SPINOSAD (203)

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EXPLANATION

Spinosad was first evaluated by the JMPR in 2001 (T, R). An ADI of 0–0.02 mg/kg bw was estimated and an acute reference dose was determined to be unnecessary. MRLs were recommended for many crops and animal commodities.

Spinosad residues were also evaluated by the JMPR in 2004 and 2008. In 2004 information on registered uses and data from supervised residue trials on grapes and stored grain, and the direct uses of spinosad on sheep for blowfly and lice control with supporting residue data were reported to the Meeting and several additional MRLs were recommended. In 2008 supervised trial data for spinosad on banana, cranberry, basil, mustard greens, spinach and legume forage were considered. No new MRLs were established.

The Meeting received residues studies submitted by the manufacturer to support additional MRLs for various berries, bulb vegetables, tree nuts and hops. Residues data were also submitted by COLEACP-PIP to support MRLs for papaya, passionfruit, okra and French beans.

METHODS OF RESIDUE ANALYSIS

Analytical methods

The analytical methods used in the supervised trials presented in this submission are generally based on the two methods previously reviewed by JMPR in 2001: HPLC and immunoassay (JMPR Report, 2001).

The HPLC methods, after an extraction specific to the matrix, follow a reasonably standard clean-up, with determination based on UV or MS detection. These methods allow measurement of the individual spinosyns and provide data on spinosyns A, D, K, B and B of D in residue trials. Spinosyn A usually contributes most of the residue, and some HPLC methods are designed to concentrate on spinosyns A and D. The LOQ for most substrates is 0.01 mg/kg.

Immunoassay methods, after an extraction designed for the matrix, may or may not require clean-up before the final colorimetric determination. The method is specific and represents the sum of the spinosyns and their metabolites. When the HPLC and immunoassay methods were tested side-by-side, the agreement was usually good. The LOQ for most substrates is 0.01 mg/kg.

A summary of the method validation and procedural recoveries for commodities for which residues trials are reported are provided in Table 1. Average method and concurrent recoveries were generally within the acceptable range of 70–120%, with relative standard deviations (RSD) below 20%. For the trials for French beans, okra, papaya and passionfruit, which were submitted by COLEACP-PIP, fewer recovery experiments were conducted in comparison with the other trials. Recoveries were similar to those obtained for the other trials with the exception of recoveries of Spinosyns A and D on papaya which showed recovery ranges and relative standard deviations of 82–139% (RSD = 20.5%) and 83–125% (RSD = 16.8%) respectively. Recovery concentrations for the COLEACP-PIP trials were generally of the same order as the method LOQs.

Table 1 Summary of method validation and concurrent recovery data

Analyte	Crop	Fortification mg/kg	n	Range Recovery (%)	Mean recovery (%)	% RSD	Method	Reference
METHOD VALIDATION								
Spinosyn A	Onion	0.01–1.0	6	85–109	101	10.8	GRM.00.03	JMPR 2001
Spinosyn D	Onion	0.01–1.0	6	87–105	99	8.4	GRM.00.03	
Spinosyn A	Onion, bulb	0.01–0.10	15	79–100	88	8.0	GRM.00.6	108424 (GHB-P-938)
Spinosyn D	Onion, bulb	0.01–0.10	15	70–103	90	10	GRM.00.6	
Spinosyn A	Onion, bulb	0.01–0.10	15	77–106	91	7	GRM.00.6	136055 (GHB-P-980)
Spinosyn D	Onion, bulb	0.01–0.10	15	70–98	83	10	GRM.00.6	
Spinosad	Onion, bulb	0.05–0.40	6	86–118	105	12	ERSA-DA-02-04	221794
Spinosad	Onion, bulb	0.05–0.40	6	80–103	91	12	ERSA-DA-02-04	222104
Spinosad	Onion, green (fresh)	0.01–2.0	20	78–114	93	11	96.10	137354 (PR-06652)
Spinosad	Onion, green (dried)	0.01–1.0	18	85–116	97	9	97.05	137354 (PR-06652)
Spinosad	Blueberries	0.01–1.0	18	79–112	96	14	GRM 96.11	80345 (PR-06850)
Spinosad	Cranberries	0.01–0.10	14	73–111	89	12.3	GRM 96.11	78981 (PR-06823)
Spinosad	Raspberries	0.01–1.0	24	80–121	102	11.8	GRM 96.11	111345 (PR-06825)
Spinosyn A	Caneberry	0.02–2.0	9	68–95	82	11.6	GRM 00.27	PR-09123
Spinosyn D	Caneberry	0.02–2.0	9	68–92	80	11.9	GRM 00.27	PR-09123
Spinosyn A	Almond Nutmeat	0.02–1.0	15	86–99	93	3.2	GRM 96.14	261436 (PR08739)
Spinosyn D	Almond Nutmeat	0.02–1.0	15	87–109	94	5.7	GRM 96.14	
Spinosyn A	Almond Hulls	0.02–20	15	71–112	90	11.5	GRM 96.14	261436 (PR08739)
Spinosyn D	Almond Hulls	0.02–20	15	78–112	90	9.2	GRM 96.14	
Spinosad	Pecan	0.001–0.1	21	72–100	86	9	GRM 96.11, modified	79801 (PR-06824)
Spinosyn A	Walnut	0.004–1.73	7	80–94	87	6	AGRI 070	223078 (AGRI 011/03 DEC)
Spinosyn D	Walnut	0.007–0.28	5	79–90	85	5.5	AGRI 070	
Spinosad	French beans	0.0–2.0	12	76–113	101	12	Multiresidue	Mende 2004a
Spinosad	Basil, fresh	0.01–5.0	15	84–117	101	9.1	Method 97.05	103522 (PR-06905)
Spinosad	Basil, dry	0.01–8.0	13	96–112	104	5.7	Method 97.05	103522 (PR-06905)
PROCEDURAL RECOVERIES								
Spinosyn A	Onion, bulb	0.01–0.10	2	89–95	92	–	GRM.00.03	101130 (GHE-P-10626)
Spinosyn D	Onion, bulb	0.01–0.10	2	81– 81	81	–	GRM.00.03	
Spinosyn A	Onion, bulb	0.01–0.10	4	98–111	105	5.2	GRM.00.03	102969 (GHE-P-9908)
Spinosyn D	Onion, bulb	0.01–0.10	4	115–120	117	1.9	GRM.00.03	
Spinosyn A	Onion, bulb	0.01–0.10	4	94–112	104	7.3	GRM.00.03	110576 (GHE-P-10007)
Spinosyn D	Onion, bulb	0.01–0.10	4	97–110	103	5.5	GRM.00.03	
Spinosyn A	Onion, bulb	0.05–1.0	8	81–123	98	16.1	GRM.00.03	139045 (GHF-P 2052)
Spinosyn D	Onion, bulb	0.05–1.0	8	78–116	94	14.2	GRM.00.03	
Spinosyn A	Onion, bulb	0.01–0.10	2	96–98	97	–	GRM.05.14	CEMR-4354 (GHE-P-12423)
Spinosyn D	Onion, bulb	0.01–0.10	2	94–97	96	–	GRM.05.14	
Spinosyn A	Onion, spring	0.01–0.10	4	89–113	99	10.9	GRM.00.03	99937 (GHE-P-10628)
Spinosyn D	Onion, Spring	0.01–0.10	4	82–114	97	14	GRM.00.03	
Spinosyn A	Onion, spring	0.01–0.10	2	109, 109	109	–	GRM.00.03	134785 (GHE-P-10009)
Spinosyn D	Onion, spring	0.01–0.10	2	100–112	106	–	GRM.00.03	
Spinosyn A	Onion, spring	0.01–0.10	2	83–112	98	–	GRM.00.03	138348

Analyte	Crop	Fortification mg/kg	n	Range Recovery (%)	Mean recovery (%)	% RSD	Method	Reference
Spinosyn D	Onion, spring	0.01–0.10	2	87–121	104	–	GRM.00.03	(GHE-P-10633)
Spinosyn A	Onion, spring	0.01–0.10	2	81–100	91	–	GRM.00.03	148871 (GHE-P-10954)
Spinosyn D	Onion, spring	0.01–0.10	2	79–98	89	–	GRM.00.03	
Spinosyn A	Onion, spring	0.01–0.10	2	98–105	102	–	GRM.05.14	(GHE-P-12424)
Spinosyn D	Onion, spring	0.01–0.10	2	98–101	100	–	GRM.05.14	
Spinosyn A	Blueberries	0.0076–0.076	4	69–86	76	11	GRM.00.06/ BRC 00.3	134913 (GHF-P-2663)
Spinosyn D	Blueberries	0.0014–0.014	4	76–121	96	21		
Spinosyn A	Canberries	0.02–2.0	6	70–95	82	11.4	GRM 00.27	PR-09123
Spinosyn D	Canberries	0.02–2.0	6	70–90	80	11.2	GRM 00.27	PR-09123
Spinosyn A	Raspberries	0.01–0.10	2	92–103	98	–	GRM 05.14	258620 (CEMS 3767)
Spinosyn D	Raspberries	0.01–0.10	2	95–100	98	–	GRM 05.14	
Spinosyn A	Almond Nutmeat	0.02–0.2	5	91–103	98	5.7	GRM 96.14	261436 (PR-08739)
Spinosyn D	Almond Nutmeat	0.02–0.2	5	92–97	94	1.9	GRM 96.14	
Spinosyn A	Almond Hulls	0.02–5	7	82–94	86	5.8	GRM 96.14	261436 (PR-08739)
Spinosyn D	Almond Hulls	0.02–5	7	82–93	86	5.3	GRM 96.14	
Spinosad	French beans	0.01–0.10	2	71–72	72	–	P-14.141	Rzepka 2005
Spinosad	Okra	0.05[a]	3	74–113	90	23	SOP PRES/002	
Spinosyn A	Papaya	0.02	5	82–139	106	20.5		PGD 222
Spinosyn D	Papaya	0.02	5	83–125	104	16.8		
Spinosyn A	Passion fruit	0.02	2	70–75	73	–		PGD 275
Spinosyn D	Passion fruit	0.02	2	69–74	72	–		
Spinosad	Passion fruit	0.01–3	7	71–103	88	12.3		RA6003
Spinosad	Passion fruit Peel	6	1	89.2	–	–		

[a] Uncertain fortification level

Stability of pesticide residues in stored analytical samples

The JMPR in 2001 evaluated a large amount of storage stability data for spinosad on various commodities and found no indications for instability during freezer storage. The minimum intervals of frozen storage stability reported, are summarised in Table 2.

Table 2 Available storage stability data (JMPR Report, 2001)

Crop	Storage interval at about –20 ºC (months)
Almond nutmeat and hulls	6
Apples	6
Cabbage	12
Celery	6
Cotton seed	12
Grapes	18
Maize grain	12
Peppers	18
Potato	12
Spinach	6
Strawberry	18
Sweet corn forage and stover	12
Tomato	12
Wine	18

Additional data were provided from a number of supervised trials in which residues from control samples fortified with known amounts of spinosad or spinosyns A or D and frozen together

with the samples were determined (Table 3). Percentage remaining on storage confirmed the stability of residues at the time of analysis. Since the storage stability data from JMPR 2001 and the submitted data cover a diverse range of crops, these storage stability data should be sufficient to cover the stability of all commodities in this submission.

Table 3 Summary of storage durations and condition of samples from supervised field trials included in this submission

Matrix	Analyte	%remaining [a]		Storage temp (ºC)	Maximum actual storage (days)	Limit of demonstrated stability (days)	Reference
		Range	Mean				
Blueberries	Spinosad	69–97	87	–20 ºC	100	141	80345 (PR-06850)
Cranberries	Spinosad	59–74	66	–24 to –7 ºC	148	152	78981 (PR-06823)
Caneberries	Spinosyns A and D	86–92	89	–21 ºC	223	223	2005398 PR-09123
Raspberries	Spinosad	98–106	103	–15 ºC	73	75	111345 (PR-06825)
Green Onion, fresh	Spinosad	103–114	109	–24 to –14 ºC	82	144	137354 (PR-06652)
Green Onion, dried	Spinosad	88–96	91	–24 to –7 ºC	120	124	
Almond	Spinosyn A	84– 93	89	< –15 ºC	554	572	261436 (PR-08739)
	Spinosyn D	80–89	85	< –15 ºC	554	572	
Almond hulls	Spinosyn A	83–89	85	< –15 ºC	552	601	
	Spinosyn D	82–88	84	< –15 ºC	552	601	
Pecan	Spinosad	86–94	90	–21 ± 7 ºC	56	63	79081 (PR-06824)
Basil, fresh	Spinosad	79–91	88	–20 ºC	176	165	103522 (PR-06905)
Basil, dry		103–106	105		147	142	

[a] Spiked samples stored alongside field samples

USE PATTERN

Information on registered uses made available to this meeting is shown in Table 4.

Table 4 Registered uses of spinosad on berries and other small fruits, tree nuts and bulb vegetables

Crop	Country	Formulation	Application					PHI days
			Method	Rate, g ai/ha	Water L/ha	g ai/hL	Max. no. or g ai/ha/year	
Berries and Other Small Fruits								
Berry fruit: Blackberries, Boysenberries Blueberries Cranberry, Currants Gooseberries, Raspberries, Strawberries	Australia	240 g/L SC	Foliar			4.8–9.6	3 at 7–14-day intervals	1
Raspberry	Belgium	480 g ai/SC	Foliar	96	1000	9.6	2 at 10-day interval	3
Raspberries	Japan	250g/kg	Foliar			5	2	3
Berries: blackberry, raspberry, blueberry, Hawthorne berries, currants,	Italy	480 g ai/L SC	Foliar	48–96	1000	4.8–9.6	3 at 7-day intervals	3

Crop	Country	Formulation	Application					PHI days
			Method	Rate, g ai/ha	Water L/ha	g ai/hL	Max. no. or g ai/ha/year	
gooseberry, elderberry, rosehips, rowan berries, wild strawberry, mulberry								
Bushberries: Blueberry, currant, elderberry, gooseberry, huckleberry, juneberry, ligonberry	USA	240 g ai/L	Foliar	70–105			6/year or max 504 at 6-day intervals	3
Caneberries: Blackberry, Loganberry, Raspberry, red and black	USA	240 g ai/L SC	Foliar	70–105			6/year or max 504 at 5-day intervals	1
Cranberry	USA	240 g ai/L SC	Foliar	70–175			6/ max 504 at 7-day intervals	21
Tree Nuts								
Almonds, walnuts, hazelnuts, chestnuts	Italy	480 g ai/L SC	Foliar	144–216	1500	9.6–14.4	Up to 3 at 7 to15- day intervals	7
Tree nuts, including pistachios	USA	240 g ai/L SC	Foliar	70–175	3741	1.9–4.6	3/year or max 504 at 7-day intervals	1
Bulb Vegetables								
Onion	UK/Ireland	480 g ai/L SC	Foliar	96	200–600	16–48	4	7
Onion	Belgium	480 g ai/L SC	Foliar	96	400–600	16–24	3	7
Onion	Brazil	480 g ai/L SC	Foliar	96	500–800	12–19.2	3	1
Onion	Germany	480 g ai/L SC	Foliar	96	400–600	16–24	4 at 10-day intervals	7
Onion	France	480 g ai/L SC	Foliar	96			2 at 8-day intervals	7
Onion	Italy	480 g ai/L SC	Foliar	96	600–800	12–16	4 at 7 to15-day intervals	7
Bulb vegetables: dry bulb onion, garlic, green onion, leek, shallot, Welch onion	USA	240 g ai/L SC	Foliar	53–140			5/year or max 504 at 4-day intervals	1
Other Crops								
Hops	USA	240 g ai/L SC	Foliar	70–105			5/year or max 526 at 5-day intervals	1
French bean	Kenya	480 g ai/L SC	Foliar	96	500–1000			1
Passionfruit	Kenya	480 g ai/L SC	Foliar	96	1000 to run-off			1

Crop	Country	Formulation	Application					PHI days
			Method	Rate, g ai/ha	Water L/ha	g ai/hL	Max. no. or g ai/ha/year	
Intended uses (no registration)								
Okra[a]		480 g ai/L SC	Foliar	160	50–1000		2	2
Papaya[a]		480 g ai/L SC	Foliar	96	250–800		3 at 56–77 day intervals	3

[a] Proposed GAP for requested Codex MRL—no relevant label was supplied.

RESIDUES RESULTING FROM SUPERVISED TRIALS

The Meeting received information on supervised trials for the uses of spinosad on berries (blueberries, cranberries, raspberries and caneberries), papaya, passionfruit, bulb vegetables (spring onions and onions), okra, French beans, tree nuts (almonds, pecans and walnuts) and basil.

Trials were well documented with laboratory and field reports. The former included method validation including procedural recoveries with spiking at residue levels similar to those occurring in samples from the supervised trials. Dates of analyses or duration of sample storage were also provided. Trials were carried out in appropriately sized plots and sample sizes were within acceptable weights. Applications were generally made using hand-held boom or knapsack boom sprayers although occasionally tractor mounted boom sprayers were used. Samples were collected and stored frozen immediately or soon after sampling. Although trials included control plots, no control data are recorded in the Tables because, unless noted, no residues in control samples exceeded the LOQ. Residues are unadjusted for recoveries.

When residues were not detected they are shown as below the LOQ (e.g., < 0.01 mg/kg). Residues, application rates and spray concentrations have generally been rounded to two significant figures. Residues from the trials conducted according to maximum GAP have been used for the estimation of maximum residue levels. Where multiple samples were taken from a single plot, each value is reported. Where results from separate plots were reported, results are listed for each plot. Results have not been corrected for recoveries unless indicated. For replicate samples (from the same plot), the highest value was used for maximum residue level estimation. For multiple plots (from the same trial location), results from the plot yielding the highest residue were utilized for maximum residue level estimation.

The results of these supervised trials are shown in the following tables:

Group	Commodity	Country/ Countries	Table No.
Berries and other small fruits	Blueberries	USA, Australia	5
	Cranberries	USA, Canada	6
	Raspberries	USA, Canada	7
Assorted tropical and sub-tropical fruits – inedible peel	Papaya	Côte d'Ivoire, Ghana	8
	Passionfruit	Kenya	9
Bulb vegetables	Bulb Onions	Brazil, France, Italy, United Kingdom and New Zealand	10
	Green Onions	France, Germany, Italy and USA	11
Fruiting vegetables, other than cucurbits	Okra	Côte d'Ivoire	12

Group	Commodity	Country/ Countries	Table No.
Legume vegetables	French beans	Kenya, Senegal	13
Tree nuts	Almonds	USA	14
	Pecans	USA	15
	Almonds and Pecans (Spinetoram)	USA	16
	Walnuts	Italy	17
Dried herbs	Hops	USA	18

Berries and other small fruits

Table 5 Spinosad residues in blueberries resulting from supervised trials in the USA and Australia

BLUEBERRIES	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
06850.98-ME02 Jonesboro, ME USA, 1998 (Low bush)	240 SC	98.6 98.6 97.5 96.4 95.3 96.4	237 239 237 233 231 234	6	1	Berries			0.041	80345 (PR-06850)
06850.98-MI32 Fennville, MI USA, 1998 (Jersey)	240 SC	98.6 98.6 98.6 97.5 97.5 97.5	461 461 463 459 459 459	6	1	Berries			0.15	80345 (PR-06850)
06850.98-MI33 Fennville, MI USA, 1998 (Jersey)	240 SC	99.7 98.6 98.6 100.9 99.8 99.5	465 463 462 473 466 456	6	1	Berries			0.16	80345 (PR-06850)
06850.98-MI34 Fennville, MI USA, 1998 (Jersey)	240 SC	99.8 99.8 97.5 98.6 98.6 99.8	465 470 458 462 460 465	6	1	Berries			0.035	80345 (PR-06850)
06850.98-NC15 Castle Hayne, NC USA, 1998 (Croatan)	240 SC	98.6 98.6 100.9 99.8 98.6 98.6	322 322 327 325 321 322	6	1	Berries			0.084	80345 (PR-06850)
06850.98-NC16 Castle Hayne, NC USA, 1998 (Blue Chip)	240 SC	99.7 101.9 98.6 99.8 100.9 100.9	328 333 321 327 329 329	6	1	Berries			0.07	80345 (PR-06850)
06850.98-OR14 Walla Walla, WA USA, 1998 (Blue Chip)	240 SC	103.1 100.9 101.9 98.6 98.6	493 475 442 428 421	6	1	Berries			0.18	80345 (PR-06850)

BLUEBERRIES	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
		99.8	439							
06850.98-PA04 Pennsylvania, PA USA, 1998 (Blue Crop)	240 SC	98.6 97.5 97.5 100.9 98.6 97.5	542 535 537 553 546 540	6	1	Berries			0.11	80345 (PR-06850)
Corindi, NSW Australia, 2000 (Sharpeblue) [a]	GF-120 at 40L/100L	8 g ai/hL	8.2 L/ha	16	7	Berries	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	134913 (GHE-P 2663)

Only one observation from each location was considered for the purposes of MRL setting.

[a] application as a spot spray to the base of plants as a fruit fly bait

Table 6 Spinosad residues in cranberries resulting from supervised trials in the USA and Canada [b]

CRANBERRIES	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
06823-99-BC03 Delta, BC Canada, 1999 (Stevens)	240 SC	183 186 182	368 378 377	3	21	Berries			< 0.01	78981 (PR-06823)
06823-98-MA02 East Wareham, MA USA, 1998 (Early black)	240 SC	171 176 171	707 725 707	3	20	Berries			< 0.01	78981 (PR-06823)
06823-98-OR32 Bandon, OR USA, 1998 (Stevens)	240 SC	178 178 175	571 572 563	3	20	Berries			< 0.01	78981 (PR-06823)
06823-98-WI23 Wisconsin Rapids, WI, USA, 1998 (Ben Lear)	240 SC	176 175 174	227 216 217	3	21	Berries			< 0.01	78981 (PR-06823)
06823-98-WI24[a] Biron, WI, USA 1998 (Ben Lear)	240 SC	173 175 176	226 217 223	3	21	Berries			< 0.01	78981 (PR-06823)
06823-99-NJ32 Tabernacle, NJ USA, 1999 (Early Black)	240 SC	176 174 180	315 311 323	3	21	Berries			< 0.01	78981 (PR-06823)

[a] During the second application, the test substance was erroneously applied at the rate of 115 g ai/ha. In order to correct this error, a second pass with a freshly prepared tank mix was made at the rate of 59 g ai/ha to the same plot on the same day. The combined rate of the two passes for the second application was 175 g ai/ha, which is the GAP rate.

[b] Concurrent storage stability samples showed less that 70% remaining, data may not be reliable and should not be used for estimation of maximum residue levels

Table 7 Spinosad residues in raspberries resulting from supervised trials in the USA, Switzerland and the United Kingdom

RASPBERRIES	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
06825-99-OR311 Aurora, OR USA, 1999 (Meeker)	240 SC	107 105 105 107 109 107	492 478 480 491 500 483	6	1	Berries			0.26, 0.37	111345 (PR-06825)
	240 SC	107 103 107 105 103	492 472 501 481 478	5	1	Berries			0.42, 0.14	111345 (PR-06825)
04-CA78 Camarillo, CA USA, 2004 (Tola – Raspberry)	240 SC	106 108 108 103 103	284 290 290 278 274	5	1	Berries	0.066 0.076	< 0.02 < 0.02	0.066 0.076	2005398 (PR-09123)
04-CA79 Madera, CA USA, 2004 (Boysenberry)	240 SC	107 105 104 107 107	283 277 283 282 282	5	1	Berries	1.1 1.5	0.25 0.31	1.4 1.8	2005398 (PR-09123)
Trial 705FF Valais, Switzerland, 2007 (Glen Ample, Tulameen)	480 SC	96 96 96	9.6 9.6 9.6 g ai/hL	3	0 1 3 7 14	Berries	< 0.01 0.04 < 0.01 < 0.01 < 0.01	< 0.01 0.01 < 0.01 < 0.01 < 0.01	< 0.01 0.05 < 0.01 < 0.01 < 0.01	258620 (CEMS-3767)
Trial 705FT (Tunnel) Valais, Switzerland, 2007 (Glen Ample, Tulameen)	480 SC	96 96 96	9.6 9.6 9.6 g ai/hL	3	0 1 3 7 14	Berries	< 0.01 0.19 0.12 0.08 0.03	< 0.01 0.04 0.02 0.02 < 0.01	< 0.01 0.23 0.14 0.10 0.03	258620 (CEMS-3767)
AK/12131/HD/1 Redbank, Ledbury, Herefordshire, UK 2007 (Mara Villa)	480 SC	106.1 85.3 85.3	9.6 9.6 9.6 g ai/hL	3	0 1 3 7 14	Berries	0.17 0.09 0.12 0.08 0.06	0.03 0.02 0.02 0.02 0.01	0.20 0.11 0.14 0.10 0.07	258620 (CEMS-3767)
Trial STCA Barrow-upon- Humber, North Line, UK, 2007 (Polka)	480 SC	143.3 128.5 128.8	9.6 9.6 9.6 g a.i./hl	3	0 1 3 7 14	Berries	0.57 0.49 0.36 0.24 0.14	0.11 0.09 0.06 0.05 0.03	0.68 0.58 0.42 0.29 0.17	258620 (CEMS-3767)

Only one observation from Aurora, OR was considered for the purposes of MRL setting.

Assorted tropical and sub-tropical fruits—inedible peel

Table 8 Spinosad residues in papaya resulting from supervised trials in the Côte de Ivoire and Ghana

PAPAYA	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
CIV/CNRA/PA/2004 Tiessalé, Côte de Ivoire, 2004 (Golden)	480 SC	96 96 96	250 250 250	3	3 7	Whole fruits			0.012 < 0.01 (1 Appl)	Papaya in Ivory Coast 2005, PGD-170
					3 7	Whole fruits			0.029 < 0.01 (2 Appl)	
					3 7	Whole fruits			0.019 0.018 (3 Appl)	
CIV/CNRA/PA/2004 Azaguié, Côte de Ivoire, 2004 (Golden)	480 SC	96 96 96	500 500 500	3	3 7	Whole fruits			< 0.01 < 0.01 (1 Appl)	Papaya in Ivory Coast 2005, PGD-170
					3 7	Whole fruits			0.023 < 0.01 (2 Appl)	
					3 7	Whole fruits			0.012 < 0.01 (3 Appl)	
GHA/PA/2005/01-02-03-04 Site 1, Season 1 Dansak farm in Ga West District Ghana, 2005 (Solo)	480 SC	96 96 96	660 660 660	3	3	Whole fruits			0.12 (1 Appl)	Papaya in Ghana 2005/2006, PGD-222
					3	Whole fruits			0.14 (2 Appl)	
					0 14 28 42 56	Whole fruits			0.23 0.22 0.020 < 0.01 < 0.01 (3 Appl)	
					14	Pulp			0.017	
					14	Peel			0.32	
GHA/PA/2005/01-02-03-04 Site 2, Season 1 Golden exotic in Ga West District, Ghana, 2005 (Golden Yellow)	480 SC	96 96 96	800 800 800	3	3	Whole fruits			0.085 (1 Appl)	Papaya in Ghana 2005/2006, PGD-222
					3	Whole fruits			0.17 (2 Appl)	
					0 14 28 42 56	Whole fruits			0.21 0.17 0.041 < 0.01 < 0.01 (3 Appl)	
					14	Pulp			0.010	
					14	Peel			0.30	
GHA/PA/2005/01-02-03-04 Site 1, Season 2 Dansak farm in Ga West District, Ghana, 2006 (Solo)	480 SC	96 96 96	660 660 660	3	3	Whole fruits			0.23 (1 Appl)	Papaya in Ghana 2005/2006, PGD-232
					3	Whole fruits			0.15 (2 Appl)	
					0 14 28 42 56	Whole fruits			0.21 0.062 0.030 0.022 0.019	

PAPAYA	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
									(3 Appl)	
					14	Pulp			< 0.01	
					14	Peel			0.24	
					28	Pulp			< 0.01	
					28	Peel			0.13	
GHA/PA/2005/01-02-03-04 Site 2, Season 2 Golden exotic in Ga West District, Ghana, 2006 (Golden Yellow)	480 SC	96 96 96	800 800 800	3	3	Whole fruits			0.15 (1 Appl)	Papaya in Ghana 2005/2006, PGD-232
					3	Whole fruits			0.13 (2 Appl)	
					0 14 28 42 56	Whole fruits			0.21 0.22 0.10 0.029 0.014 (3 Appl)	
					14	Pulp			< 0.01	
					14	Peel			0.68	
					28	Pulp			< 0.01	
					28	Peel			0.27	

Table 9 Spinosad residues in passionfruit resulting from supervised trials in Kenya

PASSIONFRUIT	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
C4/KE/PF/2005/1 Thika Magumu, Chania, Kamangi Division, Kenya 2005/6 (Purple)	480 EC	96 96 96	1000 1000 1000	3	1 3 7 14 21	Whole fruits			0.080 0.031 0.022 0.013 < 0.01	Passionfruit in Kenya 2006, R A6003
					3	Peel			0.075	
					3	Pulp			< 0.01	
C4/KE/PF/2005/2 Embu Kagari North, Runyen-jees Division, Kenya 2005/6 (Purple)	480 EC	96 96 96	1000 1000 1000	3	1 3 7 14 21	Whole fruits			0.11 0.075 0.050 0.025 0.024	Passionfruit in Kenya 2006, R A6003
					3	Peel			0.11	
					3	Pulp			0.013	
C4/KE/PF/2005/3 Nyeri, Karatina, Gatundu, Iriane, Mathera Division, Kenya 2005/6 (Purple)	480 EC	96 96 96	1000 1000 1000	3	1 3 7 14 21	Whole fruits			0.17 0.33 0.091 0.053 0.011	Passionfruit in Kenya 2006, R A6003
					3	Peel			0.45	
					3	Pulp			0.013	
C2/KE/PF/2007/1 Thika Magumu, Kenya 2007 (Purple)	480 EC	96 96 96	1020 1020 1020	3	1 3 7 14	Whole fruits			0.33 0.042 0.094 0.083	Passionfruit in Kenya 2007, PGD-275

PASSIONFRUIT	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
					21				0.045	
					3	Peel			0.11	
					3	Pulp			0.013	
C2/KE/PF/2007/2 Embu Thigingi, Runyenjes Division, Kenya 2007 (Purple)	480 EC	96 96 96	1016 1016 1016	3	1 3 7 14 21	Whole fruits			0.23 0.048 0.052 0.050 0.032	Passionfruit in Kenya 2007, PGD-275
					3	Peel			0.11	
					3	Pulp			0.025	

Bulb vegetables

Table 10 Spinosad residues in bulb onions resulting from supervised trials in Brazil, France, Italy, the United Kingdom and New Zealand

BULB ONIONS	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
Tapiratiba, Sao Paolo, Brazil 2002 (Superex)	480 SC	96 96 96	500 500 500	3	0 1 3 7 10	Bulb	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	108424 (GHB-P 938)
	480 SC	192 192 192	500 500 500	3	0 1 3 7 10	Bulb	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	
Trial 1 Mogi Mirim, Sao Paolo, Brazil, 2003 (Baia periforme)	480 SC	96 96 96	500 500 500	3	1	Bulb	< 0.01	< 0.01	< 0.01	136055 (GHB-P 980)
	480 SC	192 192 192	500 500 500	3	1	Bulb	< 0.01	< 0.01	< 0.01	
Trial 2 Ponta Grossa, Parana, Brazil 2003 (Baia periforme)	480 SC	96 96 96	500 500 500	3	1	Bulb	< 0.01	< 0.01	< 0.01	136055 (GHB-P 980)
	480 SC	192 192 192	500 500 500	3	1	Bulb	< 0.01	< 0.01	< 0.01	
Trial CEMS 2050A F-84440 Robion, S. France, 2003 (Fissa)	480 SC	98 95 96 95	609 591 598 596	4	0 [a] 0 [b] 1 3 5 7	Bulb	< 0.01 0.03 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 0.04 0.01 < 0.01 < 0.01 < 0.01	101130 (GHE-P 10626)
Trial CEMS 2050B F-26250 Livron Sur	480 SC	103 101	644 629	4	7	Bulb	< 0.01	< 0.01	< 0.01	101130 (GHE-P

BULB ONIONS	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
Drome, S. France 2003 (Karina)		97 97	607 609							10626)
Trial CEMS 4354B Monferran, Savès, Midi-Pyrénées S. France, 2009 (Sturon)	480 SC	94 104 98 97	393 433 407 403	4	0 [a] 0 [b] 2 4 7	Bulb	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	CEMS-4354 (GHE-P 12423)
Trial AF/5661/DE/1 Ansonville, 45300 Loiret, N. France, 2001 (Hysam)	480 SC	86 86 84 82	615 611 598 585	4	7	Bulb	0.03	< 0.01	0.03	102969 (GHE-P 9908)
Trial AF/5661/DE/2 Nangeville, 45330 Loiret, N. France, 2001 (Hysking)	480 SC	73 82 83 84	594 584 596 600	4	7	Bulb	0.02	< 0.01	0.02	102969 (GHE-P 9908)
Trial AF/5661/DE/3 Menil-Lepinois, F-08310 Ardennes, N. France, 2001 (Sumit)	480 SC	84 85 85 83	597 610 607 593	4	0 [a] 0 [b] 2 3 7 14	Bulb	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	102969 (GHE-P 9908)
Trial AF/5661/DE/4 Sept-Saulx, 51400, Marne, N. France 2001 (Sumit)	480 SC	85 82 84 85	607 590 600 610	4	0 [a] 0 [b] 2 3 7 14	Bulb	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	102969 (GHE-P 9908)
Trial AF/6423/DE/2 45300 Fresnay les Chaumes, Loiret, N. France, 2002 (Hygro)	480 SC	97 94 97 96	604 586 603 598	4	7	Bulb	< 0.01	< 0.01	< 0.01	110576 (GHE-P 10007)
Trial AF/6423/DE/4 45330 Coudray, Loiret, N. France, 2002 (Hysking)	480 SC	94 94 93 95	589 590 582 594	4	0 [a] 0 [b] 2 4 7 14	Bulb	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	110576 (GHE-P 10007)
Trial CEMS 4354A Voghera, Lombardy Italy, 2009 (Sterling)	480 SC	96 96 94 96	598 598 588 600	4	0 [a] 0 [b] 2 4 7	Bulb	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	CEMS-4354 (GHE-P 12423)
RSO-03/03 I-33031 Basiliano, (UD), Italy 2003 (Sterling)	480 SC	96 96 96	600 600 600	3	0 1 3 5 7	Bulb			< 0.05 < 0.05 < 0.05 < 0.05 < 0.05	222104 (ERSA-DA-01-04)
RSO-04-03-R1 33050 Clauiano di	480 SC	96 96	1000 1000	3	0 1	Bulb			< 0.05 < 0.05	221794 (ERSA-DA-

BULB ONIONS	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
Trivignano Udinese (UD), Italy 2004 (Density)		96	1000		3 5 7				< 0.05 < 0.05 < 0.05	02-05)
RSO-04-03-R2 33031 Basiliano (UD), Italy 2004 (Vaquero)	480 SC	96 96 96	1000 1000 1000	3	0 1 3 5 7	Bulb			< 0.05 < 0.05 < 0.05 < 0.05 < 0.05	221794 (ERSA-DA-02-05)
Trial AF/6423/DE/1 Kentford, Suffolk, UK, 2002 (Simaria)	480 SC	100 96 103 96	623 602 642 601	4	7	Bulb	< 0.01	< 0.01	< 0.01	110576 (GHE-P 10007)
Trial AF/6423/DE/3 Three Holes, Cambridgeshire, UK 2002 (Not reported)	480 SC	92 95 95 95	576 595 596 594	4	0 [a] 0 [b] 2 4 7 14	Bulb	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	110576 (GHE-P 10007)
Trial 099061-01 Pukekohe, New Zealand, 2000 (PLK)	120 SC	48 48 48 48	462 462 462 462	462 462 462 462	0 1 3 7 14	Bulb	0.04 0.03 0.03 0.02 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.04 0.03 0.03 0.02 < 0.01	139045 (GHF-P 2052)
	120 SC	96 96 96 96	462 462 462 462	4	0 1 3 7 14	Bulb	0.08 0.05 0.06 0.02 < 0.01	0.02 < 0.01 < 0.01 < 0.01 < 0.01	0.10 0.05 0.06 0.02 < 0.01	139045 (GHF-P 2052)
Trial 099061-02 Pukekohe, New Zealand, 2000 (PLK)	120 SC	48 48 48 48	462 462 462 462	4	0 1 3 6 14	Bulb	0.03 0.02 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.03 0.02 < 0.01 < 0.01 < 0.01	139045 (GHF-P 2052)
	120 SC	96 96 96 96	462 462 462 462	4	0 1 3 6 14	Bulb	0.05 0.05 < 0.01 0.02 < 0.01	0.01 0.01 < 0.01 < 0.01 < 0.01	0.06 0.06 < 0.01 0.02 < 0.01	139045 (GHF-P 2052)

[a] Sampled immediately prior to last application

[b] Sampled immediately after last application

Table 11 Spinosad residues in green onions resulting from supervised trials in France, Germany, Italy and the USA

GREEN ONIONS	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
CEMS-2052A F-13220 Chateauneuf les Martigues, S. France, 2003	480 SC	97 94 99 98	618 594 630 624	4	0* 0+ 1 3	Whole plant	< 0.01 0.18 0.13 0.01	ND 0.04 0.03 < 0.01	< 0.01 0.22 0.16 0.01	99937 (GHE-P 10628)

GREEN ONIONS	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
(Cristobal)					5 7		0.01 < 0.01	< 0.01 ND	0.01 < 0.01	
CEMS-2052B F-13170 Les Pennes Mirabeau, S. France 2003 (Cristobal)	480 SC	96 99 100 101	600 620 625 630	4	7	Whole plant	0.01	ND	0.01	99937 (GHE-P 10628)
CEMS-4356B Monferran Savès, Midi-Pyrénées, S. France, 2009 (Sunskin)	480 SC	94 93 101 96	393 387 422 402	4	0+ 0 2 4 7	Whole plant	0.02 0.78 0.05 0.03 < 0.01	< 0.01 0.16 0.01 < 0.01 < 0.01	0.02 0.94 0.06 0.03 < 0.01	CEMS-4356 (GHE-P 12424)
CEMS-2094B F-08250 Olizy Primat, N. France 2003 (Mikor)	480 SC	96 96 94 95	600 600 587 593	4	7	Whole plant	< 0.01	ND	< 0.01	138348 (GHE-P 10633)
CEMS-2279A F-08250 Olizy Primat, N. France, 2004 (Longor)	480 SC	94 91 100 101	587 567 627 633	4	7	Whole plant	0.01	< 0.01	0.01	148871 (GHE-P 10954)
AF/6424/DE1 Neufelderkoog, Schleswig-Holstein, Germany, 2002 (Kaigaro)	480 SC	94 98 95 97	588 613 595 607	4	0* 0+ 2 4 7 14	Whole plant	0.02 1.02 0.21 0.1 0.02 0.01	< 0.01 0.18 0.04 0.02 < 0.01 < 0.01	0.02 1.2 0.25 0.12 0.02 0.01	134785 (GHE-P 10009)
AF/6425/DE/2 Niefern-Öschelbron, Baden-Württemberg, Germany, 2002 (Matador F1)	480 SC	95 88 98 98	593 548 615 612	4	0* 0+ 2 4 7 14	Whole plant	0.04 1.52 0.94 0.54 0.09 0.02	< 0.01 0.27 0.16 0.09 0.02 < 0.01	0.04 1.79 1.1 0.63 0.11 0.02	134785 (GHE-P 10009)
CEMS-4356A Barbaresco, Piedmont, Italy 2009 (Rossa piatta d'Italia)	480 SC	95 95 96 94	493 495 501 487	4	0* 0+ 2 4 7	Whole plant	< 0.01 0.20 0.07 0.05 0.03	< 0.01 0.04 0.02 0.01 < 0.01	< 0.01 0.24 0.09 0.06 0.03	CEMS-4356 (GHE-P 12424)
06652.99-CA111 Salinas, CA USA, 1999 (White spear bunching)	240 SC	106 103 109 109 105	490 530 577 753 887	5	1	Green onion: Dried fresh			 0.95, 0.81 0.11, <u>0.20</u>	137354 (PR-06652)
06652.99-FL15 Gainesville, FL USA, 1999 (Not reported)	240 SC	110 108 109 110 110	290 283 288 291 291	5	1	Green onion fresh			0.07, <u>0.11</u>	137354 (PR-06652)
06652.99-TX13 Weslaco, TX USA, 1999 (1015)	240 SC	110 107 108 108 104	393 391 393 383 388	5	1	Green onion fresh			0.80, 1.5	137354 (PR-06652)

Fruiting vegetables, other than cucurbits

Table 12 Spinosad residues in okra resulting from supervised trials in the Côte d'Ivoire

OKRA	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
Dabou, Côte d'Ivoire 2004—dry season (Indiana)	480 SC	169 169	489 653	2	2 7	Whole fruits			0.35 < 0.05	Okra in Côte d'Ivoire 2005, PIP No. 0106/22/Direct-Lab/03 and PIP No. 0106/22/Direct-Lab/05
Abengourou, Côte d'Ivoire 2004—dry season (Indiana)	480 SC	167 168	551 733	2	2 7	Whole fruits			< 0.05 < 0.05 c0.076 [a]	Okra in Côte d'Ivoire 2005, PIP No. 0106/22/Direct-Lab/03 and PIP No. 0106/22/Direct-Lab/05
Dabou, Côte d'Ivoire 2004—wet season (Indiana)	480 SC	165	471	1	2 7	Whole fruits			0.05 < 0.05	Okra in Côte d'Ivoire 2005, PIP No. 0106/22/Direct-Lab/03 and PIP No. 0106/22/Direct-Lab/05
Abengourou, Côte d'Ivoire 2004—wet season (Indiana)	480 SC	165	449	1	2 7	Whole fruits			0.61 < 0.05	Okra in Côte d'Ivoire 2005, PIP No. 0106/22/Direct-Lab/03 and PIP No. 0106/22/Direct-Lab/05

[a] One control sample from the Abengourou dry season trial contained residues of 0.076 mg/kg. It was not clarified whether this was due to an error in labelling or cross-contamination. Observations from this trial were not considered for the purpose of MRL setting.

Legume vegetables

Table 13 Spinosad residues in French beans resulting from supervised trials in Kenya and Senegal

FRENCH BEANS	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
Trial KE/FB/2004/01 Wanguru, Mwea, Kenya, 2004 (Amy)	480 SC	132 127	552 528	2	1 3 7	Whole beans			0.18 0.11 0.01	GO4-0102

FRENCH BEANS	Application				PHI days	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No			Spinosyns			
							A	D	Total	
Trial KE/FB/2004/02 Ndulu, Thika, Kenya, 2004 (Amy)	480 SC	128 131	532 548	2	1 3 7	Whole beans			0.12 0.07 0.02	GO4-0102
Trial KE/FB/2004/03 Longonot Naivasha Kenya, 2004 (Theresa)	480 SC	134 137	558 572	2	1 3 7	Whole beans			0.07 0.07 0.01	GO4-0102
Trial SE/HV/2003/03 St Louis, Senegal, 2003 (Amy)	480 SC	160 160	800 800	2	4 7	Whole beans			0.24 0.06 (1 Appl)	20041064/01-RP
					4 7	Whole beans			0.04 0.02 (2 Appl)	
Trial SE/HV/2004/07 St Louis, Senegal, 2003 (Nerina)	480 SC	162 162	800 800	2	3 7	Whole beans			0.24 0.08 (1 Appl)	20041064/01-RP
					3 7	Whole beans			0.12 0.10 (2 Appl)	

Tree nuts

Table 14 Spinosad residues in almonds resulting from supervised trials in the USA

ALMONDS	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
ALMONDS										
08739-04-CA01 Terra Bella, CA USA, 2004 (Nonpariel)	240 SC	175 177 175 527	2089 2067 2058	3	1 3	Hulls	2.9 2.0 2.6 2.0	0.55 0.39 0.50 0.36	3.5 2.4 3.1 2.4	261436 (PR-08739)
				3	1 3	Nutmeat	0.032 0.020 0.020 0.021	< 0.02 < 0.02 < 0.02 < 0.02	0.032 0.020 0.020 0.021	
08739-03-CA116 Madera, CA USA, 2003 (Mission)	240 SC	173 174 175 522	1174 1181 1182	3	1 3	Hulls	3.9 4.4 3.9 3.7	0.61 0.69 0.67 0.55	4.5 5.1 4.6 4.3	261436 (PR-08739)
				3	1 3	Nutmeat	0.040 0.044 0.042 0.040	< 0.02 < 0.02 < 0.02 < 0.02	0.040 0.044 0.042 0.040	
08739-03-CA117 Arbuckle, CA USA, 2003 (Nonpariel)	240 SC	176 172 173 521	1617 1587 1589	3	1 4	Hulls	0.66 0.26 0.13 0.21	0.10 0.037 < 0.02 0.033	0.76 0.30 0.13 0.24	261436 (PR-08739)
				3	1 4	Nutmeat	< 0.02 < 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 < 0.02	

ALMONDS	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
08739-03-CA158 Irrigosa, CA USA, 2003 (Butte)	240 SC	173 173 174 520	1310 1309 1318	3	1 3	Hulls	3.7 3.9 3.9 3.5	0.57 0.60 0.57 0.55	4.3 4.5 4.5 4.1	261436 (PR-08739)
				3	1 3	Nutmeat	0.047 0.033 0.028 0.023	< 0.02 < 0.02 < 0.02 < 0.02	0.047 0.033 0.028 0.023	
08739-03-CA159 Glenn, CA USA, 2003 (Nonpariel)	240 SC	175 175 175 525	1847 1842 1846	3	1 3	Hulls	0.71 0.82 0.62 0.56	0.12 0.13 0.10 0.094	0.83 0.95 0.72 0.15	261436 (PR-08739)
				3	1 3	Nutmeat	< 0.02 < 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 < 0.02	
96004-CA4 McKittrick, CA USA, 1996 (Not reported)	480 SC	72 98 152 183 505	477 464 469 471	4	30	Hulls Nutmeat	0.22 0.28 < 0.01 < 0.01	0.027 0.036 < 0.01 < 0.01	0.25 0.32 < 0.01 < 0.01	60035 (GH-C 4397)
	480 SC	70 107 162 176 515	1872 1864 2047 1886	4	30	Hulls Nutmeat	0.30 0.36 < 0.01 < 0.01	0.038 0.048 < 0.01 < 0.01	0.34 0.41 < 0.01 < 0.01	60035 (GH-C 4397)
96004-CA5 Ripon, CA USA, 1996 (Not reported)	480 SC	70 100 154 182 506	468 477 475 470	4	0 5 14 21	Hulls	0.25 0.29 0.43 0.53 0.19 0.16 0.21 0.13	0.035 0.039 0.059 0.072 0.025 0.022 0.029 0.019	0.29 0.33 0.49 0.60 0.22 0.18 0.24 0.15	60035 (GH-C 4397)
				4	0 5 14 21	Nutmeat	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	
	480 SC	70 107 148 178 503	1874 1861 1875 1901	4	0 5 14 21	Hulls	0.30 0.39 0.44 0.54 0.23 0.25 0.28 0.26	0.041 0.053 0.061 0.075 0.031 0.033 0.039 0.036	0.34 0.44 0.50 0.62 0.26 0.28 0.32 0.30	60035 (GH-C 4397)
					0 5 14 21	Nutmeat	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	60035 (GH-C 4397)

ALMONDS	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
96004-CA6 Modesto, CA USA, 1996 (Not reported)	480 SC	71 99 150 181 501	471 472 465 467	4	14	Hulls Nutmeat	0.40 0.39 < 0.01 < 0.01	0.054 0.053 < 0.01 < 0.01	0.45 0.44 < 0.01 < 0.01	60035 (GH-C 4397)
		70 102 153 178 503	1867 1874 1870 1868	4	14	Hulls Nutmeat	0.52 0.69 < 0.01 < 0.01	0.073 0.096 < 0.01 < 0.01	0.59 0.79 < 0.01 < 0.01	60035 (GH-C 4397)
96004-CA1 Chico, CA USA, 1996 (Not reported)	480 SC	68 101 148 184 501	458 517 472 478	4	14	Hulls Nutmeat	0.52 0.66 < 0.01 < 0.01	0.07 0.09 < 0.01 < 0.01	0.59 0.75 < 0.01 < 0.01	60035 (GH-C 4397)
	480 SC	73 100 160 178 511	1955 2025 2004 1806	4	14	Hulls Nutmeat	0.73 0.54 < 0.01 < 0.01	0.10 0.074 < 0.01 < 0.01	0.83 0.61 < 0.01 < 0.01	60035 (GH-C 4397)
96004-CA2 Fresno, CA USA, 1996 (Not reported)	480 SC	71 99 153 178 501	485 472 474 492	4	14	Hulls Nutmeat	0.54 0.54 < 0.01 < 0.01	0.076 0.077 < 0.01 < 0.01	0.62 0.62 < 0.01 < 0.01	60035 (GH-C 4397)
	480 SC	69 101 156 185 511	1831 1866 1863 1937	4	14	Hulls Nutmeat	1.1 0.89 < 0.01 < 0.01	0.15 0.13 < 0.01 < 0.01	1.3 1.0 < 0.01 < 0.01	60035 (GH-C 4397)
96004-CA3 Ballico, CA USA, 1996 (Not reported)	480 SC	69 103- 145- 216 533	484 477 484 471	4	14	Hulls Nutmeat	0.40 0.46 < 0.01 < 0.01	0.053 0.061 < 0.01 < 0.01	0.45 0.52 < 0.01 < 0.01	60035 (GH-C 4397)
	480 SC	70 96 154 210 530	1854 1708 1954 1955	4	14	Hulls Nutmeat	0.65 0.80 < 0.01 < 0.01	0.088 0.11 < 0.01 < 0.01	0.74 0.91 < 0.01 < 0.01	60035 (GH-C 4397)

Table 15 Spinosad residues in pecans resulting from supervised trials in the USA

PECANS	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
06824-98-FL52 Hawthorne, FL USA, 1998 (Desirable)	240 SC	182 184 180 546	773 782 770	3	14	Nutmeat			< 0.001	79081 (PR-06824)
06824-98-FL53 Hawthorne, FL USA, 1998 (Stuart)	240 SC	182 184 179 545	774 783 765	3	14	Nutmeat			< 0.001	79081 (PR-06824)

PECANS	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
06824-98-TX33 Weslaco, TX USA, 1998 (Apache)	240 SC	178 179 179 536	1130 1109 1110	3	13	Nutmeat			0.002	79081 (PR-06824)
06824-98-NM01 Rincon, NM USA, 1998 (Western Schley)	240 SC	180 178 180 538	673 681 699	3	14	Nutmeat			0.008	79081 (PR-06824)

The above trials on pecans were conducted following an older US GAP for tree nuts that used three applications of spinosad at a maximum of 504 g ai/ha/year and a PHI of 14 days.

Table 16 Spinosad residues in walnuts resulting from supervised trials in Italy

WALNUTS	Application				PHI	Commo-dity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
114.1.SAG03/r Rovigo, Veneto Italy, 2003 (Lara)	480 SC	202	561	1	0 1 5 10 15	Nutmeat			< 0.005 < 0.005 < 0.005 < 0.005 < 0.005	223078 (AGRI 011)
115.1.SAG03/r Rovigo, Veneto Italy, 2003 (Chandler)	480 SC	206	571	1	0 1 5 10 15	Nutmeat			< 0.005 < 0.005 < 0.005 < 0.005 < 0.005	223078 (AGRI 011)
116.1.SAG03/r San Donà di Piave, Veneto, Italy, 2003 (Lara)	480 SC	226	628	1	0 1 5 10 15	Nutmeat			< 0.005 < 0.005 < 0.005 < 0.005 < 0.005	223078 (AGRI 011)
117.1.SAG03/r San Donà di Piave, Veneto, Italy 2003 (Lara)	480 SC	233	648	1	0 1 5 10 15	Nutmeat			< 0.005 < 0.005 < 0.005 < 0.005 < 0.005	223078 (AGRI 011)

Only one observation from each location was considered for the purposes of MRL setting.

Dried herbs

Table 17 Spinosad residues in basil resulting from supervised trials in the USA

BASIL	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
CA*90 Salinas, CA USA, 1999 (Not reported)	240 SC	119 109 112 105 112	554 577 745 888 904	5	1	Leaves and stem, fresh Leaves and stem, dry			0.66 0.43	103522 (PR-06905)

BASIL	Application				PHI	Commodity	Spinosad (mg/kg)			Reference
Trial, Country, Year (Variety)	Form (g ai/L)	g ai/ha	Water (L/ha)	No	days		Spinosyns			
							A	D	Total	
		557							6.3	
WA*39 Moxie, WA USA, 1999 (Italian Large Leaf)	240 SC	102 103 105 104 105 519	539 545 552 549 553	5	1	Leaves and stem, fresh			1.8, 1.9	103522 (PR-06905)

APPRAISAL

Spinosad was first evaluated by the JMPR in 2001 (T, R) and then in 2004 and 2008. An ADI of 0–0.02 mg/kg bw was estimated and an acute reference dose was determined to be unnecessary.

The 2011 Meeting received residues studies from the manufacturer to support additional MRLs for various berries, bulb vegetables, tree nuts and hops. Residues data were also submitted by COLEACP-PIP to support MRLs for papaya, passionfruit, okra and French beans.

Methods of analysis

The analytical methods provided with the supervised trials are generally based on the two methods previously reviewed by JMPR in 2001, namely HPLC and immunoassay.

The HPLC methods, after an extraction specific to the matrix, follow a reasonably standard clean-up, with determination based on UV or MS detection. These methods allow measurement of the individual spinosyns and provide data on spinosyns A, D, K, B and B of D in residue trials. Spinosyn A usually contributes most of the residue, and some HPLC methods concentrate on spinosyns A and D. The LOQ for most substrates is 0.01 mg/kg.

Immunoassay methods, after an extraction designed for the matrix, may or may not require clean-up before the final colorimetric determination. The methods are specific and measure the sum of the spinosyns and their metabolites. When the HPLC and immunoassay methods were tested side-by-side, the agreement was usually good. The LOQ for most substrates is 0.01 mg/kg.

Results of supervised trials on crops

The OECD calculator was used as a tool in the estimation of the maximum residue level from the selected residue data set obtained from trials conducted according to GAP. As a first step, the Meeting reviewed all relevant factors related to each data set in arriving at a best estimate of the maximum residue level using expert judgement. Then, the OECD calculator was employed. If the statistical calculation spreadsheet suggested a different value from that recommended by the JMPR, a brief explanation of the deviation was provided.

Blueberry

The Meeting received data for blueberries from supervised trials conducted in the USA and Australia.

The Australian trial did not conform to Australian GAP (1-day PHI) and was not considered further.

The GAP in the USA consists of up to six applications at 105 g ai/ha (for a total seasonal maximum of 504 g ai/ha) and a PHI of 3 days. The residues that correspond to USA GAP are in ranked order (n = 5): 0.041, 0.084, 0.11, 0.16, and 0.18 mg/kg. The Meeting estimated a maximum residue level of 0.4 mg/kg for spinosad on blueberries. The STMR is 0.11 mg/kg.

Cranberry

Data on cranberries were reviewed by the JMPR in 2008. However, the Meeting decided that since none of the trials matched GAP available at that time, no estimate could be made for a MRL for spinosad in cranberries. The GAP in the USA has since changed and the same trials are now re-evaluated against the new GAP.

Six supervised trials were conducted in the USA and Canada in 1999, according to maximum GAP of the USA (three foliar applications at 175 g ai/ha with a PHI of 21 days).

All residue values were < 0.01 mg/kg. The Meeting estimated an MRL for spinosad on cranberry of 0.02 mg/kg. The STMR is 0.01 mg/kg.

Cane berries (raspberry, boysenberry)

The Meeting received data from supervised trials on raspberries, conducted in the USA, Switzerland and the UK.

The GAP in the USA is up to six applications at a rate of 105 g ai/ha (or a seasonal maximum of 504 g ai/ha) and a PHI of 1 day. Spinosad residues in raspberries in US trials conducted according to USA GAP were 0.07 and 0.42 mg/kg and in one trial on boysenberries residues were 1.8 mg/kg.

Four supervised trials on raspberries (two in Switzerland and two in the UK) were conducted during 2007 according to the GAP in Belgium, which is up to two applications at 9.6 g ai/hL and a PHI of 3 days.

The ranked order of residues from supervised trials in Switzerland and the UK according to GAP was: < 0.01, 0.14, 0.14 and 0.42 mg/kg.

Although residues were higher in trials from the USA, the Meeting considered that there were an insufficient number of trials to recommend a maximum residue level for raspberries. Using the trials from Europe matching GAP of Belgium the Meeting estimated a maximum residue level of 1 mg/kg and an STMR of 0.14 mg/kg and agreed to extrapolate these estimates to dewberries and blackberries.

Papaya

As part of the Pesticide Initiative Project field trials from Côte d'Ivoire and Ghana were conducted where spinosad was applied as foliar sprays to papaya (3× 96 g ai/ha with intervals of 56 and 77 days).

Residues observed in rank order at a 3 day PHI were:

- after the first application: < 0.01, 0.012, 0.085, 0.12, 0.15, 0.23 mg/kg,
- after the second application: 0.023, 0.029, 0.13, 0.14, 0.15, 0.17 mg/kg
- after the last application: 0.012, 0.019 mg/kg.

While the application conditions for the trials were based on the requirement for appropriate control of pests, they were not supported by an official label or an official declaration of approved use. In the absence of evidence for an approved GAP, the Meeting could not estimate a maximum residue level for spinosad in papaya.

Passionfruit

Three supervised trials were conducted in Kenya during 2005/2006 and two in 2007 matching the Kenyan GAP (96 g ai/ha with a 1-day PHI and with the number of applications not specified).

The ranked order of residues from supervised trials according to GAP was 0.080, 0.11, 0.23, 0.33 and 0.33 mg/kg. The Meeting estimated an MRL for spinosad on passionfruit of 0.7 mg/kg. The STMR is 0.23 mg/kg.

Onions, bulb

The Meeting received a total of twenty supervised trials on bulb onions (nine in France, four in Italy, two in the UK, three in Brazil and two in New Zealand) and eleven on spring onions (five in France, two in Germany, one in Italy, and three in the USA). There is no GAP for onions in New Zealand; the information was not considered further. For the other countries the GAP for onions is applicable to both bulb and spring (green) onions.

The GAP in Brazil for bulb onions is up to three applications at 96 g ai/ha with a PHI of 1 day. Residues from trials according to the GAP were below the LOQ of 0.01 mg/kg (n = 3).

The GAP in France is two applications at 96 g ai/ha and a PHI of 7 days.

Residues in bulb onions from ttrials from the UK, France and Italy, approximating GAP from France (n = 15) are: < 0.01(10), 0.02, 0.03 and< 0.05(3) mg/kg.

The Meeting estimated a maximum residue level of 0.1 mg/kg for spinosad in bulb onions. The STMR is 0.01 mg/kg.

Onions, green (Spring onions)

The Meeting received data from eleven supervised trials conducted on spring onions in USA and France, Germany and Italy.

In France GAP for onions is two applications of spinosad at 96 g ai/ha and a PHI of 7 days. Residues in spring onions from trials from France, Germany and Italy approximating GAP of France are in ranked order (n = 8): < 0.01 (3), 0.01, 0.01, 0.02, 0.03 and 0.11 mg/kg.

The GAP in the USA is up to five applications at a maximum rate of 140 g ai/ha (maximum seasonal rate of 504 g ai/ha) and a PHI of 1 day. The residues from the USA trials are in ranked order: 0.11, 0.2 and 1.5 mg/kg.

As residues in trials matching the GAP of the USA would lead to the higher maximum residue level the Meeting used the data from the USA trials to estimate a maximum residue level of 4 mg/kg for spinosad in spring onions. The STMR is 0.2 mg/kg.

Okra

Field trials on okra from Côte d'Ivoire were conducted within the Pesticide Initiative Project aiming to provide data for establishing import MRLs in the European Union. Spinosad was applied as foliar sprays to okra (1 or 2 applications of spinosad at 160 g ai/ha at a 14-day interval and a PHI of 2 days). The residues at two days after the last application were 0.05, 0.35, and 0.61 mg/kg.

While the application conditions for the trials were based on the requirement for appropriate control of pests, they were not supported by an official label or an official declaration of approved use. In the absence of evidence of an approved GAP, the Meeting could not estimate a maximum residue level for spinosad in okra.

French beans

Three supervised trials were conducted in Kenya and Senegal, but did not match the GAP in Kenya (96 g ai/ha and a PHI of 1 day).

Tree nuts

Almonds

Data from supervised trials on almonds conducted in the USA (GAP of 180 g ai/ha with a PHI of 14 days) were reviewed by the 2001 JMPR and Codex MRLs of 0.01(*) mg/kg for nutmeat and 2 mg/kg for almond hulls have been established based. The GAP has since changed and new trials were evaluated by the Meeting.

The new GAP for almonds in the USA is up to 3 applications at a maximum rate of 175 g ai/ha with a PHI of 1 day. Supervised trials on almonds were conducted in the USA that matched the revised GAP. Residues of spinosad in almond nutmeat are in rank order: < 0.01, < 0.02, ≤ 0.02, 0.032, 0.044, and 0.047 mg/kg.

Pecans

The Meeting received data from four trials conducted on pecans in the USA however the trials did not match the new GAP.

Walnuts

Data were received from two supervised trials conducted in Italy. The GAP for tree nuts in Italy is up to three applications at a rate of 216 g ai/ha with a PHI of 7 days. Residues corresponding to GAP were below the LOQ of 0.005 (2) mg/kg. There are insufficient data to estimate a maximum residue level for walnuts.

The Meeting agreed to use the data on almonds from the USA to estimate a maximum residue level of 0.07 mg/kg for tree nuts and an STMR of 0.026 mg/kg. The recommendation replaces the previous recommendation of 0.01* mg/kg for almonds.

Hops, dry

Two supervised trials were conducted on basil in the USA. The data were provided to support a maximum residue level for hops. The Meeting agreed that data for basil were not relevant for hops.

Animal feed commodities

Almond hulls

Residues of spinosad in almond hulls from trials conducted according to the GAP of the USA are in rank order: 0.62, 0.76, 0.95, 3.5, 4.5 and 5.1 mg/kg. The median residue is 2.23 mg/kg. The Meeting considered that almond hulls are not traded and agreed to withdraw its previous recommendation of 2 mg/kg for almond hulls.

Residues in animal commodities

Almond hulls are the only commodity in the present evaluation which can be considered as a beef and dairy cattle feed item and are not consumed by poultry. Maximum and mean dietary burdens for beef and dairy cattle were recalculated to determine if the resulting higher residues on almond hulls from the updated USA GAP would change the dietary burdens previously estimated by JMPR. The dietary burdens were estimated using the OECD diets listed in Appendix IX of the 2009 edition of the FAO Manual.

The increased residue levels for almond hulls do not change the previously estimated maximum dietary burden of spinosad in cattle and the corresponding previous recommendations on animal commodities will remain the same.

RECOMMENDATIONS

On the basis of the data from supervised trials, the Meeting concluded that the residue concentrations listed below are suitable for establishing MRLs and for assessing IEDIs.

Definition of the residue (for compliance with the MRL and for estimation of dietary intake) *sum of spinosyn A and spinosyn D.*

CCN	Commodity	MRL (mg/kg)		STMR or STMR-P (mg/kg)
		New	Previous	
TN 0660	Almonds	W [a]	0.01*	

CCN	Commodity	MRL (mg/kg)		STMR or STMR-P (mg/kg)
		New	Previous	
AM 0660	Almond hulls	W [b]	2	2.2
FB 0264	Blackberries	1		0.14
FB 0020	Blueberries	0.4		0.11
FB 0265	Cranberry	0.02		0.01
FB 0266	Dewberries (including Boysenberry & Loganberry)	1		0.14
VA0385	Onion, Bulb	0.1		0.01
FI 0351	Passion fruit	0.7		0.23
FB 0272	Raspberry, Red, Black	1		0.14
VA 0389	Spring onion	4		0.2
TN 0085	Tree nuts	0.07		0.026

*The MRL is estimated at or about the LOQ.

[a] The recommendation for almonds is withdrawn to be replaced by a recommendation for Tree nuts

[b] The recommendation for almond hulls is withdrawn as the commodity is not traded.

DIETARY RISK ASSESSMENT

Long-term intake

The evaluation of spinosad resulted in recommendations for new MRLs and STMR values for raw and processed commodities. Data on consumption were available for 71 food commodities from this and previous evaluations and were used to calculate dietary intake. The results are shown in Annex 3 of the 2011 JMPR Report.

The IEDIs in the five GEMS/Food regional diets, based on estimated STMRs were 10–40% of the maximum ADI (0.02 mg/kg bw). The Meeting concluded that long-term intake of residues of spinosad from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The 2001 JMPR concluded that it was unnecessary to establish an ARfD for spinosad. The Meeting therefore concluded that short-term dietary intake of spinosad residues is unlikely to present a risk to consumers.

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