

US EPA ARCHIVE DOCUMENT



Flumioxazin/59639-RRO/129034/Valent USA/59639
 DACO 7.4.1/OPPTS 860.1500/OECD IIA 6.3.1, 6.3.2, 6.3.3 and IIIA 8.3.1, 8.3.2, 8.3.3
 Crop Field Trial - Almond

Primary Evaluator William Cutchin, Chemist
 SIMB/HED (7509C)

Date: 7/19/04

Peer Reviewer William Drew, Chemist
 RAB2/HED (7509C)

Approved by Richard Loranger
 Branch Senior Scientist
 RAB2/HED (7509C)

Michael A. DeBartolo for RAL 7/24/04

STUDY REPORTS:

MRID No. 45375505 T. Schreier (2001) Magnitude of the Residue of Flumioxazin on Almonds: Lab Project Number: 20116. Unpublished study prepared by Valent U.S.A. Corp. 368 pages.

EXECUTIVE SUMMARY:

The registrant has submitted field trial data for flumioxazin on almonds. Five field trials were conducted encompassing Regions 10 (CA) during the 1999 growing season. The number and locations of field trials are in accordance with OPPTS Guideline 860.1500 and Directive 98-02; Section 9. At four of the locations, flumioxazin, formulated as Valor™ WDG, was twice broadcast to the soil at 0.375 lb ai/A (0.42 kg ai/ha) at a 60-day retreatment interval for a total seasonal application rate of 0.75 lb ai/A (0.84 kg ai/ha). At the fifth location, flumioxazin, formulated as Valor™ WDG, was twice broadcast to the soil at 0.75 lb ai/A (0.84 kg ai/ha) at a 60-day retreatment interval for a total seasonal application rate of 1.5 lb ai/A (1.68 kg ai/ha). An adjuvant was added to the spray mixture for all applications, but not always identified. Almonds were harvested at 60-61 day PHI.

The analytical method used to analyze samples for flumioxazin in/on the almond matrices of almond nutmeat and almond hulls is adequate for data collection purposes. In the method, RM-30A-1, flumioxazin is extracted from almond nutmeat and hulls using acetone:water, partitioned into dichloromethane then between hexane and acetonitrile, and cleaned up by column chromatography. Gas chromatographic analysis is performed using a nitrogen-phosphorus specific detector. The limit of quantitation (LOQ) and limit of detection (LOD) of the residue method for flumioxazin in/on almond nutmeat and almond hulls were 0.01 ppm and 0.005 ppm, respectively.

The analytical method used to analyze samples for 1-hydroxy-trans-1,2-cyclohexanedicarboxylic acid (1-OH-HPA) during this study is adequate for data collection purposes. In the method, based on RM-30M4, the metabolite 1-OH-HPA is extracted from almond hulls using acid hydrolysis followed by liquid/liquid partition into ethyl acetate. The 1-OH-HPA is methylated, partitioned into hexane, and cleaned up by column chromatography.



Flumioxazin/5939-RRO/129034/Valent USA/59639
 DACO 7.4.1/OPTS 860.1500/OECD IIA 6.3.1, 6.3.2, 6.3.3 and IIIA 8.3.1, 8.3.2, 8.3.3
 Crop Field Trial - Almond

The residues of 1-OH-HPA are analyzed as its dimethyl ester, 1-OH-HPA-DME-1 (a.k.a. 1-HPA-DME, HPADME) using gas chromatography and a mass selective detector. The LOQ and LOD of the residue method for 1-OH-HPA in/on almond hulls were 0.1 ppm and 0.05 ppm, respectively.

The results from these trials show that maximum flumioxazin residues are 0.007 ppm on almond nutmeats for both total application rates, 0.75 lb ai/A and 1.5 lb ai/A, and 60-day PHI. The results also show that maximum flumioxazin residues on almond hulls are 0.066 ppm for the 0.75 lb ai/A total application rate, and 0.617 ppm for the 1.5 lb ai/A total application rate, both with 60-day PHIs. No residues of 1-OH-HPA were found above the 0.05 ppm LOQ on almond hulls for either application rate. A residue decline study was not conducted.

STUDY/WAIVER ACCEPTABILITY/DEFICIENCIES/CLARIFICATIONS:

Under the conditions and parameters used in the study, the field trial residue data are classified as scientifically acceptable.

The acceptability of this study for regulatory purposes is addressed in the forthcoming U.S. EPA Residue Chemistry Summary Document [DP Barcode D301247].

COMPLIANCE:

Signed and dated Good Laboratory Practice (GLP), Quality Assurance and Data Confidentiality statements were provided. With the exception of the following items, this study was performed in compliance with EPA GLP FIFRA Standards [40 CFR Part 160]: weather and miscellaneous field information (e.g. field history, irrigation and cultural practices, and plot description) included in this report was not collected following GLP standards; storage temperature data for Trial B were not collected in accordance with GLPs; scales used to weigh field samples for Trial B and Trial C were not maintained in accordance with GLPs; and, some entries in the Field Notebook for Trial E were not initialed and dated at the time of entry. The deviations from regulatory requirements do not adversely impact the validity of the study.

A. BACKGROUND INFORMATION

Flumioxazin is a new N-phenylphthalimide herbicide proposed for preemergence application for the selective control of susceptible broadleaf weeds.



Flumioxazin/59639-RRO/129034/Valent USA/59639
 DACO 7.4.1/OPPTS 860.1500/OECD IIA 6.3.1, 6.3.2, 6.3.3 and IIIA 8.3.1, 8.3.2, 8.3.3
 Crop Field Trial - Almond

TABLE A.1. Test Compound Nomenclature

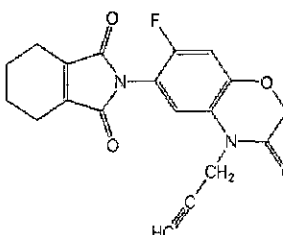
Compound	Chemical Structure	
Common name	Flumioxazin	
Company experimental name	S-53482	
IUPAC name	<i>N</i> -(7-fluoro-3,4-dihydro-3-oxo-4-prop-2-ynyl-2 <i>H</i> -1,4-benzoxazin-6-yl)cyclohex-1-ene-1,2-dicarboxamide	
CAS name	2-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propynyl)-2 <i>H</i> -1,4-benzoxazin-6-yl]-4,5,6,7-tetrahydro-1 <i>H</i> -isoindole-1,3(2 <i>H</i>)-dione	
CAS #	103361-09-7	
End-use product/EP	Chateau™ WDG	

TABLE A.2. Physicochemical Properties

Parameter	Value
Melting point/range (°C)	202-204
pH	7.29 @ 25°C
Density	1.51 g/mL @ 20°C
Water solubility (25°C)	1.79 mg/L
Solvent solubility (mg/L at __ °C)	NA
Vapour pressure	2.41 x 10 ⁻⁶ mm Hg
Dissociation constant (pK _a)	NA
Octanol/water partition coefficient Log(K _{ow})	2.55 @ 20°C
UV/visible absorption spectrum	NA

B. EXPERIMENTAL DESIGN

B.1. Study Site Information

TABLE B.1.1 Trial Site Conditions

Trial Identification (City, State/Year)	Soil Type	Meteorological data	
		Overall monthly rainfall range	Overall T°C range
Chico, CA 1999 V-20116-A	Vina sandy loam	12 in (sprinkler irrigation)	NR



Flumioxazin/59 39-RRO/129034/Valent USA/59639
 DACO 7.4.1/OPTS 860.1500/OECD IIA 6.3.1, 6.3.2, 6.3.3 and IIIA 8.3.1, 8.3.2, 8.3.3
 Crop Field Trial - Almond

Hughson, CA 1999 V-20116-B	Hanford	4-6 in (flood irrigation)	reported as within historical norms
Kerman, CA 1999 V-20116-C	Hanford sandy loam	4-8 in (flood irrigation)	reported as cooler than average
Madera, CA 1999 V-20116-D	Tugunga	2-12 in (microsprinkler irrigation)	reported as below normal
Terra Bella, CA 1999 V-20116-E	Hanford fine sandy loam	8-10 in (microsprinkler irrigation)	reported as below normal

NR= not reported

The reported temperatures are below the average historical values for the residue study period. The actual rainfall average was within the historical rainfall average. Irrigation was used to supplement as needed.

TABLE B.1.2. Study Use Pattern.

Location (City, State/Year)	EP ¹	Application					Tank Mix Adjuvants
		Method/Timing	Vol, GPA ²	Rate, g a.i./A	RTI, ³ days	Total Rate, g a.i./A (lb a.i./A) (kg ai/ha)	
Chico, CA 1999	Valor WDG Herbicide	broadcast to soil/ nut development	18	169.6	60	341.5 (0.753) (0.845)	crop oil conc.
		broadcast to soil/ nut maturation prior to hull split	18	171.9			
	Valor WDG Herbicide	broadcast to soil/ nut development	18	339.3	60	682.2 (1.5) (1.69)	
		broadcast to soil/ nut maturation prior to hull split	18	342.9			
Hughson, CA 1999	Valor WDG Herbicide	broadcast to soil/ green nut	25	172.0	60	343.7 (0.758) (0.85)	identity of adjuvant not indicated
		broadcast to soil/ beginning hull split	25	171.7			
Kerman, CA 1999	Valor WDG Herbicide	broadcast to soil/ nuts to 1 1/2", trees leafed	20	168.7	60	338.3 (0.746) (0.84)	Agridex
		broadcast to soil/ before hull split, trees mature	20	169.6			
Madera, CA 1999	Valor WDG Herbicide	broadcast to soil/ fruits 1 1/2 - 2 1/2"	20	171.5	60	340.7 (0.751) (0.84)	identity of adjuvant not indicated
		broadcast to soil/ fruits 1 1/2 - 2 1/2"	20	169.2			



Flumioxazin/59639-RRO/129034/Valent USA/59639
 DACO 7.4.1/OPPTS 860.1500/OECD IIA 6.3.1, 6.3.2, 6.3.3 and IIIA 8.3.1, 8.3.2, 8.3.3
 Crop Field Trial - Almond

TABLE B.1.2. Study Use Pattern.

Location (City, State/Year)	EP ¹	Application					Tank Mix Adjuvants
		Method/Timing	Vol, GPA ²	Rate, g a.i./A	RTI, ³ days	Total Rate, g a.i./A (lb a.i./A) (kg ai/ha)	
Terra Bella, CA 1999	Valor WDG Herbicide	broadcast to soil/ fruit maturation	20	170.2	60	339.8 (0.749) (0.84)	RMA crop oil
		broadcast to soil/	24	169.6			

¹EP = End-use Product

² Gallons per acre

³ Retreatment Interval

TABLE B.1.3. Trial Numbers and Geographical Locations

NAFTA Growing Region	Almond	
	Submitted	Requested US
1		
1A		
2		
3		
4		
5		
5A		
5B		
6		
7		
7A		
8		
9		
10	5	5
11		
12		
13		



Flumioxazin/59 39-RRO/129034/Valent USA/59639
 DACO 7.4.1/OPTS 860.1500/OECD IIA 6.3.1, 6.3.2, 6.3.3 and IIIA 8.3.1, 8.3.2, 8.3.3
 Crop Field Trial - Almond

14		
15		
16		
17		
18		
19		
20		
21		
Total	5	5

B.2. Sample Handling and Preparation

Almonds were collected at normal mature harvest from the untreated control plots and from the five treated plots (in duplicate). All almond nutmeat and hull samples harvested for this study were shipped frozen and stored at -20°C until analysis.

B.3. Analytical Methodology

The analytical method used to analyze samples for flumioxazin in/on the almond matrices of almond nutmeat and almond hulls was RM-30A-1. The method has undergone both a successful ILV trial and has been successfully validated down to an LOQ of 0.01 ppm by the Agency (PP#s 7F4841 and 0F6171, DP Barcodes: D259493 and D268181, D. Dotson, 3/12/2001). Flumioxazin is extracted from almond nutmeat and hulls using acetone:water. The residues of flumioxazin are partitioned into dichloromethane, partitioned between hexane and acetonitrile, and subjected to a Florisil column chromatography cleanup. Gas chromatographic analysis is performed using a nitrogen-phosphorus specific detector and a DB-5 or DB-17 column. The LOQ and LOD of the residue method for flumioxazin in/on both almond nutmeat and almond hulls were 0.01 ppm and 0.005 ppm, respectively.

The analytical method used to analyze samples for 1-OH-HPA during this study was based on RM-30M4. The method has been determined to be adequate for data collection of 1-OH-HPA from peanuts and soybeans down to an LOQ and LOD of 0.02 ppm and 0.01, respectively (PP#s 7F4841 and 0F6171, DP Barcodes: D259493 and D268181, D. Dotson, 3/12/2001). The metabolite 1-OH-HPA is extracted from almond hulls using acid hydrolysis. A diatomaceous earth partition column in the original method was replaced with the more common liquid/liquid partition. Both the diatomaceous earth column and the liquid/liquid partition allow the 1-OH-HPA to be partitioned into ethyl acetate. The 1-OH-HPA is methylated with dimethyl sulfate, partitioned between water and hexane, and cleaned up using Florisil column chromatography. The residues of 1-OH-HPA are analyzed as its dimethyl ester, 1-OH-HPA-DME-1 (a.k.a. 1-HPA-DME, HPADME). Gas chromatographic analysis is performed using a mass selective detector and an RTX-200 column. The LOQ and LOD of the residue method for



Flumioxazin/59639-RRO/129034/Valent USA/59639
 DACO 7.4.1/OPPTS 860.1500/OECD IIA 6.3.1, 6.3.2, 6.3.3 and IIIA 8.3.1, 8.3.2, 8.3.3
 Crop Field Trial - Almond

1-OH-HPA in/on almond hulls were 0.1 ppm and 0.05 ppm, respectively.

C. RESULTS AND DISCUSSION

The storage stability study (45375505ss.der.wpd, W. Cutchin) supports the storage durations/conditions of samples in the crop field trials. The analytical methods for flumioxazin and 1-OH-HPA are adequate for data collection for this study. Flumioxazin fortification of control samples of almond nutmeats and hulls were conducted at 0.01 to 1.0 ppm and 1-OH-HPA fortification of control samples of almond hulls were conducted at 0.01 to 0.5 ppm. Concurrent recoveries ranges from 71 to 114 (avg $91 \pm 10\%$). The LOQ and LOD of the residue method for flumioxazin in/on both almond nutmeat and almond hulls were 0.01 ppm and 0.005 ppm, respectively. The petitioner provided adequate sample chromatograms of control samples of various crop matrices that show no interfering peaks. Although no calibration curves were presented, adequate sample chromatograms of standard solutions were provided to indicate that the analytical method provided a linear response. The LOQ and LOD of the residue method for 1-OH-HPA in/on almond hulls were 0.1 ppm and 0.05 ppm, respectively.

The number and geographic location of the submitted studies were adequate. The results from these trials show that maximum flumioxazin residues are 0.007 ppm on almond nutmeats for both total application rates, 0.75 lb ai/A and 1.5 lb ai/A, and 60-day PHI. The results also show that maximum flumioxazin residues on almond hulls are 0.066 ppm for the 0.75 lb ai/A total application rate, and 0.617 ppm for the 1.5 lb ai/A total application rate, both with 60-day PHIs. No residues of 1-OH-HPA were found above the 0.05 ppm LOQ on almond hulls for either application rate. A residue decline study was not conducted.

TABLE C.1. Summary of Concurrent Recoveries of Flumioxazin and from Almond Matrices.

Matrix	Spike level (mg/kg)	Sample size (n)	Recoveries (%)	Mean \pm std dev (%)
Flumioxazin				
nutmeat	0.01	5	94,106,90,89,105	97 ± 7.3
	0.5	5	101,110,106,98,114	106 ± 5.8
hulls	0.01	5	90,71,75,77,83	79 ± 6.7
	0.5	5	83,84,86,88,96	87 ± 4.6
	1.0	1	83	83
1-OH-HPA				
hulls	0.01	5	90,93,81,86,86	87 ± 4.1
	0.5	5	98,96,90,84,93	92 ± 4.9

TABLE C.2. Summary of Storage Conditions

Matrix	Storage Temp. (°C)	Actual Storage Duration (days)	Interval of Demonstrated Storage Stability (days)
Flumioxazin			
nutmeat	-20	152-185	186
hulls	-20	152-185	186



Flumioxazin/59 39-RRO/129034/Valent USA/59639
 DACO 7.4.1/OPTS 860.1500/OECD IIA 6.3.1, 6.3.2, 6.3.3 and IIIA 8.3.1, 8.3.2, 8.3.3
 Crop Field Trials - Almond

1-OH-HPA			
hulls	-20	235-254	263

TABLE C.3. Residue Data from Crop Field Trials with Flumioxazin.

Trial ID (City, State/Year)	Region	Crop/Variety	Commodity or Matrix	Total Rate, g a.i./A (lb a.i./A) (kg ai/ha)	PHI (days)	Flumioxazin (ppm)	1- OH-HPA (ppm)
Chico, CA 1999	X	Carmel	nutmeat	341.5 (0.753) (0.845)	60	0.005,<0.005 <0.005,<0.005	NA
			hulls			0.013,0.014 0.029,0.032	<0.05,<0.05 <0.05,<0.05
Hughson, CA 1999	X	Carmel	nutmeat	682.2 (1.5)	60	0.006,0.007	NA
			hulls	(1.69)		0.487,0.617	<0.05,<0.05
Kerman, CA 1999	X	Carmel	nutmeat	343.7 (0.758)	60	<0.005,<0.005	NA
			hulls	(0.85)		<0.005,<0.005	<0.05,<0.05
Madera, CA 1999	X	Non-Pareil	nutmeat	340.7 (0.751)	60	<0.005,<0.005	NA
			hulls	(0.84)		0.037,0.041	<0.05,<0.05
Terra Bella, CA 1999	X	Carmel	nutmeat	339.8 (0.749)	61	0.006,0.007	NA
			hulls	(0.84)		0.062,0.066	<0.05,<0.05

TABLE C.4. Summary of Residue Data from Crop Field Trials with Flumioxazin.

Commodity	Total Application Rate, g a.i./A (lb a.i./A) (kg ai/ha)	PHI (days)	Residue Levels (ppm)						
			n	Min.	Max.	HAFT*	Median (STMdR)	Mean (STMR)	Std. Dev.
Flumioxazin									
nutmeat	340 (0.75) (0.84)	60-61	10	<0.005	0.007	0.0065	0.0025	0.0036	0.0017
hulls			10	<0.005	0.041	0.039	0.0305	0.0299	0.0213
nutmeat	682 (1.5) (1.69)	60	2	0.006	0.007	0.0065	0.0065	0.0065	0.0005
hulls			2	0.487	0.617	0.552	0.552	0.552	0.065
1-OH-HPA									
hulls	340 (0.75) (0.84)	60-61	2	<0.005	<0.005	<0.005	<0.005	<0.005	0
	682 (1.5) (1.69)	60	2	<0.005	<0.005	<0.005	<0.005	<0.005	0

* HAFT = Highest Average Field Trial.



Flumioxazin/59639-RRO/129034/Valent USA/59639
DACO 7.4.1/OPPTS 860.1500/OECD IIA 6.3.1, 6.3.2, 6.3.3 and IIIA 8.3.1, 8.3.2, 8.3.3
Crop Field Trial - Almond

D. CONCLUSION

The submitted studies are adequate to determine the residues of flumioxazin on almond nutmeats and hulls as a result of the use pattern.

E. REFERENCES

PP#s 7F4841 and 0F6171. Tolerance Petitions for the Use of Flumioxazin on Peanuts, Soybeans, and Sugarcane. Evaluation of Residue Chemistry and Analytical Methodology. DP Barcodes: D259493 and D268181, D. Dotson, 3/12/2001

F. DOCUMENT TRACKING

RDI: W. Drew (7/13/04), R. Loranger (7/19/04)
Petition Number(s): 1F6296
DP Barcode(s): 284045
PC Code: 129034

Template Version September 2003