UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

MEMORANDUM

Date: July 2, 2003

Reviewers:

William Cutchin, Chemist — Date: 8/25/03
Reviewer
SIMB/HED (7509C)

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RAB2/HED (7509C)

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FREAS, HED, PMRA

DP Barcode: D281841 and D297173

Petition No.: 1F06313

Citations: 45623401 Wofford, J.; Abdel-Baky, S. (2002) The Magnitude of BAS 510 F Residues in Cabbage: Final Report: Lab Project Number: 2001/5002617:66704: F-96/1. Unpublished study prepared by BASF Agro Research. 51 p.

45623404 Wofford, J.; Abdel-Baky, S. (2002) The Magnitude of BAS 510 F Residues in Broccoli: Final Report: Lab Project Number: 2001/5002616: 66702: FR0108. Unpublished study prepared by BASF Agro Research. 43 p.

45623406 Wofford, J.; Abdel-Baky, S. (2002) Magnitude of BAS 510 F and BAS 500 F Residues in Mustard Greens - 2001 Field Study: Final Report: Lab Project Number: 2001/5003339: 67080: CF-A 587. Unpublished study prepared by BASF Agro Research. 68 p.

Sponsor: BASF Corporation

Background

The information contained herein was compiled by Dynamac Corporation (20440 Century Boulevard, Suite 100, Germantown MD 20874), contractor, under the supervision of RAB2/HED. This DER has undergone secondary review by RAB2, and reflects current HED

(1)

and Office of Pesticide Programs (OPP) policies. This DER has also been peer-reviewed by PMRA/Canada.

Executive Summary

BASF Corporation has submitted field trial data on the representative crops, broccoli, cabbage, and mustard greens, of the *Brassica* (cole) leafy vegetable crop group (Crop Group 5). During the 2001 growing season, six broccoli trials were conducted in Regions 6 (1 trial, TX), 10 (4 trials, CA), and 12 (1 trial, OR); six cabbage trials were conducted in Regions 1 (1 trial, PA), 2 (1 trial, NC), 3 (1 trial, FL), 5 (1 trial, MI), 6 (1 trial, TX), and 10 (1 trial, CA); and five mustard green trials were conducted in Regions 2 (1 trial, NC), 4 (1 trial, MS), 5 (1 trial, WI), 6 (1 trial, TX), and 10 (1 trial, CA). The number and location of field trials are adequate with respect to EPA's data requirements for the *Brassica* leafy vegetable crop group. Due to the lack of representative data from zones applicable to Canada, PMRA will not support the domestic registration in Canada of BAS 510F on the *Brassica* Head and Stem sub-crop group based on the information provided. The PMRA will however consider a registeration on subcrop group 5B pending one additional residue trial in mustard greens conducted in zone 12. It should be noted that these trials are needed to support both the use of this chemical on this crop group but also to support the residue levels resulting in rotated crops from the use of this chemical in any crop.

Samples of broccoli, cabbage, and mustard greens were harvested 0, 3-4, 7, 10-11, and 14 days following the last of two foliar spray applications of the 70% wettable granular (WG) formulation at ~0.4 lb ai/A/application (≈0.45 kg ai/ha/application), with a 6- to 8-day retreatment interval, for a total rate of 0.78-0.83 lb ai/A (0.87-0.93 kg ai/ha). Applications were made using ground equipment in a spray volume of 11.8-37.7 gal/A (132-422 l/ha) of water with a spray adjuvant added. [We note that the 70% BAS 510 F WG formulation used in the mustard green field trials also contained another experimental active ingredient (BAS 500 F, pyraclostrobin) as part of the tank-mix.]

Maximum storage intervals of crop samples from harvest-to-analysis were 147 days (4.8 months) for broccoli, 169 days (5.6 months) for cabbage, and 201 days (6.6 months) for mustard greens. Adequate storage stability data (refer to the DER for MRID 45405109) are available to support the storage conditions and intervals of samples from the submitted broccoli, cabbage, and mustard green field trials.

Residues in representative commodities were quantitated using LC/MS/MS method D9908, the data collection method for plant commodities. Adequate concurrent method validation data for broccoli, cabbage, and mustard greens were included in the submission.

Residues of BAS 510 F were 0.72-2.73 ppm, 0.26-1.92 ppm, 0.20-1.32 ppm, 0.18-1.48 ppm, and <0.05-0.92 ppm in/on treated samples of broccoli harvested at the 0-, 3-, 7-, 10-, and 14-day PHIs, respectively.

Residues of BAS 510 F were 0.60-2.82 ppm, 0.24-1.80 ppm, 0.30-1.04 ppm, 0.14-1.34 ppm, and 0.13-1.32 ppm in/on treated samples of cabbage with wrapper leaves harvested at the 0-, 3- or 4-, 7-, 10- or 11-, and 14-day PHIs, respectively. Residues of BAS 510 F were <0.05-0.55 ppm, <0.05-0.34 ppm, <0.05-0.21 ppm, <0.05-0.11 ppm, and <0.05-0.09 ppm in/on treated samples of cabbage without wrapper leaves harvested at the 0-, 3- or 4-, 7-, 10- or 11-, and 14-day PHIs, respectively.

Residues of BAS 510 F were 18.70-71.60 ppm, 2.83-26.25 ppm, 0.90-22.10 ppm, 0.33-20.10 ppm, and 0.43-15.35 ppm in/on treated samples of mustard greens harvested at the 0-, 3-, 7-, 10-, and 14-day PHIs, respectively.

The residue decline data for broccoli, cabbage, and mustard greens indicated that residues of BAS 510 F generally were highest at 0-day PHI and subsequently decreased at longer PHIs.

This study is **acceptable** and fulfills the data requirements for Crop Group 5. However, a crop group 5 tolerance is not appropriate since the maximum residue in mustard greens versus that in broccoli and cabbage varies by more than a factor of 5x.

Separate tolerances for the Head and Stem *Brassica* subgroup (5A) and the Leafy *Brassica* Greens subgroup (5B) would be appropriate. The number and geographic distribution of field trials for a crop subgroup 5A tolerance are adequate to fulfill Guideline requirements. However, the number and geographic distribution of field trials for a crop subgroup 5B tolerance is inadequate; three additional field trials on mustard greens, one each from Regions 2, 3, and 10, would be required to fulfill Guideline requirements.

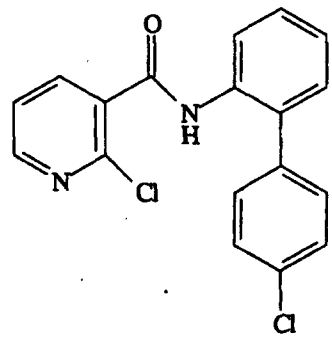
In lieu of a crop subgroup 5B tolerance, an adequate number of trials (5) have been submitted to meet the Guideline requirements for an individual tolerance on mustard greens.

GLP Compliance

Signed and dated GLP, Quality Assurance, and Data Confidentiality statements were provided. No GLP deviations were reported which would impact the study results or their interpretation.

1. Materials and Methods

1.1. Test Substance



BAS 510 F

Active Ingredient

Common Name:	Nicobifen (ISO, proposed)
IUPAC Name:	2-Chloro-N-(4'-chlorobiphenyl-2-yl)nicotinamide
CAS Name:	3-Pyridinecarboxamide, 2-chloro-N-(4'chloro[1,1'-biphenyl]-2-yl)-
CAS Number:	188425-85-6
Company Name:	BAS 510 F
Other Synonyms:	BASF Registry No. 300355

TABLE B.1.2. Trial Numbers and Geographical Locations

NAFTA Growing Region	Broccoli			Cabbage			Mustard greens		
	Submitted	Requested		Submitted	Requested		Submitted	Requested	
		Canada	US		Canada	US		Canada [2]	US
1				1		1			
0.04166667									
2				1		1	1		1
3				1		1			
4							1		1
5		2		1	2	1	1		1
0.208333333									
5B		2			2				
6	1		1	1		1	1		1
7									
0.291666667									
8									
9									
10	4		4	1		1	1		1
11									
12	1	1	1		1				
13									
14									
15									
16									
17									
18									
19									
20									
21									
Total	6	5	6	6	5	6	5	0	5

[1] The representative commodities for the Brassica leafy vegetable crop group are broccoli or cauliflower, cabbage, and mustard greens. [2] There are no specific zonal requirements in Dir 98-02..

Table 1.2.2. Crop and Field Trial Information.

EPA Region	Location (County, State, Year)	Crop; Variety	Formul.	Applic. Timing	Applic. Rate (lb ai/A) [kg ai/ha]	Retreat. Intervals (days)	No. of Applics.	Applic. Method/ Applic. Volume (GPA)	Total Applic. Rate (lb ai/A)	Tank Mix Adjuvants	Harvest Procedures
Broccoli											
6	Uvalde, TX, 2001	Broccoli; Not reported	70% WG	Heads 0-6" diameter Heads 3-8" diameter	0.403-0.404 [0.451-0.452]	6	2	Foliar spray/ 20.15-20.24	0.807	Silwet L-77	Broccoli harvested 0, 3, 7, 10, and 14 days after last application (DALA).
10	Monterey, CA, 2001	Broccoli; Marathon	70% WG	Heading (floret) Maturity	0.400 [0.448]	7	2	Foliar spray/ 30.12-30.13	0.8	Latron B-1956	Broccoli harvested 0, 3, 7, 10, and 14 DALA.
10	Tulare, CA, 2001	Broccoli; Marathon	70% WG	~3" buttons; 18-20" crop height Maturity; 18-20" crop height	0.400 [0.448]	6	2	Foliar spray/ 26.26-30.35	0.8	Latron B-1956	Broccoli harvested 0, 3, 7, 10, and 14 DALA.
10	Fresno, CA, 2001	Broccoli; Marathon	70% WG	Robust ~4" heads; 22" crop height Heads to 5"; 21" crop height	0.4-0.404 [0.448-0.452]	7	2	Foliar spray/ 30-30.3	0.804	Agridex (2nd applic. only)	Broccoli harvested 0, 3, 7, 10, and 14 DALA.
10	Glenn, CA, 2001	Broccoli; Greenbelt	70% WG	~2' crop height Head development; ~2' crop height	0.398-0.402 [0.446-0.450]	7	2	Foliar spray/ 30-30.4	0.8	Kinetic	Broccoli harvested 0, 3, 7, 10, and 14 DALA.
12	Benton, OR, 2001	Broccoli; Arcadia	70% WG	7 days PHI Mature heads	0.4 [0.448]	7	2	Foliar spray/ 24.99-25.25	0.8	R-11 (2nd applic. only)	Broccoli harvested 0, 3, 7, 10, and 14 DALA.

Table 1.2.2. Crop and Field Trial Information.

EPA Region	Location (County, State, Year)	Crop; Variety	Formul.	Applic. Timing	Applic. Rate (lb ai/A) [kg ai/ha]	Retreat. Intervals (days)	No. of Applics.	Applic. Method/ Applic. Volume (GPA)	Total Applic. Rate (lb ai/A)	Tank Mix Adjuvants	Harvest Procedures
Cabbage											
1	Lehigh, PA, 2001	Cabbage; Market Prize	70% WG	Heads 6-8" diameter Heads 6-10" diameter	0.41-0.419 [0.459-0.469]	8	2	Foliar spray/ 36.99-37.7	0.829	Penetrator Plus	Cabbage heads with and without wrapper leaves harvested 0, 3, 7, 10, and 14 DALA.
2	Wake, NC, 2001	Cabbage; Early Jersey Wakefield	70% WG	Fist-size heads; 12-13" crop height Heading (4-6"); 12-14" crop height	0.39-0.399 [0.437-0.446]	7	2	Foliar spray/ 19.52-19.92	0.789	Surf AC 820	Cabbage heads with and without wrapper leaves harvested 0, 3, 7, 10, and 14 DALA.
3	Seminole, FL, 2001	Cabbage; Everlasting	70% WG	Nearing maturity; 11" crop height Mature cabbage	0.386-0.396 [0.433-0.443]	7	2	Foliar spray/ 21.25-21.75	0.782	Triangle DW Surfactant	Cabbage heads with and without wrapper leaves harvested 0, 3, 7, 10, and 14 DALA.
5	Ottawa, MI, 2001	Cabbage; Rinda	70% WG	Heads up to 7"diameter Heads up to 7.5" diameter	0.4 [0.448]	6	2	Foliar spray/ 25.3	0.8	Latron B-1956	Cabbage heads with and without wrapper leaves harvested 0, 4, 7, 11, and 14 DALA.
6	Uvalde, TX, 2001	Cabbage; Pennant	70% WG	Heads 3-8" diameter Heads 5-10" diameter	0.394-0.4 [0.441-0.448]	6	2	Foliar spray/ 19.74-20.02	0.794	SilWet L-77	Cabbage heads with and without wrapper leaves harvested 0, 3, 7, 10, and 14 DALA.
10	Tulare, CA, 2001	Cabbage; Supreme Vantage	70% WG	Near maturity; 8" Mature 8-10" heads	0.394-0.399 [0.441-0.447]	7	2	Foliar spray/ 35.29-36.05	0.793	Latron B-1956	Cabbage heads with and without wrapper leaves harvested 0, 3, 7, 10, and 14 DALA.

Table 1.2.2. Crop and Field Trial Information.

EPA Region	Location (County, State, Year)	Crop; Variety	Formul.	Applic. Timing	Applic. Rate (lb ai/A) [kg ai/ha]	Retreat. Intervals (days)	No. of Applics.	Applic. Method/ Applic. Volume (GPA)	Total Applic. Rate (lb ai/A)	Tank Mix Adjuvants	Harvest Procedures
Mustard Greens											
2	Wake, NC, 2001	Mustard greens; Florida Broadleaf	70% WG	4-6 leaf; 6-9" crop height 3-5 leaf; 10-12" crop height	0.4-0.402 [0.448-0.450]	7	2	Foliar spray/ 20.00-20.09	0.802	Suf-Ac 820	Greens harvested 0, 3, 7, 10, and 14 DALA.
4	Washington, MS, 2001	Mustard greens; Florida Broadleaf	70% WG	2-5 leaf Mature; 5-6" crop height	0.4 [0.448]	7	2	Foliar spray/ 11.84-12.74	0.8	Surf Aid	Greens harvested 0, 3, 7, 10, and 14 DALA.
5	Pepin, WI, 2001	Mustard greens; Florida Broadleaf India Mustard	70% WG	5-6 leaves; 6" crop height 7-8 leaves; 11" crop height	0.398-0.4 [0.446-0.448]	6	2	Foliar spray/ 19.88-20.02	0.798	Class Preference	Greens harvested 0, 3, 7, 10, and 14 DALA.
6	Uvalde, TX, 2001	Mustard greens; Southern Giant Curled Mustard	70% WG	11 leaves; 11-16" crop height At harvest; 13-17" crop height	0.4-0.4145 [0.448-0.464]	7	2	Foliar spray/ 30.2-31.1	0.815	Induce	Greens harvested 0, 3, 7, 10, and 14 DALA.
10	Fresno, CA, 2001	Mustard greens; Florida Broadleaf	70% WG	12 leaf; 20" crop height 14 leaf; 20" crop height	0.392-0.396 [0.439-0.443]	8	2	Foliar spray/ 29.4-29.7	0.788	Agridex	Greens harvested 0, 3, 7, 10, and 14 DALA.

1.3. Post-harvest Procedures

A single untreated (0-day PHI only) and duplicate treated samples of broccoli, cabbage (with and without wrapper leaves), and mustard greens were harvested from each field site at each sampling interval. Specific harvesting procedures were not described; however, each broccoli or cabbage sample consisted of at least 12 plants/heads, each broccoli sample weighed ≥2.2 lbs, and each mustard green sample weighed ≥4.4 lbs. Samples were bagged and stored frozen (temperature not specified) on the day of harvest. Samples were shipped frozen within 0-28 days of harvest to BASF Agro Research (Research Triangle Park, NC) for analysis; mustard green samples from a single trial (NC) were hand delivered, under cold storage, to BASF on the day of harvest and were frozen at BASF. Broccoli, cabbage, and mustard green samples were analyzed within 5 days of extraction.

Table 1.3.1. Summary of Storage Conditions

Matrix	RAC or Extract	Storage Temperature (°C) (Analytical Laboratory)	Duration
Broccoli	Head/Stem (RAC)	<-10	39-147 days (1.3-4.8 months)
Cabbage	Heads with (RAC) and without wrapper leaves		24-169 days (0.8-5.6 months)
Mustard	Greens (RAC)		46-201 days (1.5-6.6 months)

1.4. Analytical Methods

Samples of broccoli, cabbage, and mustard greens were analyzed for residues of BAS 510 F using LC/MS/MS method D9908, the data collection method for plants. Briefly, samples were extracted with methanol:water:2N HCl (70:25:5, v:v:v). An aliquot of the extract was subjected to liquid/liquid partitioning with saturated sodium chloride and cyclohexane. An aliquot of the cyclohexane phase was collected and, if necessary for broccoli or cabbage samples, subjected to further cleanup through a silica gel micro-column; residues were eluted with ethyl acetate in DCM. The cyclohexane aliquot or eluate following silica gel cleanup was then evaporated to dryness and residues were redissolved in methanol:4 mM ammonium formate and 0.1% formic acid buffer solution (8:2, v:v) for analysis by LC/MS/MS. Refer to the DER for MRID 45405027 for a complete description of the quantitation procedures. The limit of detection (LOD) was 0.025 ppm, and the validated limit of quantitation (LOQ) was 0.05 ppm for the residues of BAS 510 F in/on broccoli, cabbage, and mustard greens.

2. Results

Table 2.1. Summary of Concurrent Analytical Method Validation.			
Crop Matrix	Fortification Level (ppm)	Recoveries (%)	Mean Recovery ± SD
Broccoli	0.05-5.0	78, 84, 90, 90, 94, 98, 99, 102, 105, 106, 130	98 ± 14
Cabbage with wrapper leaves	0.05-5.0	76, 78, 78, 78, 79, 79, 82, 82, 86, 98, 98, 105, 110, 127	88 ± 13
Cabbage without wrapper leaves	0.05-5.0	76, 79, 81, 82, 86, 86, 90, 99	
Mustard greens	0.05-100	84, 84, 97, 117, 121, 124, 126, 129	110 ± 19

Table 2.2. Residue Data from Crop Field Trials in Brassica Leafy Vegetables with BAS 510 F.						
Location (County, State, Year)	Crop Variety	Commodity	Formul.	Total Rate (lbs ai/A) [kg ai/ha]	PHI (days)	BAS 510 F residues (ppm)
Broccoli						
Uvalde, TX, 2001	Broccoli; Not reported	Head/Stem	70% WG	0.8067 [0.903]	0	1.57, 1.60
					3	0.71, 1.00
					7	0.56, 0.64
					10	0.34, 0.43
					14	0.10, 0.11
Monterey, CA, 2001	Broccoli; Marathon	Head/Stem	70% WG	0.7996 [0.896]	0	0.74, 1.21
					3	0.26, 0.30
					7	0.27, 0.30
					10	0.18, 0.21
					14	0.15, 0.23
Tulare, CA, 2001	Broccoli; Marathon	Head/Stem	70% WG	0.800 [0.896]	0	1.53, 1.62
					3	1.53, 1.86
					7	1.06, 1.20
					10	0.84, 1.48
					14	<0.05, 0.68
Fresno, CA, 2001	Broccoli; Marathon	Head/Stem	70% WG	0.804 [0.900]	0	2.67, 2.73
					3	1.51, 1.92
					7	1.20, 1.32
					10	0.85, 0.91
					14	0.69, 0.92

Table 2.2. Residue Data from Crop Field Trials in Brassica Leafy Vegetables with BAS 510 F.

Location (County, State, Year)	Crop Variety	Commodity	Formul.	Total Rate (lbs ai/A) [kg ai/ha]	PHI (days)	BAS 510 F residues (ppm)
Glenn, CA, 2001	Broccoli; Greenbelt	Head/Stem	70% WG	0.800 [0.896]	0	0.72, 0.90
					3	0.54, 0.81
					7	0.43, 0.54
					10	0.31, 0.40
					14	0.17, 0.23
Benton, OR, 2001	Broccoli; Arcadia	Head/Stem	70% WG	0.800 [0.896]	0	1.41, 1.48
					3	0.68, 0.83
					7	0.20, 0.23
					10	0.18, 0.31
					14	0.08, 0.10
Cabbage (with wrapper leaves)						
Lehigh, PA, 2001	Cabbage; Market Prize	Heads with wrapper leaves	70% WG	0.829 [0.926]	0	1.61, 2.82
					3	1.04, 1.49
					7	1.02, 1.04
					10	0.99, 1.29
					14	0.34, 0.52
Wake, NC, 2001	Cabbage; Early Jersey Wakefield	Heads with wrapper leaves	70% WG	0.7885 [0.883]	0	1.93, 2.72
					3	1.03, 1.22
					7	0.40, 0.52
					10	0.19, 0.44
					14	0.25, 0.36
Seminole, FL, 2001	Cabbage; Everlasting	Heads with wrapper leaves	70% WG	0.7819 [0.876]	0	1.53 [1], 2.17 [1]
					3	1.75, 1.80
					7	0.87, 1.01
					10	1.30, 1.34
					14	0.99, 1.32
Ottawa, MI, 2001	Cabbage; Rinda	Heads with wrapper leaves	70% WG	0.8 [0.896]	0	0.70, 0.76
					4	0.24, 0.34
					7	0.30, 0.39
					11	0.14, 0.29
					14	0.13, 0.19
Uvalde, TX, 2001	Cabbage; Pennant	Heads with wrapper leaves	70% WG	0.794 [0.889]	0	1.00, 1.12

Table 2.2. Residue Data from Crop Field Trials in Brassica Leafy Vegetables with BAS 510 F.

Location (County, State, Year)	Crop Variety	Commodity	Formul.	Total Rate (lbs ai/A) [kg ai/ha]	PHI (days)	BAS 510 F residues (ppm)
					3	0.58, 0.70
					7	0.45, 0.49
					10	0.39, 0.40
					14	0.35, 0.42
Tulare, CA, 2001	Cabbage; Supreme Vantage	Heads with wrapper leaves	70% WG	0.793 [0.888]	0	0.60, 0.67
					3	0.53, 0.81
					7	0.31, 0.34
					10	0.39, 0.48
					14	0.57, 0.70
Cabbage (without wrapper leaves)						
Lehigh, PA, 2001	Cabbage; Market Prize	Heads without wrapper leaves	70% WG	0.829 [0.928]	0	<0.05, <0.05
					3	<0.05, <0.05
					7	<0.05, <0.05
					10	<0.05, <0.05
					14	<0.05, <0.05
Wake, NC, 2001	Cabbage; Early Jersey Wakefield	Heads without wrapper leaves	70% WG	0.789 [0.883]	0	0.36, 0.55
					3	0.12, 0.21
					7	0.07, 0.10
					10	<0.05, <0.05
					14	<0.05, 0.05
Seminole, FL, 2001	Cabbage; Everlasting	Heads without wrapper leaves	70% WG	0.782 [0.876]	0	0.25, 0.34
					3	0.21, 0.34
					7	0.21, 0.21
					10	0.10, 0.11
					14	0.07, 0.09
Ottawa, MI, 2001	Cabbage; Rinda	Heads without wrapper leaves	70% WG	0.8 [0.896]	0	0.23, 0.28
					4	0.06, 0.08
					7	0.05, 0.06
					11	<0.05, <0.05
					14	<0.05, <0.05
Uvalde, TX, 2001	Cabbage; Pennant	Heads without wrapper leaves	70% WG	0.794 [0.889]	0	0.11, 0.13
					3	<0.05, 0.06

Table 2.2. Residue Data from Crop Field Trials in Brassica Leafy Vegetables with BAS 510 F.

Location (County, State, Year)	Crop Variety	Commodity	Formul.	Total Rate (lbs ai/A) [kg ai/ha]	PHI (days)	BAS 510 F residues (ppm)
					7	<0.05, <0.05
					10	<0.05, <0.05
					14	<0.05, <0.05
Tulare, CA, 2001	Cabbage; Supreme Vantage	Heads without wrapper leaves	70% WG	0.793 [0.888]	0	0.17, 0.17
					3	0.10, 0.17
					7	0.09, 0.14
					10	0.06, 0.07
					14	<0.05, 0.06
Mustard greens						
Wake, NC, 2001	Mustard greens; Florida Broadleaf	Greens (leaves)	70% WG	0.802 [0.898]	0	24.45, 27.20
					3	16.80, 17.70
					7	17.35, 18.30
					10	12.75, 13.25
					14	11.90, 13.80
Washington, MS, 2001	Mustard greens; Florida Broadleaf	Greens	70% WG	0.8 [0.896]	0	45.65, 52.20
					3	24.65, 26.25
					7	18.40, 22.10
					10	9.75, 11.76
					14	13.40, 15.35
Pepin, WI, 2001	Mustard greens; Florida Broadleaf India Mustard	Greens	70% WG	0.798 [0.894]	0	35.80, 36.10
					3	2.83, 2.97
					7	0.90, 1.02
					10	0.33, 0.54
					14	0.43, 0.64
Uvalde, TX, 2001	Mustard greens; Southern Giant Curled Mustard	Greens	70% WG	0.815 [0.912]	0	18.70, 24.30
					3	6.05, 7.23
					7	5.15, 5.81
					10	3.91, 4.08
					14	2.64, 2.95
Fresno, CA, 2001	Mustard greens; Florida Broadleaf	Greens	70% WG	0.788 [0.883]	0	31.7, 71.6
					3	24.70, 25.10
					7	11.90, 13.30

Table 2.2. Residue Data from Crop Field Trials in Brassica Leafy Vegetables with BAS 510 F.						
Location (County, State, Year)	Crop Variety	Commodity	Formul.	Total Rate (lbs ai/A) [kg ai/ha]	PHI (days)	BAS 510 F residues (ppm)
					10	18.80, 20.10
					14	5.38, 6.70

[1] The highest residue value of triplicate analyses is reported.

Table 2.3. Summary of Residue Data from Crop Field Trials in Brassica Leafy Vegetables with BAS 510 F.							
Commodity	Total Applic. Rate (lb ai/A)	PHI (days)	Residue Levels (ppm)				
			Minimum	Maximum	HAFT	Mean [Median]	Std. Dev.
Broccoli	0.80-0.81	0	0.72	2.73	2.7	1.52 [1.51]	0.64
		3	0.26	1.92	1.72	1.00 [0.82]	0.57
		7	0.2	1.32	1.26	0.66 [0.55]	0.42
		10	0.18	1.48	1.16	0.54 [0.37]	0.4
		14	<0.05	0.92	0.81	0.29 [0.16]	0.29
Cabbage with wrapper leaves	0.78-0.83	0	0.6	2.82	2.33	1.47 [1.33]	0.79
		37318	0.24	1.8	1.78	0.96 [0.92]	0.52
		7	0.3	1.04	1.03	0.60 [0.47]	0.3
		37539	0.14	1.34	1.32	0.64 [0.42]	0.46
		14	0.13	1.32	1.16	0.51 [0.40]	0.35
Cabbage without wrapper leaves	0.78-0.83	0	<0.05	0.55	0.46	0.22 [0.20]	0.14
		37318	<0.05	0.34	0.28	0.13 [0.09]	0.09
		7	<0.05	0.21	0.21	0.09 [0.08]	0.06
		37539	<0.05	0.11	0.11	0.06 [<0.05]	0.02
		14	<0.05	0.09	0.08	0.06 [<0.05]	0.01
Mustard greens	0.79-0.81	0	18.7	71.6	51.65	36.77 [33.6]	15.93
		3	2.83	26.25	25.45	15.43 [12.2]	9.76
		7	0.9	22.1	20.3	11.42 [17.8]	7.74
		10	0.33	20.1	19.45	9.53 [10.8]	7.1
		14	0.43	15.35	14.38	7.32 [6.04]	5.79

3. Discussion

3.1. Methods

In studies conducted during the 2001 growing season, broccoli, cabbage, and mustard greens were harvested 0, 3-4, 7, 10-11, and 14 days following of the last of two foliar spray applications of the 70% WG formulation at ~0.4 lb ai/A/application (≈0.448 kg ai/ha/application), with a 6- to 8-day retreatment interval, for a total rate of 0.78-0.83 lb ai/A (0.87-0.93 kg ai/ha). Applications were made using ground equipment in a spray volume of 11.8-37.7 gal/A (132-422 l/ha) of water with a spray adjuvant added. We note that the 70% BAS 510 F WG formulation used in the mustard green field trials also contained another experimental active ingredient (BAS 500 F, pyraclostrobin) as part of the tank-mix; data for the BAS 500 F active ingredient are not reviewed herein. Weather information indicates that for *Brassicas*, temperatures were normal with slightly below normal rainfall during the growing season.

Six broccoli trials were conducted in Regions 6 (1 trial, TX), 10 (4 trials, CA), and 12 (1 trial, OR); six cabbage trials were conducted in Regions 1 (1 trial, PA), 2 (1 trial, NC), 3 (1 trial, FL), 5 (1 trial, MI), 6 (1 trial, TX), and 10 (1 trial, CA); and five mustard green trials were conducted in Regions 2 (1 trial, NC), 4 (1 trial, MS), 5 (1 trial, WI), 6 (1 trial, TX), and 10 (1 trial, CA). Geographic representation of residue data for Brassica leafy vegetables is adequate. The number and location of field trials conducted for broccoli, cabbage, and mustard greens, the representative crops for the Brassica leafy vegetables group, are in accordance with the guidance requirements (OPPTS 860.1500, Tables 2 and 5). Due to the lack of representative data from zones applicable to Canada, the PMRA will not support the domestic registration in Canada of BAS 510F on the *Brassica* crop group based on the information provided.

Residues of BAS 510 F in/on broccoli, cabbage (with and without wrapper leaves), and mustard greens were quantitated using LC/MS/MS (method D9908), the data collection method for plant commodities. Acceptable concurrent method validation data for broccoli, cabbage, and mustard greens were included in the submission. Storage stability data (refer to the DER for MRID 45405109) are available to support the storage conditions and intervals of 147 days (4.8 months) for broccoli, 169 days (5.6 months) for cabbage, and 201 days (6.6 months) for mustard greens.

3.2. Results

In broccoli, residues of BAS 510 F were 0.72-2.73 ppm, 0.26-1.92 ppm, 0.20-1.32 ppm, 0.18-1.48 ppm, and <0.05-0.92 ppm in/on samples harvested 0, 3, 7, 10, and 14 days, respectively, following the last of two foliar spray applications of the 70% WG formulation at 0.398-0.404 lb ai/A/application (0.436-0.452 kg ai/ha/application), for a total rate of 0.80-0.81 lb ai/A (0.90-0.91 kg ai/ha). Apparent residues of BAS 510 F were less than the method LOQ (<0.05 ppm) in/on six samples of untreated broccoli. The residue decline data for broccoli indicated that residues of BAS 510 F generally decreased at longer posttreatment intervals.

In cabbage with wrapper leaves, residues of BAS 510 F were 0.60-2.82 ppm, 0.24-1.80 ppm, 0.30-1.04 ppm, 0.14-1.34 ppm, and 0.13-1.32 ppm in/on samples harvested 0, 3 or 4, 7, 10 or 11, and 14 days, respectively, following the last of two foliar spray applications of the 70% WG formulation at 0.3864-0.419 lb ai/A/application (0.432-0.4698 kg ai/ha/application), for a total rate of 0.78-0.83 lb ai/A (0.87-0.93 kg ai/ha). In cabbage without wrapper leaves, residues of BAS 510 F were <0.05-0.55 ppm, <0.05-0.34 ppm, <0.05-0.21 ppm, <0.05-0.11 ppm, and <0.05-0.09 ppm in/on samples harvested at the 0-, 3- or 4-, 7-, 10- or 11-, and 14-day PHIs, respectively. Apparent residues of BAS 510 F were less than the method LOQ (<0.05 ppm) in/on six samples each of untreated cabbage with and without wrapper leaves. The residue decline data for cabbage indicated that residues of BAS 510 F generally decreased at longer posttreatment intervals.

In mustard greens, residues of BAS 510 F were 18.70-71.60 ppm, 2.83-26.25 ppm, 0.90-22.10 ppm, 0.33-20.10 ppm, and 0.43-15.35 ppm in/on samples harvested 0, 3, 7, 10, and 14 days, respectively, following the last of two foliar spray applications of the 70% WG formulation at 0.392-0.4145 lb ai/A/application (0.439-0.464 kg ai/ha/application), for a total rate of 0.79-0.81 lb ai/A (0.88-0.91 kg ai/ha). Apparent residues of BAS 510 F were less than the method LOQ (<0.05 ppm) in/on five samples of untreated mustard greens. The residue decline data for mustard greens indicated that residues of BAS 510 F generally decreased at longer posttreatment intervals.

Throughout the studies, residues of BAS 510 F declined in the RACs with increasing time after application.

4. Deficiencies

None.

5. References

45672101 Wofford, J.; et al (2002) A Summary of Weather Conditions for BAS 510 F Field Residue Studies Conducted from 1999-2001 Data: BASF Registration Document Number: 2002/5002878. Unpublished study prepared by BASF Agro Research. 24 p.