 2418/G676, ZA RMG 0010 2013 (10)
		134	Flesh (pulp)	0.02	0.50	0.01	0.33	
		134	Peel	0.03	n.a.	0.02	n.a.	
		136	Dried fruit	0.20	5.00	0.12	4.00	

The effect of processing on the nature of residues was not specifically investigated. The processing factors for both the parent and the metabolite CGA322704 indicate that no significant changes are expected to occur with regard to the nature of the residues during drying process of mangoes.

Mint processing

Two supervised residue trials with spearmint were conducted in the USA in 1999 [Syngenta, 2001, 406892, 07362]. Three foliar applications were made with an exaggerated rate (5×) of 370 g ai/ha, with a spray interval of 13–15 days. The applications were made with a backpack sprayer at a spray volume of 296 L/ha. The last application was made at (early) bud stage (26 July, 1999 and June 17, 1999 for trial WI25 and WA*18, respectively). Mature tops were harvested at normal commercial harvest, 7 days after the last application. Tops were harvested manually. Dead and/or senesced leaves were removed. The tops were processed into oil using standardised procedures designed to simulate relevant industrial processes. All weight fractions have been corrected for subsampling and represent weight fractions for trial 99-WI25 and 99-WA*18, respectively.

Oil processing

Large samples of fresh mint plants were collected. About 1.1 kg from each sample was distilled immediately after harvest, using a mint still and boiler for distillation (at steam pressure of 75 psi, pot pressure of 1–1.5 psi and distillate temperature of -1 to 7 °C for 1.5–2.5 hours. For analysis, the (2 g) oil was diluted with GPC mobile phase (50% ethyl acetate/50% cyclohexane). Clean up was done by injection in GPC, followed by evaporation of the eluate to ~0.5 mL at 35–40 °C on a Turbovap. The sample was dissolved in a total volume of 4.0 mL using acetonitrile.

Mint oil samples were stored at < 0 °C for a maximum of 502 days prior to analyses. Mint top samples were stored at < 0 °C for a maximum of 482 days. This storage period is sufficiently covered by the storage stability (452 days for tops and 465 days for oil). Samples were analysed for parent and CGA322704 using LC-MS/MS Method No AG-675 with an LOQ of 0.05 mg/kg for both parent and metabolite. Samples were analysed for parent and its metabolite CGA322704 Residues of thiamethoxam and CGA322704 and processing factors from the trial are summarised in Tables 13 and 15.

Results were not corrected for control levels (< 0.05 mg/kg for each analyte) nor for average concurrent method recoveries (77–85% (parent) and 92–96% (CGA322704) at 0.05, 0.50 and 5.0 mg/kg in tops and 92–116% (parent) and 92–111% (CGA322704) at 0.05, 0.50 and 5.0 mg/kg in oil).

Note: The analytical method is considered valid in the range 0.05–5.0 mg/kg for the determination of thiamethoxam and CGA322704 in mint.

Table 13 Residues of thiamethoxam and CGA322704 (clothianidin) and processing factors in mint tops and processed mint (oil)

Location, year, (variety)	Treatment	DAT	processed products	parent		CGA322704 mg/kg		reference
				residues (mg/kg)	PF	residues (mg/kg)	PF	
Sullivan, WI, USA, 1999 (Murray Mitchem) peppermint, soil: clay muck	Foliar spray, 3 x 0.370 kg ai/ha, interval 13-15 days	7	Mint tops	2.36	-	0.23	-	Syngenta, 2001, 406892, 99-WI25
			Mint oil	< 0.05	< 0.02	< 0.05	< 0.22	
Prosser, WA, USA, 1999 (native spearmint), soil: sandy loam	Foliar spray, 3 x 0.370 kg ai/ha, interval 13-15 days	7	Mint tops	1.83	-	0.273	-	Syngenta, 2001, 406892, 99-WA*18
			Mint oil	< 0.05	< 0.03	< 0.05	< 0.19	

Processing studies summary

An overview of calculated processing factors for mango and mint is given in Tables 14 and 15 for thiamethoxam and CGA322704 (clothianidin), respectively.

Table 14 Overview of processing factors for thiamethoxam in mango and mint

Compound	Processed fraction	Processing Factor (n=2-4)
Mango	Pulp	0.6 (4)
Mango	Dried	5.9 (4)
Mint	Aspirated oil	< 0.02 (2)

Table 15 Overview of processing factors for metabolite CGA322704 (clothianidin) in mango and mint

Compound	Processed fraction	Processing Factor (n=2-4)
Mango	Pulp	0.8 (4)
Mango	Dried	6.3 (4)
Mint	Aspirated oil	< 0.2 (2)

APPRAISAL

SEE ALSO CLOTHIANIDIN (238)

Thiamethoxam is a neonicotinoid compound with broad-spectrum insecticidal properties. The compound was evaluated by the JMPR in 2010 (T, R), 2011 (R) and 2012 (R).The 2010 Meeting established an ADI for Thiamethoxam of 0–0.08 mg/kg bw and an ARfD of 1 mg/kg bw. It was listed by the Forty-fifth Session of CCPR (2013) for the evaluation of 2014 JMPR for additional MRLs.

The residue definition for enforcement for thiamethoxam in plant and animal commodities is thiamethoxam. The residue for dietary risk assessment for plant and animal commodities (except poultry) is thiamethoxam and clothianidin (considered separately). The residue definition for risk

assessment dietary intake for poultry is the sum of thiamethoxam, CGA 265307 and MU3, expressed as thiamethoxam and clothianidin (clothianidin to be considered separately from thiamethoxam). In the current appraisal CGA322704 is referred to as clothianidin.

At the 2014 JMPR Meeting residue data were submitted to support maximum residue level recommendations for use of thiamethoxam on several crops. Residue trials were conducted to support use avocado, mango, beans, mint and hops. In addition, trials were submitted by Republic of Korea to support the use on persimmon. Summaries of the trials have been provided to support the recommendations for thiamethoxam and clothianidin on the respective crops.

Methods of Analysis

The Meeting received additional validation data for the analytical method REM 179.06 (evaluated by the 2010 Meeting) of thiamethoxam and clothianidin.

Most of the methods used in the supervised residue trials had previously been evaluated (2010 JMPR) and determined parent compound thiamethoxam and the metabolite clothianidin. Samples were extracted with methanol:water. The final residue could then be determined by HPLC-MS/MS. The Meeting considers validation of the method sufficient for the respective crops with an LOQ of 0.01 mg/kg for parent and its metabolite, respectively. The analytical methods not previously evaluated, but used in the trials for the current evaluation (LC-MS/MS Method 954/2010 and Method HPLC/DAD) were sufficiently validated.

Stability of pesticide residues in stored analytical samples

At the 2010 JMPR, thiamethoxam and clothianidin were shown to be stable for 1–2 years when stored frozen at < -18 °C or lower for a large range of commodities. The stability in the crops under evaluation in 2014 was sufficiently demonstrated in the respective residue trials.

Results of supervised residue trials on crops

The Meeting received supervised trials data for persimmon, avocado, mango, beans, mint (herbs) and hops.

Pome fruit

Residue data in support of the use of thiamethoxam and clothianidin on pome fruit (apples and pears) were previously evaluated by the 2010 JMPR. In 2010 insufficient data were submitted for the use of clothianidin on persimmons to lead to a maximum residue level recommendation (not yet categorized under pome fruit at that time). No data were previously submitted to support the use of thiamethoxam on persimmons.

The critical GAP for thiamethoxam on persimmon in Republic of Korea is for 3 foliar applications at 0.005 kg ai/hL (interval of 10 days) and a PHI of 7 days, until “leaves are dripping”. The Meeting received two independent trials that were performed according to the Korean critical GAP using an application rate of 0.005 kg ai/hL.

As the GAPs for pome fruit and persimmon are different, a specific maximum residue level for persimmon would need to be estimated. However, the Meeting agreed that the dataset was insufficient for the estimation of a maximum residue level for persimmon.

The Meeting confirmed the maximum residue level, STMR and HR for thiamethoxam and clothianidin in pome fruit as recommended by the 2010 JMPR Meeting.

Assorted tropical and sub-tropical fruits – inedible peel

Supervised trials were available for avocado and mango. The use of thiamethoxam and/or clothianidin on avocados had not been previously evaluated by the JMPR. The use of thiamethoxam on mango was been evaluated by the 2010 JMPR, but there were insufficient data to support a maximum residue

level recommendation. The Meeting had not previously received residue data supporting the use of clothianidin on mangoes.

Avocado

The critical GAP for use on avocado's in the USA is for 3 foliar directed applications at 0.070 kg ai/ha (minimum interval of 7 days) and no PHI.

Five field trials involving the use of thiamethoxam (3 foliar applications at approximately 70 g ai/ha, with a 6–7 day interval and PHI of 3 days) on avocados were performed in the USA (3) and in Mexico (2) in 2006 (4) and 2007 (1). Thiamethoxam residues on whole fruit (RAC) were not reported. Using a conversion factor to correct from flesh and peel to whole fruit (0.8× residue level), calculated residue levels in whole fruit were: < 0.01, 0.03, 0.06, 0.10, and 0.24 mg/kg (n=5). Converted clothianidin residues in RAC were: < 0.01, < 0.01, < 0.01, 0.016, and 0.016 mg/kg (n=5).

The Meeting agreed that the dataset for avocados matching the USA critical GAP could be used to support a maximum residue level recommendation for avocados, and estimated a maximum residue level of 0.5 mg/kg for thiamethoxam and a maximum residue level of 0.03 mg/kg for clothianidin on avocado.

The residue data for estimating the STMR and HR (flesh+peel) were: < 0.01, 0.04, 0.08, 0.12, and 0.30 mg/kg (n=5), resulting in an STMR and HR of 0.08 mg/kg and 0.30 mg/kg, respectively for thiamethoxam.

Clothianidin residues (flesh+peel) were: < 0.01, < 0.01, < 0.01, 0.02, and 0.02 mg/kg (n=5), resulting in STMR and HR estimates of 0.01 and 0.02 mg/kg, respectively.

Mango

Field trials involving the use of thiamethoxam on mango were performed in South Africa. Eight trials in 2003–2005 were evaluated by the JMPR in 2010. Trials performed 2011–2012 were submitted to the 2014 Meeting.

The critical GAP for use of thiamethoxam on mangoes in the South Africa is a single soil application at 1.44 g ai/tree poured from a jug with a PHI of 130 days. Seven residue trials (three in 2003/2005 and four in 2011/2012) matched the South African GAP, using a single soil application at a rate of 1.44 g ai/tree and a PHI of 130 days. Thiamethoxam residues (whole fruit) were: 0.01, 0.02, 0.02, 0.02, 0.036#, 0.08#, and 0.088# mg/kg. Clothianidin residues were: < 0.01, 0.01, 0.01, < 0.02#, < 0.02#, < 0.02# and 0.02 mg/kg. The values identified with # are residue data of flesh and peel corrected for stone using a default conversion factor of 0.8, because the weights of the different fractions of the fruit were not reported in the 2010 evaluation.

The Meeting agreed that the dataset for mangoes matching the South African critical GAP could be used to support a maximum residue level recommendation for mangoes, and estimated a maximum residue level of 0.2 mg/kg for thiamethoxam on mango. For clothianidin the Meeting estimated a maximum residue level of 0.04 mg/kg.

For the STMR and HR estimates the residue data excluding the stone are used. Thiamethoxam residues (flesh+peel) were: 0.01, 0.03, 0.03, 0.03, 0.04, 0.10, and 0.11 mg/kg, resulting in a STMR and HR of 0.03 and 0.11 mg/kg, respectively for thiamethoxam. Clothianidin residues (flesh and peel) were: 0.01, < 0.02, 0.02, 0.02, 0.02, 0.02, and 0.02 mg/kg. The Meeting estimated STMR and HR values of 0.02 and 0.02, respectively for clothianidin.

Legume vegetables

The Meeting received data on the use of thiamethoxam on fresh beans. A Portuguese label for use of thiamethoxam on fresh beans was submitted to the Meeting. The label included indoor use (foliar application and drip irrigation) and outdoor use (foliar application).

Indoor use: No data were submitted to support the indoor use (neither the foliar, nor the drip irrigation uses).

Outdoor use: The use of thiamethoxam on beans and peas had been evaluated by the 2010 Meeting. In 2010 the data reviewed covered seed treatment use; therefore the datasets could not be combined. According to the 2010 evaluation there was no GAP for clothianidin on legume vegetables. The critical GAP for outdoor use of thiamethoxam is a double foliar application of 100 g ai/ha, with an interval of 7 days and a PHI of 3 days.

Eight field trials involving fresh beans (with pods) were conducted in 2003 and 2004 in Spain. The critical GAP for outdoor use was supported with seven trials using two foliar applications of 93–113 g ai/ha (total rate of 200 g ai/ha within ±25% range), 6–8 day interval and 3 day PHI. Thiamethoxam residues were: 0.03, 0.08, 0.08, 0.08, 0.09, 0.16, and 0.18 mg/kg.

The Meeting agreed that the dataset for fresh beans matching the Portuguese critical GAP for outdoor use could be used to support a maximum residue level recommendation for fresh beans, and estimated a maximum residue level of 0.3 mg/kg for thiamethoxam in fresh beans.

The Meeting estimated STMR and HR values of 0.08 and 0.18 mg/kg, respectively for thiamethoxam in fresh beans.

The same trials were used for clothianidin. The residues were: 0.04, 0.04, 0.06, 0.07, 0.08, 0.09, and 0.10 mg/kg.

The Meeting estimated a maximum residue level of 0.2 mg/kg for clothianidin and STMR and HR values of 0.07 mg/kg and 0.10 mg/kg, respectively for clothianidin in fresh beans.

Fresh herbs

The Meeting received data on the use of thiamethoxam on mints. No uses of thiamethoxam or clothianidin on fresh herbs (mints) have previously been evaluated by the JMPR.

Mints

Field trials involving the use of thiamethoxam on mint were performed in the USA in 1999.

The critical GAP for mint in the USA is 3 foliar applications of 0.070 kg ai/ha (minimum interval 14 days, maximum total rate of 0.21 kg ai/ha per season) and PHI of 7 days. Five trials matched this GAP (3×0.072–0.074 kg/ai/ha, interval 13–15 days, PHI 6–7 days), although slightly higher applications rates were used (< 25% difference). Thiamethoxam residues were: 0.24, 0.28, 0.34, 0.36, and 0.86 mg/kg.

The Meeting agreed that the dataset on mints matching the USA GAP could be used to support a maximum residue level recommendation for mints and estimated a maximum residue level of 1.5 mg/kg for thiamethoxam on mint and STMR and HR values of 0.34 and 0.86 mg/kg, respectively for thiamethoxam.

The same trials were used to derive the residue levels for clothianidin. Residues were: 0.06, 0.07, 0.11, 0.11, and 0.12 mg/kg.

The Meeting agreed that the dataset on mints could be used to support a maximum residue level for mints and estimated a maximum residue level of 0.3 mg/kg for clothianidin and STMR and HR values of 0.11 mg/kg and 0.12 mg/kg, respectively for clothianidin.

Dried herbs

The Meeting received data on the use of thiamethoxam on hops. The use of thiamethoxam on hops was evaluated by the 2010 Meeting. No maximum residue level was recommend due to the limited dataset (n=3). The JMPR has not evaluated any uses for clothianidin on dried herbs.

Hops

Field trials involving hops were performed in the USA in 2002 (three evaluated by JMPR 2010) and 2011 (one submitted in 2014).

The critical GAP for hops in the USA is a single soil surface treatment (band application with incorporation) at a rate of 0.14 kg ai/ha and a PHI of 65 days. The trials performed in the USA matched this GAP (1×0.13–0.14 and PHI 62–66 days).

Thiamethoxam residues in hops (dried cones) were: < 0.025, 0.027, 0.029, and 0.055 mg/kg. The Meeting agreed that the dataset for hops matching the USA GAP could be used to support a maximum residue level recommendation for hop, and estimated a maximum residue level of 0.09 mg/kg for thiamethoxam on dried hops. The Meeting estimated STMR and HR values of 0.028 and 0.055 mg/kg, respectively for thiamethoxam.

Clothianidin residues were: < 0.025, 0.025, 0.027, and 0.028 mg/kg. The Meeting estimated a maximum residue level of 0.07 mg/kg for clothianidin on hops. The Meeting estimated STMR and HR values of 0.026 and 0.028 mg/kg, respectively for clothianidin, respectively.

Legume animal feeds

The Meeting received data on the outdoor use of thiamethoxam on fresh beans. The use of thiamethoxam on beans and peas has been evaluated by the 2010 Meeting, but only covered seed treatment uses and provided residue data for thiamethoxam and clothianidin in pea vines and pea hay/fodder (dry), but not for bean forage. No residue data for clothianidin in legume animal feeds was available.

Bean forage

The Portuguese outdoor GAP for use of thiamethoxam on beans is a foliar application 2×100 g ai/ha, with a PHI of 3 days and a minimum interval of 7 days.

Outdoor use

Eight field trials involving fresh beans (with pods) were conducted in 2003 and 2004 in Spain. The application rates used were two foliar applications of 69–113 g ai/ha with an interval of 6–8 days and a PHI of 3 days. Matching the Portuguese GAP. Residues in bean forage were determined in four field trials. Thiamethoxam residues in bean forage (rest of plants harvested at BBCH < 80) were: 0.56, 0.82, 0.93, and 1.4 mg/kg. Clothianidin residues in bean forage were: 0.06, 0.07, 0.08, and 0.11 mg/kg.

The Meeting agreed that the dataset for fresh bean forage matching the outdoor Portuguese GAP could be used to estimate median residues of 0.87 and 0.075 mg/kg for thiamethoxam and clothianidin, respectively. The respective highest residues are 1.4 and 0.11 mg/kg.

Fate of residues during processing

Processing studies were undertaken for mango and mint. Processing factors based on the residue for parent and metabolite clothianidin are listed in the table below. Using the $STMR_{RAC}$ obtained from the thiamethoxam use, the Meeting estimated STMR-Ps for processed commodities to be used in dietary intake calculations.

Commodity	PFs	PF (median or best estimate)	STMR-P = $STMR_{pulp+peel}$ × PF (mg/kg)	HR-P = $HR_{pulp+peel}$ × PF (mg/kg)	PFs	PF (median or best estimate)	STMR-P = $STMR_{RAC}$ × PF (mg/kg)	HR-P = HR_{RAC} × PF (mg/kg)
	Parent thiamethoxam ($STMR_{pulp+peel}$ = 0.03 mg/kg $HR_{pulp+peel}$ = 0.11 mg/kg)				clothianidin ($STMR_{pulp+peel}$ = 0.02 mg/kg, $HR_{pulp+peel}$= 0.02 mg/kg)			
Mango, dried flesh	4.0, 6.7, 7.3, 5.0	5.9	0.18	0.65	5.7, 8.4, 7.00, 4.00	6.3	0.13	0.13
Mint, oil	< 0.02, < 0.03	< 0.02	n.a.	n.a.	< 0.22, < 0.19	< 0.20	n.a.	n.a.

Residues in animal commodities

The Meeting estimated the dietary burden of thiamethoxam residues (thiamethoxam only, for CGA322704 see clothianidin appraisal 2014) on the basis of the livestock diets listed in the FAO manual appendix IX (OECD feedstuff table) using the OECD_Feed_Calculator_V1_4. Calculation from highest residue, STMR (some bulk commodities) and STMR-P values provides the levels in feed suitable for estimating MRLs, while calculation from STMR and STMR-P values from feed is suitable for estimating STMR values for animal commodities.

The Meeting recalculated the livestock dietary burden based on the uses presented by the 2010 JMPR and including the residue values for fresh bean forage from the 2014 JMPR Meeting. The maximum dietary burden for cattle for MRL (tissues) setting changed slightly from 5.2 to 6.1 ppm, and the mean dietary burden for cattle changed only marginally from 2.1 to 2.4 ppm. For residue level estimations in milk the dietary burden raised from 5.2 to 6.1 ppm (maximum) and from 1.6 to 2.4 ppm (mean). The new maximum dietary burden of thiamethoxam for poultry of 1.64 ppm is only marginally higher than the maximum dietary burden of 1.59 ppm as calculated by the Meeting in 2010, rounded both 1.6 ppm. The new mean dietary burden for poultry of 0.59 ppm is not changed since the evaluation in 2010.

The Meeting agreed that no new mean and maximum residue level estimations are needed and confirmed its previous recommendations.

Residue data for clothianidin used for the dietary burden calculation were derived from the 2010 JMPR appraisal for clothianidin, where the data from thiamethoxam and clothianidin use were combined and included the residue data on bean forage from the 2014 JMPR Meeting. For the dietary burden calculations and recommendations for animal commodities see appraisal clothianidin 2014.

RECOMMENDATIONS

THIAMETHOXAM

On the basis of the data from supervised residue trials the Meeting concluded that the residue levels listed below are suitable for establishing maximum residue limits and for IEDI and IESTI assessment.

The 2011 Meeting recommended the following residue definition for thiamethoxam:

Definition of the residue for animal and plant commodities (for compliance with the MRL): *thiamethoxam*.

Definition of the residue for plants and animals (except poultry), (for estimation of dietary intake): *thiamethoxam and clothianidin* (considered separately).

Definition of the residue for poultry (for estimation of dietary intake): *sum of thiamethoxam, CGA 265307 and MU3, expressed as thiamethoxam and clothianidin* (clothianidin to be considered separately from thiamethoxam).

The residue is not fat-soluble.

Note that thiamethoxam metabolite CGA322704 (N-(2-chlorothiazol-5-ylmethyl)-N'-methyl-N"-nitroguanidine) will appear as clothianidin in the analytical method and residues of CGA322704 occurring in food are included in the clothianidin MRLs.

Metabolite CGA 265307: N-(2-chlorothiazol-5-ylmethyl)-N'-nitroguanidine.

Metabolite MU3: amino-([(2-chlorothiazol-5-ylmethyl)-amino]-methylene)-hydrazide.

	Commodity	THIAMETHOXAM Maximum residue level recommendations (mg/kg)		STMR or STMR-P (mg/kg)		HR or HR-P
CCN	Name	New	previous	new	previous	mg/kg
FI 0326	Avocado	0.5		0.08		0.30
VP 0061	Beans with pods	0.3		0.08		0.18
DH 1100	Hops	0.09		0.028		0.55
FI 0345	Mango	0.2		0.03		0.11
HH 0738a	Mints	1.5		0.34		0.86
-	Mango pulp			0.02		0.07
-	Mango dried			0.18		0.65

[a] It is noted that there are several types of mints (native mints HH0764, Vietnamese mint HH0765). The reported CCN code is listed for several types of mints, including spearmint and peppermint.

	Commodity	THIAMETHOXAM Maximum residue level recommendations	Median residue	Highest residue
CCN	Name	mg/kg	mg/kg	mg/kg
AL	Bean forage	n.a.	0.87	1.4

The recommendations for clothianidin resulting from thiamethoxam use are listed in the clothianidin appraisal 2014.

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Daily Intakes (IEDI) of thiamethoxam, based on the STMRs estimated for 112 commodities, for the 17 cluster diets were in the range of 1-3% of the maximum ADI (0.08 mg/kg bw) (Annex 3 to the 2014 Report). The Meeting concluded that the long-term intake of residues of thiamethoxam resulting from its uses that have been considered by the 2010, 2011 2012 and the present Meeting is unlikely to present a public health concern.

For the International Estimated Daily Intakes (IEDI) for clothianidin resulting from thiamethoxam and clothianidin use see appraisal clothianidin 2014.

Short-term intake

The International Estimated Short Term Intake (IESTI) for thiamethoxam was calculated for food commodities and their processed fractions for which maximum residue levels were estimated and for which consumption data were available. The results are shown in Annex 4 to the 2014 Report.

The IESTI represented 0–1% of the ARfD (1.0 mg/kg bw). The Meeting concluded that the short-term intake of residues of thiamethoxam, when used in ways that have been considered by the present Meeting, is unlikely to present a public health concern.

For the International Estimated Short Term Intake (IESTI) for clothianidin resulting from thiamethoxam and clothianidin use see appraisal clothianidin (2014).

REFERENCES

Code	Author	Year	Title, Institute & report number, Submitting manufacturer and report code, GLP/Non-GLP. Published/Unpublished
Syngenta 08092014, E-mail communication	Boseley, A.	2014	JMPR Thiamethoxam Evaluation, Response for Complimentary Information, Syngenta, e-mail of Sept'08-2014, GLP+Published: n.a.
Syngenta CGA293343_11624	Anderson L., Crook	2013	Thiamethoxam (CGA293343) and CGA322704 Summary of validation Data of Residue Analytical Method REM179.06 for the Determination of

	S.		Residues in Crops Syngenta Syngenta - Jealott's Hill, Bracknell, United Kingdom, TK0122383 GLP, not published
Syngenta CGA293343/2217	Kang J.	2005a	Residue Study with Thiamethoxam (CGA293343) in or on Common Beans in Spain Syngenta Crop Protection AG, Basel, Switzerland CEMAS, North Ascot, United Kingdom, CEMR-2185 03-1012 GLP, not published
Syngenta GA293343/2218	Kang J.	2005b	Residue Study with Thiamethoxam (CGA293343) in or on Common Beans in Spain Syngenta Crop Protection AG, Basel, Switzerland CEMAS, North Ascot, United Kingdom, CEMR-2186 03-1013 GLP, not published
Syngenta CGA293343/2633	Kang J.	2005c	Thiamethoxam (CGA293343): Residue Study in or on Protected Fresh Beans with Pods in Spain Syngenta Crop Protection AG, Basel, Switzerland CEMAS, North Ascot, United Kingdom, CEMR-2322 GLP, not published
MFDS201304	Kim, K.	2012	Residue Study of Thiamethoxam During Cultivation of Persimmon, Korea, 2012 Report No. - Under preparation Hoseo Toxicological Research Center, 165 Sechul, Baebang, Asan-city, Chungnam (336-795), Korea Non-GLP. Unpublished
Syngenta CGA293343/2203	Rawle N.	2005a	Residue Study with Thiamethoxam (CGA293343) in or on Protected Common Beans in Spain Syngenta Crop Protection AG, Basel, Switzerland CEMAS, North Ascot, United Kingdom, CEMR-2201 03-1011 GLP, not published
Syngenta CGA293343/2204	Rawle N.	2005b	Residue Study with Thiamethoxam (CGA293343) in or on Protected Common Beans in Spain Syngenta Crop Protection AG, Basel, Switzerland CEMAS, North Ascot, United Kingdom, CEMR-2202 03-1014 GLP, not published
Syngenta 464507	Syngenta	2008	Thiamethoxam - Magnitude of the Residues in or on Avocado Syngenta Crop Protection, Inc., Greensboro, USA Syngenta Crop Protection, Inc., Greensboro, USA, T010202-06 GLP, not published
Syngenta 406892	Syngenta	2001	Thiamethoxam: Magnitude of the Residue on Mint IR-4 Project, North Brunswick, USA IR-4 Project, North Brunswick, USA, 07362 GLP, not published
Syngenta A9549C_50012	Syngenta	2013a	Thiamethoxam 75SG (A9549C) - Magnitude of the Residues on Hops Following Soil Application - USA 2011 Syngenta Syngenta Crop Protection, LLC, Greensboro, NC, USA, Golden Pacific Laboratories, LLC (GPL), Fresno, USA, TK0053990, 120423 GLP, not published
Syngenta A9795B_11446	Thirion M.	2013a	To generate results on the magnitude of residues in order to support the registration of thiamethoxam on mangoes and set an import tolerance Syngenta South African Bureau of Standards, Pretoria, South Africa, 2418/F787 GLP, not published
Syngenta A9795B_11447	Thirion M.	2013b	To determine the magnitude of thiamethoxam and its metabolite (CGA 322 704) in processed fractions of mango (dried and mango pulp) for the generation of processing factors Syngenta South African Bureau of Standards, Pretoria, South Africa, 2418/F788 GLP, not published
Syngenta A9795B_11448	Thirion M.	2013c	To determine the magnitude of thiamethoxam and its metabolite (CGA 322 704) in processed fractions of mango (dried and mango pulp) for the generation of processing factors Syngenta South African Bureau of Standards, Pretoria, South Africa, 2418/G676 GLP, not published