



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES,
AND TOXIC SUBSTANCES

MEMORANDUM

Date: August 31, 2004

Subject: Flumetsulam. Summary of Analytical Chemistry and Residue Data for the Tolerance Reassessment Eligibility Decision (TRED) Document.

DP Barcode: D306242
Chemical Class: Triazolopyrimidine

PC Code: 129016
40 CFR §: 180.468

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This summary of analytical chemistry and residue data document was originally prepared under contract by Versar, Inc. (6850 Versar Center, Springfield, VA 22151; submitted June 11, 2004). The summary document has been reviewed by the Health Effects Division (HED) and revised to reflect current Office of Pesticide Program (OPP) policies.

Executive Summary

Flumetsulam, N-(2,6-difluorophenyl)-5-methyl-(1,2,4)-triazolo-[1,5a]-pyrimidine-2-sulfonamide, is a herbicide in the triazolopyrimidine chemical class. The mode of action of flumetsulam is similar to the sulfonylurea herbicides, which are acetolactate synthase (ALS) inhibitors.

Registered food/feed uses of flumetsulam in the U.S. are on field corn and soybeans.

Additionally, Dow AgroSciences, LLC (Dow) has petitioned (Petition Number: 7F4851) for the establishment of a tolerance of flumetsulam in/on dry beans at 0.05 ppm. Current formulations of flumetsulam include emulsifiable concentrate (EC), wettable powder (WP), and water dispersible granules (WDG). Flumetsulam as an active ingredient (ai) ranges in formulations from 2.1 to 80%. Flumetsulam can be applied to corn and soybeans at the pre-plant (surface or incorporated), preemergence, or postemergence stage using ground equipment with up to 0.070 lb ai/A applied per year. Flumetsulam can also be applied to corn as a foliar application via aircraft up to 0.03478 lb ai/A. For the proposed use on dry beans, flumetsulam can only be applied at the pre-plant (surface or incorporated) or at the preemergence stage. The pre-harvest intervals (PHI) for flumetsulam range from 70 to 85 days.

The nature of residues in corn and soybeans is adequately delineated based on acceptable plant metabolism studies. The Health Effects Division (HED) Metabolism Committee concluded that the residue of concern resulting from the uses on field corn and soybeans is flumetsulam *per se*. Plant metabolism studies for dry beans have not been submitted; however, metabolism data from soybeans may be translated to dry beans because of the similarities between the two crops. The HED Metabolism Committee has not determined the residue of concern in livestock; however, based on the submitted data, the nature of the residue in livestock (goats and hens) is adequately defined because no detectable residues of flumetsulam *per se* were found in feed items. The available analytical methodology (GC/MS) is considered adequate for tolerance enforcement of flumetsulam in/on plant commodities. The method is available and has been submitted for inclusion in the Pesticide Analytical Manual (PAM), Volume II; however, the methods have not yet been included. The limit of quantitation (LOQ) of the method is 0.010 ppm and the estimated limit of detection (LOD) is 0.005 ppm.

Tolerances have been established under 40 CFR §180.468 for residues of flumetsulam in/on field corn (forage, grain, and stover) and soybean at 0.05 ppm. A tolerance of 0.05 ppm for dry beans has been proposed. Field trials conducted on field corn, soybeans, and dry beans show that residues of flumetsulam are consistently below the LOD in all crops which received flumetsulam at approximately the maximum label rate through preplant soil incorporated, preemergence, or postemergence applications. The corn field trials were conducted using a 75% WDG formulation of flumetsulam, the soybean field trials were conducted using a 75% WDG formulation or an aqueous concentrate formulation of flumetsulam, and the dry bean field trials were conducted using an 80.8% WDG formulation of flumetsulam. Corn from field trials conducted at approximately 3x the maximum application rate were processed into grits, meal, flour, refined oil, crude oil, and starch using either wet or dry milling practices. Even though the application rate for the processing study should have been 5x or higher, provided that phytotoxicity was not a concern, the absence of detectable residues in all the processed fractions and the properties of flumetsulam (low octanol/water partition coefficient [$\log P = 0.21$] and greater solubility in water

than in hexane) indicate that the concentration of residues in oil is highly unlikely. A processing study and food additive tolerances are not required for soybeans because no detectable residues were found in soybeans resulting from postemergence treatment at 6x the maximum application rate, which is the theoretical concentration factor for soybean oil. A processing study for dry beans is not required because dry beans are not processed into food/feed items.

Regulatory Recommendations and Residue Chemistry Deficiencies

Tolerances have been established under 40 CFR §180.468 for residues of flumetsulam *per se* (N-(2,6-difluorophenyl)-5-methyl-(1,2,4)-triazolo-[1,5a]- pyrimidine-2-sulfonamide) in/on field corn (forage, grain, and stover) and soybean at 0.05 ppm. HED supports these tolerances, and the proposed tolerance of 0.05 ppm in/on dry beans.

Background

The nomenclature of flumetsulam is listed below in Table 1 and the physicochemical properties are listed in Table 2.

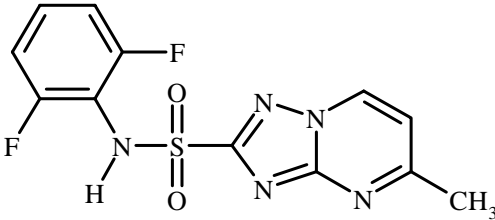
Table 1. Test Compound Nomenclature.	
Chemical Structure	
Common name	Flumetsulam
Company experimental name	DE-498 and TSN-100986
Molecular formula	C ₁₂ H ₉ F ₂ N ₅ O ₂ S
Molecular weight	325.30
IUPAC name	2-(2,6-difluorophenylsulphamoyl)-5-methyl(1,2,4)-Triazolo(1,5-a)pyrimidine
CAS name	N-(2,6-difluorophenyl)-5-methyl-(1,2,4)triazolo(1,5-a)pyrimidine-2-sulfonamide
CAS number	98967-40-9
Current food/feed site registrations	Corn and soybean (a petition for dry beans has been submitted)

Table 2. Physicochemical Properties of the Technical Grade Test Compound.		
Parameter	Value	Reference
Melting point	252.9°C	N. Dodd, PP# 1G4006, 3/27/92
pH	3.44 at 24.4°C for a 10% suspension in water	
Density	1.77 g/cm ³ at 21°C	

Parameter	Value	Reference
Water solubility	49.1 ± 0.5 mg/L at 25 °C, pH 2.5 5.65 ± 0.01 g/L at 25 °C, pH 7.0	
Solvent solubility	17.0 g/L in acetone 5.2 g/L in acetonitrile 0.0016 g/L in aromatic 100 9.0 g/L in cyclohexanone 261.0 g/L in dimethylformamide Less than 0.001 g/L in hexane 3.3 g/L in methanol Less than 0.001 g/L in o-xylene 0.06 g/L in octanol 11.0 g/L in tetrahydrofuran	N. Dodd, PP# 2F4036, 4/14/93
Vapor pressure	1.0 x 10 ⁻¹⁵ mm Hg at 25 °C	N. Dodd, PP# 1G4006, 3/27/92
Dissociation constant	pK _a = 4.6	
Octanol/water partition coefficient Log(K _{ow})	log P = 0.21	

860.1200 Directions for Use

Product List

Currently, there are two registered manufacturing-use products (MPs) and thirteen end-use products (EPs) registered for use on food/feed sites. The MPs are registered to Dow and contain 98% (EPA Reg. No. 62719-223) and 23.1% flumetsulam (EPA Reg. No. 62719-300). Eleven EPs are registered to Dow and two EPs are registered to E. I. du Pont De Nemours and Company, Inc. (DuPont). The EPs are listed in Table 3 below. Table 3 also lists if the product is intended for use on field corn, soybeans, and/or dry beans. There are no special local need (SLN) registrations associated with flumetsulam.

EPA Reg. No.	Formulation ¹	Label Acceptance Date	Registrant	Product Name	Commodity
352-593	19.1% WDG	9/11/03	E. I. du Pont De Nemours and Co., Inc.	Accent Gold [®] Herbicide	Field corn
352-612	15.9% WDG	3/5/03	E. I. du Pont De Nemours and Co., Inc.	Dupont Accent Gold [®] WDG Herbicide	Field corn
62719-222	2.67% EC	2/16/99	Dow AgroSciences, LLC	Broadstrike [®] + Treflan [®]	Soybean, dry bean
62719-224	74.9% WDG	10/20/93	Dow AgroSciences, LLC	Broadstrike [®]	Field corn, soybean
62719-239	2.1% EC	2/23/98	Dow AgroSciences, LLC	Broadstrike [®] + Dual [®]	Field corn, soybean, dry bean
62719-240	2.6% EC	3/19/98	Dow AgroSciences, LLC	Broadstrike [®] SF + Dual [®]	Field corn, soybean
62719-253	23.1% WP	6/14/01	Dow AgroSciences, LLC	Hornet [®]	Field corn

EPA Reg. No.	Formulation ¹	Label Acceptance Date	Registrant	Product Name	Commodity
62719-264	9.3% WP	10/26/00	Dow AgroSciences, LLC	Scorpion III [®]	Field corn
62719-277	80% WDG	9/24/03	Dow AgroSciences, LLC	Python [®] WDG	Soybean, dry bean
62719-278	13.9% WP	3/26/96	Dow AgroSciences, LLC	NAF-280 [®]	Field corn
62719-279	12.1% WP	3/26/96	Dow AgroSciences, LLC	NAF-281 [®]	Field corn
62719-299	40% WDG	7/2/02	Dow AgroSciences, LLC	Frontrow [®]	Soybean
62719-315	18.5% WDG	2/20/03	Dow AgroSciences, LLC	Hornet [®] WDG	Field corn

1. WDG = water-dispersible granules; EC = emulsifiable concentrate; WP = wettable powder.

Use Patterns

For the purposes of reregistration, the registered food/feed uses of flumetsulam have been re-evaluated for field corn and soybeans. Additionally, food/feed uses of flumetsulam are being evaluated for use on dry beans. A comprehensive summary of use patterns was originally prepared by the Biological and Economic Analysis Division (BEAD) and is presented in Appendix A. Currently, there are no registered non-food/feed use patterns. A tabular summary of the chemistry science assessments is presented in Table 4. The conclusions listed in Table 4 regarding the reregistration eligibility of flumetsulam food/feed uses are based on the use patterns registered by the producer. When end-use product data call in's (DCIs) are developed (e.g., at issuance of the RED), the Registration Division (RD) should require that all end-use product labels (e.g., MAI labels, SLNs, and products subject to the generic data exemption) be amended such that they are consistent with the basic producer labels.

OPPTS Guideline Number Data Requirements	Current Tolerances (ppm) [§180.468]	Additional Data Needed?	MRID Nos.
860.1200 Directions for Use	N/A = Not applicable	No	See Appendix A
860.1300 Nature of the Residue - Plants			
- Field Corn	N/A	No	41931714 ¹ , 41931715 ¹ , 42573801 ² , 42573802 ² , 42489001 ^{2,3} , 42407001 ⁴
- Soybean	N/A	No	41931712 ¹ , 41931713 ¹ , 42513501 ² , 42513502 ² , 42489001 ^{2,3} , 42407001 ⁴
- Dry Bean	N/A	No ¹¹	None
860.1300 Nature of the Residue - Animals			
- Goat	N/A	No	41931716 ¹
- Hen	N/A	No	41931717 ¹

Table 4. Residue Chemistry Science Assessment for Reregistration of Flumetsulam.			
OPPTS Guideline Number Data Requirements	Current Tolerances (ppm) [§180.468]	Additional Data Needed?	MRID Nos.
860.1340 Residue Analytical Method			
- Plant Commodities	N/A	No ¹²	42580607 ² , 41952104 ¹ , 41952105 ¹
- Animal Commodities	N/A	No	None
860.1360 Multiresidue Method	N/A	No	41993802 ¹
860.1380 Storage Stability Data			
- Plant Commodities	N/A	No	42677801 ⁵ , 41931718 ¹ , 42580608 ²
- Animal Commodities	N/A	No	None
860.1400 Magnitude of the Residue - Water, Fish, and Irrigated Crops	None established	No	None
860.1460 Magnitude of the Residue - Food Handling	None established	No	None
860.1480 Magnitude of the Residue - Meat, Milk, Poultry, and Eggs	None established	No	None
860.1500 Crop Field Trials			
- Soybean	0.05	No	41952106 ¹ , 41931719 ¹ , 41931720 ¹
- Field Corn	0.05	No	42677803 ⁵ , 41931721 ¹
- Dry Bean	None established ¹⁴	No	44304402 ⁶
860.1520 Processed Food/Feed			
- Field Corn	None established	No	42677802 ⁵
860.1850 Confined Accumulation in Rotational Crops	N/A	No	41263232 ⁷ , 41931738 ⁸ , 41931739 ⁹ , 42512501 ¹⁰
860.1900 Field Accumulation in Rotational Crops	None established	No	None

1. N. Dodd, PP# 1G4006, 3/27/92.

2. N. Dodd, PP# 2F4036, 4/14/93.

3. N. Dodd, D183546, 12/23/92.

4. N. Dodd, D178112, 8/20/92.

5. N. Dodd, D188957, 6/28/93.

6. S. Ary, D301807, 8/18/04.

7. G. Maske, DER (data evaluation record), MRID No.: 41263232, 1/21/90.

8. G. Maske, DER, MRID No.: 41931738, 3/12/93.

9. G. Maske, DER, MRID No.: 41931739, ca. 1993.

10. MRID No.: 42512501 is a summary of MRID Nos.: 41263232, 41931738, and 41931739.

11. A plant metabolism study has not been submitted for dry beans; however, metabolism data from soybeans may be translated to dry beans because of the similarities between the two crops.

12. The submitted GC/MS method is adequate for tolerance enforcement purposes on plant commodities.

14. The registrant has petitioned for the establishment of a tolerance of flumetsulam at 0.05 ppm in/on dry beans.

860.1300 Nature of the Residue - Plants

The nature of the residue in corn and soybean is adequately understood. The major residues in corn are parent, the free and conjugated 5-CH₂OH metabolite (N-(2,6-difluorophenyl)-5-hydroxymethyl-1,2,4-triazolo(1,5a)pyrimidine-2-sulfonamide), and the free and conjugated 4-OH metabolite (N-(2,6-difluoro-4-hydroxyphenyl)-5-methyl-1,2,4-triazolo(1,5a)pyrimidine-2-sulfonamide). The major residues in soybean forage are parent and the metabolite hydroxybutyl-DFATSA (N-(2,6-difluorophenyl)-5-((3-hydroxy-1-methylpropyl)amino)-1,2,4-triazole-3-sulfonamide) and its conjugates. The major residues in soybean seed are parent and DFATSA (N-(2,6-difluorophenyl)-5-amino-1H-1,2,4-triazole-3-sulfonamide). The stability of the sulfonamide bond was demonstrated in both field corn and soybean. Additionally, the absence of 2,6-difluoroaniline (2,6-DFA) as a metabolite was demonstrated in soybean. In field corn, if any 2,6-DFA did occur, it would be expected to be found in an organic fraction, which contained low percentages of the residue (less than or equal to 3.6% total radioactive residues; N. Dodd, PP# 2F4036, 4/14/93).

On April 21, 1993, the HED Metabolism Committee concluded that the residue of concern resulting from the uses of flumetsulam on field corn and soybean is parent *per se*. This decision was based on the low levels of total radioactive residues present in plant metabolism studies and the lack of toxicological concern for metabolites which have the sulfonamide linkage intact (N. Dodd, HED Metabolism Committee Memo, 4/26/93).

Plant metabolism studies for dry beans have not been submitted; however, metabolism data from soybeans may be translated to dry beans because of the similarities between the two crops.

860.1300 Nature of the Residue - Livestock

Nature of residue studies for ruminant (goat) and poultry (hens) have been submitted and reviewed (N. Dodd, PP# 1G4006, 3/27/92). In the ruminant study, goats were fed 5-¹⁴C-pyridine-labeled flumetsulam in capsules at a dose of 21 mg/day (10 ppm in feed) for 5 consecutive days. Ninety-two percent of the radioactive residues in milk and 88% of the radioactive residues in kidney were identified as parent. Residues in muscle, fat, and liver were not characterized; however, ¹⁴C-residues in these tissues were low (less than or equal to 0.1 ppm) after dosing at an exaggerated feeding level. In the poultry study, hens were fed 5-¹⁴C-pyridine-labeled flumetsulam in capsules at a dose of 2.1 mg/day (15 ppm in feed) for 10 consecutive days. Seventy percent of the radioactive residues in kidney were identified as parent and 24% were identified as 5-hydroxymethyl metabolite. Residues in muscle, fat, liver, and eggs were not characterized; however, ¹⁴C-residues in the muscle, fat, liver, and eggs were low (less than or equal to 0.1 ppm) after dosing at an exaggerated feeding level (N. Dodd, PP# 1G4006, 3/27/92).

The nature of the residue in animals is adequately defined for the current and proposed uses because no detectable or very low concentrations of residues of flumetsulam *per se* were found in feed items. However, for uses which may result in detectable residues in feed items, additional animal metabolism data on ruminants and poultry may be required.

860.1340 Residue Analytical Methods

DowElanco's methods ACR 91.6 (GC/MS) on soybean and ACR 91.61S (GC/MS) on corn grain and fodder were submitted by the petitioner for purposes of data collection and enforcement of tolerances. In these methods, flumetsulam is extracted from the crop material with a 90% acetone/10% 0.1 N HCl solution. The acetone is evaporated from an aliquot of the extract and the residue is diluted with 0.005 N HCl and washed with hexane. The sample is cleaned up on C₁₈ and alumina SPE cartridges and derivatized with methyl iodide. The resulting N-methyl derivative is dissolved in N-d₃-methyl flumetsulam internal standard solution and quantitated by gas chromatography. Average recoveries of soybeans fortified between 5 and 50 ppb ranged from 88 to 99%. An independent laboratory evaluation for Method ACR 91.6 on soybeans was conducted by A&L Great Lakes Laboratories, Inc. Average recoveries of flumetsulam from soybean samples fortified at 5 and 25 ppb by the independent laboratory were 90 and 121%, respectively (N. Dodd, PP# 1G4006, 3/27/92). An independent laboratory validation for Method ACR 91.61S on corn was not conducted; however, it is not needed because only minor modifications were made from Method ACR 91.6 on soybeans for use on corn (N. Dodd, D183546, 12/23/92). Additionally, a confirmatory method is not needed because the methods combine gas chromatography with mass spectroscopy. The stated LOQ of the method was 0.005 ppm and the estimated LOD was 0.0025 ppm, however, BEAD's Analytical Chemistry Branch (ACB) estimated the LOQ at 0.01 ppm and the LOD at 0.005 ppm in/on soybean and corn grain and fodder (N. Dodd, D189444, 3/29/93).

ACB validated DowElanco's Method ACR 91.6 (Method I) on soybean grain and DowElanco's Method ACR 91.61S (Method II) on corn grain and corn fodder at 0.05 ppm (N. Dodd, D189444, 3/29/93). The methods were approved by EPA for enforcement of tolerances and the results were forwarded to Food and Drug Administration (FDA) on December 6, 1992 for inclusion in the Pesticide Analytical Manual (PAM), Volume II (memo from N. Dodd). FDA has received a submission for flumetsulam; however, the method has not yet been compiled in PAM Volume II.

860.1360 Multiresidue Methods

The registrant has submitted data for Protocol B (Section 402, Hopper method for acids and phenols) and Protocol C (Section 302 DG, GLC Data only) on soybeans and wheat grain and the results were forwarded by EPA to the Food and Drug Administration (FDA) to determine sufficiency (N. Dodd, PP# 1G4006, 3/27/92; N. Dodd, PP# 1G4006, 11/24/92). The FDA PESTDATA database dated 11/01 (PAM Volume I, Appendix I) indicates that flumetsulam was not recovered using Protocol B and extraction methods E1 (extraction with solvents from acidified denatured products) and E2 (extraction with acidified methylene chloride). According to the PESTDATA database, the retention time of methylated flumetsulam using an OV-101 GLC column is 12.4 (relative to chlorpyrifos).

Testing through Protocol A is not required because flumetsulam does not contain the N-methylcarbamate structure (N. Dodd, PP# 1G4006, 3/27/92) and testing through Protocol G is not required because flumetsulam is not a substituted urea. Protocols D, E, and F are not

appropriate because the protocols do not include a methylation step, which is necessary for flumetsulam to be chromatographed (N. Dodd, D178112, 8/20/93).

860.1380 Storage Stability

Storage stability studies have been conducted using fortified samples of field corn and soybean. The results indicate that residues of flumetsulam are stable in corn grain, forage, and fodder stored for at least 555 days at -15 °C. Based on the corrected average residues at 0 and 555 days, flumetsulam losses were 4% for grain, 5% for forage, and 13% for fodder (N. Dodd, PP# 3F4185, 6/28/93). In soybeans, residues of flumetsulam are stable for up to thirty months (908 days) at -15 °C. At thirty months, flumetsulam recoveries corrected for percent recovery from method spikes ranged from 93 to 99% (average 97%; N. Dodd, PP# 2F4036, 4/14/93).

A storage stability study for dry beans was not conducted; however, the storage intervals and conditions from the dry bean magnitude of residue study (-20 °C for a maximum of ninety-seven days) are adequately supported by the storage stability data from the studies conducted with soybeans and corn. Therefore, the submitted information from the corn and soybean storage stability studies is adequate to support the residue data on dry beans.

860.1400 Water, Fish, and Irrigated Crops

Flumetsulam is not presently registered for direct use on water and aquatic food and feed crops; therefore, no residue chemistry data are required under these guideline topics.

860.1460 Food Handling

Flumetsulam is not presently registered for use in food-handling establishments; therefore, no residue chemistry data are required under this guideline topic.

860.1480 Meat, Milk, Poultry, and Eggs

The dietary burdens of beef cattle, dairy cattle, and poultry are presented in Table 5. Using a diet containing field corn forage, field corn grain, and field corn milled byproducts, the maximum theoretical dietary burden for beef cattle is 0.07 ppm, 0.09 ppm for dairy cattle, and 0.05 ppm for poultry.

Feedstuff	% Dry Matter ¹	Residue (ppm) ²	Beef Cattle		Dairy Cattle		Poultry	
			% in Diet	Dietary Burden (ppm) ³	% in Diet	Dietary Burden (ppm) ²	% in Diet	Dietary Burden (ppm) ²
Corn, field, forage	40	0.05	30	0.04	50	0.06	0	0
Corn, field, grain	88	0.05	60	0.03	40	0.02	80	0.04

Table 5. Calculation of Theoretical Dietary Burdens of Flumetsulam to Livestock.								
Feedstuff	% Dry Matter ¹	Residue (ppm) ²	Beef Cattle		Dairy Cattle		Poultry	
			% in Diet	Dietary Burden (ppm) ³	% in Diet	Dietary Burden (ppm) ²	% in Diet	Dietary Burden (ppm) ²
Corn, field, milled byproducts	85	0.05	10	0.01	10	0.01	20	0.01
Total			100	0.07	100	0.09	100	0.05

1. OPPTS Guideline 860.1000, Table 1.

2. Established tolerance levels of 0.05 ppm on field corn were used.

3. Dietary Burden = % in diet x (residue / percent dry matter).

MRID Number: 41931716 (N. Dodd, PP# 1G4006, 3/27/92):

Nature of residue studies for ruminant (goat) and poultry (hens) have been submitted and reviewed. In the ruminant study, goats were fed 5-¹⁴C-pyridine-labeled flumetsulam in capsules at a dose of 21 mg/day (10 ppm in feed, ca. 200x dosing level) for 5 consecutive days. Ninety-two percent of the radioactive residues in milk and eighty-eight percent of the radioactive residues in kidney were identified as parent. Residues in muscle, fat, and liver were not characterized; however, ¹⁴C-residues in these tissues were low (less than or equal to 0.10 ppm) after dosing at the exaggerated feeding level (10 ppm, ca. 200x). The maximum residues of flumetsulam observed in any matrix in the goat metabolism study were less than or equal to 0.10 ppm after dosing at an exaggerated feeding level (10 ppm, ca. 200x dosing level). Based on a 200x dosing level for goats, the expected residues of flumetsulam at a 10x level are 0.005 ppm, which is equal to the plant method LOD of 0.005 ppm.

In the poultry study, hens were fed 5-¹⁴C-pyridine-labeled flumetsulam in capsules at a dose of 2.1 mg/day (15 ppm in feed, ca. 300x dosing level) for 10 consecutive days. Seventy percent of the radioactive residues in kidney were identified as parent and twenty-four percent were identified as 5-hydroxymethyl metabolite. Residues in muscle, fat, liver, and eggs were not characterized; however, ¹⁴C-residues in the muscle, fat, liver, and eggs were low (less than or equal to 0.10 ppm) after dosing at the exaggerated feeding level (15 ppm, ca. 300x). The maximum residues of flumetsulam observed in any matrix in the poultry metabolism study were less than or equal to 0.10 ppm after dosing at an exaggerated feeding level (15 ppm, ca. 300x the dosing level). Based on a 300x dosing level for poultry, the expected residues of flumetsulam at a 10x level are 0.0033 ppm, which is less than the plant method LOD of 0.005 ppm.

Flumetsulam is not presently registered for use as a direct livestock treatment and residues of flumetsulam were not detected in the feed items. The nature of the residue in animals is adequately defined for the current and proposed uses. HED concludes that the registered uses on corn and soybeans and the proposed use on dry beans results in a 40 CFR §180.6(a)(3) situation for ruminant and poultry commodities; i.e., there is no reasonable expectation of finite residues in ruminant and poultry commodities. Therefore, additional data on the transfer of residues to meat, milk, and poultry are not required. However, for uses which may result in detectable residues in feed items, additional animal metabolism data on ruminants and poultry may be required. Such

data may, in turn, trigger the need for magnitude of the residue (feeding) studies in livestock.

860.1500 Crop Field Trials

Crop field trials were conducted on field corn, soybean, and dry beans. Detailed summaries of these studies are presented below. Briefly, flumetsulam residues were not detected at a concentration above the stated method (ACR 91.6) LOQ of 0.005 ppm in/on corn (forage, grain, and fodder) and soybeans. However, ACB estimated the LOQ of analytical method ACR 91.6 at 0.01 ppm and the LOD at 0.005 ppm in/on soybean and corn grain and fodder (N. Dodd, D189444, 3/29/93). Flumetsulam residues were not detected above the method (GRM 96.21) LOQ of 0.017 ppm in/on dry beans. Corn, soybean, and dry bean samples were collected from plots which received applications of flumetsulam at approximately the maximum label rate (Table 6). The applications were made using a 75% WDG formulation (corn and soybeans), 80.8% WDG formulation (dry beans), or an aqueous soluble concentrate formulation (soybeans). The corn and soybean crop field trials were conducted using two separate plots which each received either a single preplant incorporated application or postemergence application of the test substance. A limited number of field trials with corn were also conducted using a single preemergence application of the test substance. The dry bean crop field trials were conducted using only plots which received a single preplant incorporated application. These use patterns reflect the current and proposed use patterns of flumetsulam, except that no preplant studies without soil incorporation were conducted on all crops and no preemergence studies were conducted on soybeans and dry beans.

As discussed in the storage stability section, EPA has accepted the storage stability data submitted for corn and soybeans to support the residue data from the crop field trials conducted on corn, soybeans, and dry beans. Additionally, the analytical methods (ACR 91.6 and ACR 91.6S) used in the soybean and corn crop field trial studies are adequate for the analysis of flumetsulam. These methods have been validated by EPA at 0.05 ppm and approved for use as enforcement methods. The analytical method used for the analysis of flumetsulam in/on dry beans was GRM 96.21. The stated LOQ of GRM 96.21 was 0.017 ppm and the stated LOD was 0.005 ppm (S. Ary, D301807, 8/30/04). This method has not been reviewed by EPA; however, based on concurrent recoveries, the method appears acceptable for data collection. Flumetsulam *per se* was determined to be the residue of concern in field corn and soybeans by HED Metabolism Committee. Tolerance levels of 0.05 ppm are supported by the available residue data.

Field Corn

MRID Number: 41931721 (N. Dodd, PP# 1G4006, 3/27/92):

Studies were conducted on field corn at sixteen locations in thirteen states: GA (one), IL (two), IN (one), IA (two), KY (one), MI (one), MN (two), MO (one), NE (one), NC (one), OH (one), WI (one), and MS (one). At each location, one preplant incorporated soil application was made on a plot, and one postemergence application was made on a different plot. A 75% WDG formulation (EPA Reg. No.: 62719-224, XRM-5019) was applied at the rate 0.06 lb ai/A. At three locations (IL, IA, and MS) on additional plots, a rate of 0.18 lb ai/A was applied postemergent. Applications were made with ground equipment. Most applications were made in

approximately twenty gallons of spray per acre. All postemergence sprays included 0.25% (v/v) Ortho X-77, a non-ionic surfactant. Forage, grain, and fodder were sampled at harvest and frozen in polyethylene bags. Grain was not ground before storage. Forage and fodder were cut but not ground. Samples were analyzed within eleven months. The analytical method used was ACR 91.6 (GC/MS), with minor modifications. The LOQ of the method was 0.005 ppm and the estimated LOD was 0.0025 ppm. All control values for forage, fodder, and grain were less than the method LOD of 0.002. Average recoveries from control samples of field corn fortified with 0.005 to 0.05 ppm were 92% for forage, 97% for grain, and 91% for fodder. No detectable residues (less than 0.002 ppm) were found in field corn grain, forage, and fodder.

MRID Number: 42677803 (N. Dodd, D188957, 6/28/93):

Four residue studies on field corn were conducted in the states of CA, WA, TX, and MD (one study in each state). A 75% WDG formulation (EPA Reg. No.: 62719-224, XRM-5019) was mixed with water and applied preemergence as a broadcast spray or postemergence to 12-inch corn. Postemergence applications included the additive Ortho X-77. Only one application was made to each plot. The preemergence application rates were 0.07, 0.11, and 0.20 lb ai/A. The postemergence application rates were 0.06, 0.09, and 0.18 lb ai/A. For both the preemergence and postemergence applications, the application rates were 1x, 1.5x, and 3x the maximum use rate of 0.07 lb ai/A. The samples were frozen after analysis, shipped frozen, and stored at -20 °C until analysis. The samples were analyzed within six months of sampling. The samples were analyzed by method ACR 91.6.S1 (GC/MSD), with slight modifications to allow use of a laboratory robot. The method was validated by EPA at 0.05 ppm, the current tolerance level. The petitioner indicated that the LOQ of the analytical method was 0.007 ppm and the LOD was 0.0025 ppm. Recoveries were 71 to 104% for forage, 76 to 94% for grain, and 71 to 90% for fodder. All forage, grain, and fodder controls were less than 0.05 ppm. All residues on forage, grain, and fodder were less than 0.05 ppm except for the residue data on forage in CA, reflecting postharvest application at a 3x rate. The petitioner indicated that the higher residues in CA may be due to furrow irrigation only. The corn received little or no overhead irrigation after application of the herbicide and minimal rainfall during the 1992 growing season.

Soybean

MRID Number 41952106 (N. Dodd, PP# 1G4006, 3/27/92):

Residue studies on soybeans were conducted in 1988. Studies were conducted at eighteen locations in thirteen states: AR (two), GA (one), IL (two), IN (two), IA (two), LA (one), MI (one), MN (two), MS (one), MO (one), NE (one), NC (one), and OH (one). The flumetsulam formulation used was an aqueous suspension concentrate containing 1 lb ai/gallon. At each location, one preplant incorporated application was made on a plot, and one postemergence application was made on a different plot. The preplant application was made at the rate of 0.09 lb ai/A (ca. 1.3x the maximum preemergence application rate). The postemergence application was made at the fifth to seventh trifoliate stage at the rate of 0.03 lb ai/A (1x the maximum postemergence application rate). At three locations (MI, IL, and MS) on additional plots, one postemergence application was made at the rate of 0.09 lb ai/A (3x the maximum postemergence application rate). Applications were made with ground equipment. Most applications were made in approximately twenty gallons of spray per acre. An adjuvant was not added to the spray

solutions in any of the trials. Threshed seeds were harvested at maturity (114-166 days after preplant incorporated application; 79-132 days after postemergence application at the rate of 0.03 lb ai/A and 104-132 days after postemergence application at the rate of 0.09 lb ai/A). Samples of soybeans were stored frozen in polyethylene bags. The samples were analyzed 4.5 to 32.5 months after sampling using either method ACR 91.6 with a LOQ of 0.005 ppm and an estimated LOD of 0.0025 ppm) or an earlier version of this method with a LOQ of 0.01 ppm and an estimated LOD of 0.005 (N. Dodd, D178112, 8/20/93). All control values were less than the LOD for both methods. Recoveries from controls fortified with flumetsulam at 0.005 to 0.10 ppm were 79 to 113%; however, the method used to obtain this data was not specified. No detectable residues of flumetsulam (i.e., less than one-half the lower limits of quantitation of the methods) were found.

MRID Number: 41931719 (N. Dodd, PP# 1G4006, 3/27/93):

In this study, flumetsulam was applied preplant incorporated to soybeans at the rate of 0.28 lb ai/A (4x the maximum preemergence rate) in IL, MI, and MS. Applications were made with ground equipment. Threshed mature soybean seeds were collected at harvest (124 to 146 days after application). Samples were stored frozen in polyethylene bags until analysis. Samples were analyzed within six to twenty months using method ACR 91.6, modified by substituting a liquid/liquid extraction using diethyl ether for the dual solid phase extraction purification before methylation. The validated LOQ of the method was 0.005 ppm. All control values were less than the method LOD. Recoveries from controls fortified with flumetsulam at 0.005 to 0.10 ppm were 77 to 101%. No detectable residues of flumetsulam (i.e., less than one-half the LOQ of the method) were found.

MRID Number: 41931720 (N. Dodd, PP# 1G4006, 3/27/93):

A formulation comparison study was conducted on soybeans in IL and MS to compare residues from postemergence applications of two different sprayable formulations of flumetsulam, XRM-5019 and XRM-4950R. XRM-5019, a 75% WDG formulation, was applied with ground equipment at the rate of 0.03 lb ai/A in both states. XRM-4950R, an aqueous suspension concentrate, was applied at the rate of 0.03 lb ai/A in IL, and at the rate of 0.0032 lb ai/A in MS due to error. Both formulations were applied to soybeans at the third or fourth trifoliolate stage. Mature threshed soybeans were collected at PHIs of 89 days in IL and 108 days in MS. Samples were stored frozen. The analytical method used was ACR 91.6 with a LOQ of 0.005 ppm and an estimated LOD of 0.002 ppm. Recoveries of flumetsulam at fortification levels of 0.005 to 0.05 ppm were 75 to 107%. No detectable residues were found in soybean seeds from application of either formulation.

Dry Bean

MRID Number: 44304402 (S. Ary, D301807, 8/24/04):

DowElanco has submitted field trial data for flumetsulam on dry beans. Ten field trials were conducted encompassing EPA Regions 5 (ND, MI, and MN; five trials), 7 (NE; one trial), 8 (KS; one trial), 9 (CO; one trial), 10 (CA; one trial), and 11 (ID; one trial) during the 1996 growing season. The number and locations of field trials are in accordance with Office of Prevention, Pesticides, and Toxic Substances (OPPTS) Guideline 860.1500.

At each test location, the treated plot received a single application of an 80.8% water dispersible granular (WDG) formulation as a preplant incorporated spray. The test substance was incorporated to a depth of two to three inches on the same day as the application and the plots were planted with bean seed between zero and three days after application. All applications were made at a target rate of 0.07 lb ai/A and a spray volume of 20 gal/A. Actual application rates ranged from 0.086 to 0.089 lb ai/A. An adjuvant was not added to the spray mixtures. Mature bean samples were collected at PHIs between 92 and 131 days.

Residues of flumetsulam in the bean samples were quantitated by GC/MS using DowElanco method GRM 96.21. The stated LOQ was 0.017 ppm and the stated LOD was 0.005 ppm. This method is adequate for data collection based on acceptable concurrent method recovery data.

The maximum storage interval of bean samples from harvest to analysis was ninety-seven days (3.2 months). Sample extracts were stored for a maximum of two months prior to analysis. Flumetsulam has been shown to be stable in soybeans after a period of 908 days in frozen storage (97% recovery; N. Dodd, PP# 2F4036, MRID No.: 42580608, 4/14/93) and in corn grain, forage, and fodder after a period of 555 days in frozen storage (83 to 110% recovery; N. Dodd, PP# 3F4185, MRID No.: 42677801, 6/28/93). In the absence of specific storage stability data for bean samples, it is assumed that residues will behave similarly in beans as in the tested commodities.

The results of the preplant incorporated spray field trials showed that flumetsulam residues were less than the LOD (0.005 ppm) in all dry bean samples analyzed. In the decline study, residues of flumetsulam were below the method LOD (0.005 ppm) at all sampling intervals (-7, -3, +3, and +7 days from normal harvesting).

Table 6. Summary of Residues from the Crop Field Trials with Flumetsulam.									
MRID No.	EP ¹	Crop Matrix	Applic. Rate (lb ai/A)	PHI (days)	Flumetsulam Residues (ppm) ²				
					Mean	Std. Dev.	HAFT	Min.	Max.
Field Corn									
Preplant Incorporated (current maximum application rate = 0.07 lb ai/A; PHI = 85 days)									
41931721	75% WDG	forage	0.06	72-121	<0.05	0	<0.05	<0.05	<0.05
		grain	0.06	120-169	<0.05	0	<0.05	<0.05	<0.05
		fodder	0.06	102-127	<0.05	0	<0.05	<0.05	<0.05
Preemergence (current maximum application rate = 0.07 lb ai/A; PHI = 85 days)									
42677803	75% WDG	forage	0.07	NP ³	<0.05	0	<0.05	<0.05	<0.05
			0.11	NP	<0.05	0	<0.05	<0.05	<0.05
			0.20	NP	<0.05	0	<0.05	<0.05	<0.05
		grain	0.07	NP	<0.05	0	<0.05	<0.05	<0.05
			0.11	NP	<0.05	0	<0.05	<0.05	<0.05
			0.20	NP	<0.05	0	<0.05	<0.05	<0.05
fodder	0.07	NP	<0.05	0	<0.05	<0.05	<0.05		

Table 6. Summary of Residues from the Crop Field Trials with Flumetsulam.									
MRID No.	EP ¹	Crop Matrix	Applic. Rate (lb ai/A)	PHI (days)	Flumetsulam Residues (ppm) ²				
					Mean	Std. Dev.	HAFT	Min.	Max.
			0.11	NP	<0.05	0	<0.05	<0.05	<0.05
			0.20	NP	<0.05	0	<0.05	<0.05	<0.05
Postemergence (current maximum application rate = 0.07 lb ai/A; PHI = 85 days)									
41931721	75% WDG	forage	0.06	43-80	<0.05	0	<0.05	<0.05	<0.05
		grain	0.06	88-134	<0.05	0	<0.05	<0.05	<0.05
			0.18	102-127	<0.05	0	<0.05	<0.05	<0.05
		fodder	0.06	88-134	<0.05	0	<0.05	<0.05	<0.05
42677803	75% WDG	forage	0.06	NP	<0.05	0	<0.05	<0.05	<0.05
			0.09	NP	<0.05	0	<0.05	<0.05	<0.05
			0.18	14	NP	NP	NP	0.1764 (0.2025) ⁴	0.2184 (0.2318) ⁴
			0.18	28	NP	NP	NP	0.0538 (0.0571) ⁴	0.0860 (0.0987) ⁴
		grain	0.06	NP	<0.05	0	<0.05	<0.05	<0.05
			0.09	NP	<0.05	0	<0.05	<0.05	<0.05
			0.18	NP	<0.05	0	<0.05	<0.05	<0.05
		fodder	0.06	NP	<0.05	0	<0.05	<0.05	<0.05
			0.09	NP	<0.05	0	<0.05	<0.05	<0.05
			0.18	NP	<0.05	0	<0.05	<0.05	<0.05
Soybean									
Preplant Incorporated (current maximum application rate = 0.07 lb ai/A; PHI = 70-85 days)									
41952106	Aqueous Suspension Concentrate (1 lb ai/gal)	Soybean	0.09	114-166	<0.05	0	<0.05	<0.05	<0.05
41931719	75% WDG	Soybean	0.28	124-146	<0.05	0	<0.05	<0.05	<0.05
Postemergence (current maximum application rate = 0.021 lb ai/A total application rate; PHI = 85 days)									
41952106	Aqueous Suspension Concentrate (1 lb ai/gal)	Soybean	0.03	79-132	<0.05	0	<0.05	<0.05	<0.05
	75% WDG	Soybean	0.09	104-132	<0.05	0	<0.05	<0.05	<0.05
41931720	Aqueous Suspension Concentrate (1 lb ai/gal)	Soybean	0.03	89-108	<0.05	0	<0.05	<0.05	<0.05
	75% WDG	Soybean	0.03	89-108	<0.05	0	<0.05	<0.05	<0.05
Dry Bean									
Preplant Incorporated (current maximum application rate = 0.07 lb ai/A total application rate; PHI = 85 days)									

Table 6. Summary of Residues from the Crop Field Trials with Flumetsulam.									
MRID No.	EP ¹	Crop Matrix	Applic. Rate (lb ai/A)	PHI (days)	Flumetsulam Residues (ppm) ²				
					Mean	Std. Dev.	HAFT	Min.	Max.
44304402	80.8% WDG	Dry bean	0.086 - 0.089	94 - 131	<0.05	0	<0.05	<0.05	<0.05

1. EP = End-use product.
2. The method was validated by EPA at 0.05 ppm.
3. NP = Not provided.
4. These values are corrected for concurrent recovery. The petitioner indicated that the higher residues in CA may be due to furrow irrigation only. The corn received little or no overhead irrigation after application of the herbicide and minimal rainfall during the 1992 growing season. Also, the application rate was ca. 3x (0.18 lb ai/A) the current use rate of 0.07 lb ai/A.

860.1520 Processed Food and Feed

A processed food and feed study was conducted using field corn that was treated postemergence at 0.18 lb ai/A (ca. 3x the application use rate). The corn was processed into crude oil, refined oil, grits, meal, flour, and starch using either dry or wet processing techniques that were intended to produce commercially representative fractions. The solid by-product samples (grits, meal, flour, and starch) were stored for up to 3.5 months prior to analysis and the oil samples were stored up to four weeks prior to analysis. Storage stability data was not submitted for the solid by-product processed fractions; however, because the solid by-product processed fractions closely resemble corn grain, the demonstrated stability of flumetsulam in corn grain (555 days at -15 °C) is acceptable for the storage conditions and intervals of the solid by-product processed fractions. Storage stability data were also not submitted for the oil samples; however, data are not required because the oil samples were stored for less than or equal to thirty days and flumetsulam is not known to be volatile or labile. The raw agricultural commodity (RAC) and processing samples were analyzed for flumetsulam using method ACS 91.6S, which was validated with corn grain, corn fodder, and soybeans by EPA at 0.05 ppm. The HED Metabolism committee determined that the residue of concern in field corn is flumetsulam *per se*. Flumetsulam residues in the RAC and the processing fractions were not detected above the estimated method LOD of 0.002 ppm (D188957, N. Dodd, 6/28/93).

The application rate for the study was 3x. Unless the 3x application rate was chosen because of phytotoxicity concerns, the application rate for the processing study should have been 5x the maximum application rate. Considering the absence of detectable residues in all the processed fractions at 3x and the properties of flumetsulam (low octanol/water partition coefficient [$\log P = 0.21$] and greater solubility in water than in hexane), HED concludes that concentration of residues in oil is highly unlikely. Therefore, the processing study is adequate to show that food or feed additive tolerances are unnecessary (N. Dodd, D188957, 6/28/93).

A processing study and food additive tolerances are not required for soybeans because no detectable residues (less than 0.005 ppm) were found in soybeans resulting from postemergence treatment at 6x the maximum application rate, which is the theoretical concentration factor for soybean oil. Additionally, no detectable residues were found in soybeans from preplant incorporated treatment at 4x the maximum application rate (N. Dodd, PP# 1G4006, 3/27/93).

A processing study for dry beans is not required because dry beans are not processed into

food/feed items.

860.1650 Submittal of Analytical Reference Standards

An analytical reference standard for flumetsulam was submitted by Dow in July of 1999 and expires May of 2007. The standard is available at the EPA National Pesticide Standards Repository.

860.1850 Confined Accumulation in Rotational Crops

MRID Numbers: 41263232, 41931738, 41931739, and 42512502:

An accumulation in confined rotational crops study was initiated in May of 1997 with plant back intervals of 30, 120, and 365 days after soil treatment. The application rate for this study was 0.12 lb ai/A (ca. 2x the recommended use rate). The study was reported in two parts. The 30-day and 120-day plant back interval study was submitted and reviewed first (G. Maske, MRID No.: 41263232, 1/21/90), followed by the 365-day study (G. Maske, MRID No.: 41931738, 3/12/93). The review of the 30-day and 120-day study listed the following deficiencies: incomplete residue characterization, storage stability questions, and lack of confirmation of the application rate. A 33-day study was conducted at 0.13 lb ai/A (ca. 2x the recommended use rate) and was submitted and reviewed to satisfy the 30-day and 120-day study deficiencies (G. Maske, MRID No.: 41931739, ca. 1993). The registrant was instructed by the Environmental Fate and Effects Division (EFED) to submit an overview (MRID No.: 42512502) to summarize the results of the confined rotational crop studies.

For all phases of the original confined rotational crop studies (MRID Nos.: 41263232 and 41931738) and the supporting study (MRID No.: 41931739), the ¹⁴C residues in lettuce, carrot tops and roots, wheat grain, and soybeans were reported to be less than or equal to 0.01 ppm. Wheat forage and soybean forage had reported total ¹⁴C residues of 0.039 and 0.056 ppm, respectively. The highest total ¹⁴C residues were reportedly found in wheat straw/chaff and soybean trash at 0.060 and 0.082 ppm, respectively. These residues were characterized by solvent extractability, acid extractability, and/or lignin and cellulose isolation. The neutral solvent extractable ¹⁴C residues were further characterized by chromatographic comparison of the extractable residue components to reference standards. Four degradates were shown to be present which had concentrations ranging from less than 0.001 to 0.031 ppm. These were reported as Components A, B, C, and D. Component D, which had a retention time similar to flumetsulam, was present at less than 0.001 ppm for all tissues analyzed. Component C occurred at a retention time similar to both the 5-hydroxymethyl and 7-hydroxymethyl metabolites of flumetsulam. With the exception of soybean forage (0.020 ppm), the concentration of Component C was less than or equal to 0.007 ppm. Component B was determined to be more polar than Component C and was present at less than or equal to 0.005 ppm, with the exception of soybean forage (0.031 ppm). The concentration of Component A was less than or equal to 0.009 ppm, with the exception of soybean forage (0.019 ppm). Component A is likely composed of two degradates. The registrant indicated that the total radioactive residues were present at such low levels that only characterization and not identification of specific degradates was possible.

The current use labels for flumetsulam restricts crop rotation after treatment to four months or greater for all crops except soybean. Feeding of soybean forage, hay, or straw to livestock is restricted. Under these restrictions, the total quantifiable ^{14}C residues accumulated in crop fractions is less than 0.006 ppm with the exception of wheat straw/chaff. The highest wheat straw/chaff residue occurred for the 30-day planting at 0.060 ppm. The total ^{14}C residue levels in wheat straw/chaff samples were 0.029 ppm in the 120-day study and 0.010 ppm in the 365-day study.

The results of the 30-day, 120-day, and 365-day rotational crop studies indicate that the total ^{14}C residue accumulation in lettuce, carrot roots and tops, turnip roots and tops, wheat grain, and soybeans was less than or equal to 0.01 ppm. However, total ^{14}C residues reported in wheat straw/chaff ranged from 0.010 to 0.047 ppm (MRID Nos.: 41263232 and 41931738). In a separate study (MRID No.: 41931739), wheat forage, soybean forage, soybean trash, and wheat straw/chaff had reported total ^{14}C residues of 0.039, 0.056, 0.082, 0.060 ppm, respectively. Therefore, for leafy and root crops, a 30-day rotational crop interval is satisfactory. For cereal grains, a 120-day rotational crop interval is satisfactory. A restriction against feeding soybean forage, hay, or straw to livestock should be added to all labels.

860.1900 Field Accumulation in Rotational Crops

Studies for field accumulation in rotational crops studies have not been submitted; however, review of the confined studies (MRID Numbers: 41263232, 41931738, and 41931739) indicate that residues of concern in these studies are less than 0.01 ppm at the appropriate rotational intervals. Trials for field accumulation in rotational crops are not required at this time. However, if the registrant wishes to have shorter plant-back intervals (PBI), field accumulation studies will be needed to set tolerance levels for rotational crops.

860.1550 Proposed Tolerances

Tolerances have been established under 40 CFR §180.468 for residues of flumetsulam in/on field corn (forage, grain, and stover) and soybean at 0.05 ppm. Available residue data indicate that the established tolerances for these commodities are adequate. Dow has petitioned for the establishment of a tolerance for residues of flumetsulam in/on dry beans at 0.05 ppm. HED recommends that the tolerance level in/on dry beans be established at the proposed rate. Table 7 presents the established/proposed and recommended tolerance levels for all commodities.

There are no Codex, Canadian, or Mexican maximum residue limits (MRLs) for flumetsulam; therefore, no questions of compatibility with U.S. tolerances exist.

Table 7. Tolerance Summary for Flumetsulam.			
Commodity	Established/Proposed Tolerance (ppm)	Recommended Tolerance (ppm)	Comments (correct commodity definition)
Corn, field, forage	0.05 (established)	0.05	None

Commodity	Established/Proposed Tolerance (ppm)	Recommended Tolerance (ppm)	Comments (correct commodity definition)
Corn, field, grain	0.05 (established)	0.05	None
Corn, field, stover	0.05 (established)	0.05	None
Soybean	0.05 (established)	0.05	None
Dry bean	0.05 (proposed)	0.05	Bean, dry

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Agency Memoranda Citations

Agency Memoranda Citations.							
Date	Barcode	CBTS No.	Petition or ID Number	From	To	MRID Nos.	Subject
1/21/90	None	None	None	G. Maske	EFED Files	41263232	DER: Confined Accumulation of Rotational Crops; MRID No.: 41233232.
3/10/92	D168583	8560	1G4006	N. Dodd	J. Miller	None	PP# 1G4006 (CBTS #8560; Barcode #D168583). DE-498 and Trifluralin on Soybeans. Formulation XRM-5313.
3/27/92	D167462 D168563	8400 8646	1G4006	N. Dodd	J. Miller and Toxicology Branch	41931701 41931702 41931712- 41931721 41952101 41952104- 41952106 41993802	PP#1G4006 (CB#'s 8400 and 8646; Barcode #'s D167462 and D168563, respectively). DE-498 on Soybeans and Field Corn. (MRID #'s 419317-01, -02; 419317-12 through -21; 419521-01, -04, -05, -06; and 419938-02).
8/20/92	D178112	9845	1G4006	N. Dodd	J. Miller and Toxicology Branch	42407000- 42407004	PP#1G4006 (CBTS #9845; Barcode #D178112). DE-498 and DE-498/Trifluralin on Soybeans. Amendment dated 7/24/92. (MRID #s 424070-00, 424070-01, 424070-02, 424070-03, 424070-04).
11/24/92	None	None	1G4006	N. Dodd	Leon Sawyer (FDA)	41993802	Multiresidue Test Information for the Updating of PAM I.
12/23/92	D183546	10738	2G4149	N. Dodd	J. Miller and Toxicology Branch	42489001	PP#2G4149 (CBTS # 10738; Barcode #D183546). DE-498 on Field Corn. Amendment dated 9/24/92. (MRID #'s 424890-01).
3/12/93	None	None	None	G. Maske	EFED Files	41931738	DER: Confined Accumulation of Rotational Crops; MRID No.: 41931738.
Ca. 1993	None	None	None	G. Maske	EFED Files	41931739	DER: Confined Accumulation of Rotational Crops; MRID No.: 41931739.
3/29/93	D189444	11610	062719-EEG	N. Dodd	J. Miller	None	ID # 062719-EEF (CBTS #11610; Barcode #D189444). Flumetsulam (DE-498) on Soybeans and Corn. Evaluation of Method Trial Report dated 3/19/93.

Agency Memoranda Citations.							
Date	Barcode	CBTS No.	Petition or ID Number	From	To	MRID Nos.	Subject
4/14/93	D183274 D184405 D184530 D185716 D185720	10708 10846 10914 11054 11055	2F4036	N. Dodd	J. Miller A. Kocialski	42489001 42513501 42513502 42580601- 42580608	TASK 4. PP# 2F4036. Flumetsulam (DE-498) on Soybeans and Corn. Amendments dated 9/25/92, 10/8/92, 11/30/92, and 12/7/92.
4/26/93	None	None	None	N. Dodd	HED Metabolism Committee	None	Flumetsulam Metabolism in Soybeans and Field Corn. The HED Metabolism Committee Meeting Held on 4/21/93.
6/28/93	None	None	2F4036	N. Dodd	J. Miller A. Kocialski	None	PP#2F4036. Flumetsulam (DE-498) on Soybeans. Addendum to Review dated 5/3/93 regarding Section 409.
6/28/93	D188957	11516 11799	3F4185 062719- EEG	N. Dodd	J. Miller	426778-00 through - 03	PP#3F4185 and ID# 062719-EEG. (CBTS #'s 11516 and 11799; Barcode #'s D188957 and D190750). DE-498 (Flumetsulam) on Field Corn (MRID #'s 426778-00, -01, -02, and -03).
12/6/93	None	None	2F4036 3F4185	N. Dodd	A. Marcotte (FDA)	None	Materials for a new entry in PAM II.
9/24/04	D301807	None	7F4851	S. Ary	A. Nielsen	44304402	DER: Flumetsulam Crop Field Trial - Dry Bean

RDI: S. Ary (8/25/04); S. Kinard (8/27/04); W. Hazel (8/31/04).

Appendix A. Food/Feed Use Patterns of Flumetsulam.

Food/Feed Use Patterns of Flumetsulam.					
Application Timing – Application Type – Application Equipment	Max. Single Application Rate	Max. Seasonal Rate	Max. No. Applications/ cc & yr	MRI	Use Limitations
CORN					
Early preplant – Conservation tillage/Soil broadcast treatment – Granule applicator/ Ground/Low pressure ground sprayer	0.06875 lb ai/A	0.07031 lb ai/A/yr	NS	NS	REI: 12 h Geographic allowable: CO CT DE IA IL IN KS KY MA MD ME MI MN MO MT ND NE NH NJ NY OH PA RI SD TN VA VT WI WV WY
Preemergence – Broadcast/Soil band treatment/Soil broadcast treatment – Band sprayer/Granule applicator/Ground/Low pressure ground sprayer	0.06875 lb ai/A	0.07031 lb ai/A/yr	NS	NS	REI: 12 h
Preplant – Soil band treatment/Soil incorporated treatment – Granule applicator/Ground/Low pressure ground sprayer/Soil incorporation equipment	0.06875 lb ai/A	0.07031 lb ai/A/yr	NS	14 days	REI: 12 h Incorporate to a depth of 2 inches.
Limitations: 85 day(s) preharvest interval. 85 day(s) preharvest interval. Do not apply by aircraft. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply through any type of irrigation system. Do not apply to muck soils. Do not contaminate water by cleaning of equipment or disposal of equipment wash waters. Do not contaminate water, food, or feed by storage or disposal. Do not feed straw to livestock.					

Food/Feed Use Patterns of Flumetsulam.					
Application Timing	Max. Single Application Rate	Max. Seasonal Rate	Max. No. Applications/ cc & yr	MRI	Use Limitations
<ul style="list-style-type: none"> - Application Type - Application Equipment 					
Do not graze or feed forage or hay. Groundwater restriction. Rotational/plant back crop restriction. Treated pulp may be fed to animals being finished for slaughter. Geographic disallowable: Other					
CORN (UNSPECIFIED)					
Early preplant <ul style="list-style-type: none"> - Soil broadcast treatment - Granule applicator/Ground/Low pressure ground sprayer 	0.06875 lb ai/A	0.07031 lb ai/A/yr	NS	NS	REI: 12 h Geographic allowable: CO CT DE IA IL IN KS KY MA MD ME MI MN MO MT ND NE NH NJ NY OH PA RI SD TN VA VT WI WV WY
Preemergence <ul style="list-style-type: none"> - Soil band treatment/Soil broadcast treatment - Band sprayer/Granule applicator/Low pressure ground sprayer 	0.06875 lb ai/A	0.07031 lb ai/A/yr	NS	NS	REI: 12 h
Preplant <ul style="list-style-type: none"> - Soil band treatment/Soil incorporated treatment - Granule applicator/Ground/Low pressure ground sprayer/Soil incorporation equipment 	0.06875 lb ai/A	0.07031 lb ai/A/yr	NS	14 days	REI: 12 h Incorporate to a depth of 2 inches.
Limitations: 85 day(s) preharvest interval. Do not apply by aircraft. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply through any type of irrigation system. Do not apply to muck soils. Do not contaminate water by cleaning of equipment or disposal of equipment wash waters.					

Food/Feed Use Patterns of Flumetsulam.					
Application Timing	Max. Single Application Rate	Max. Seasonal Rate	Max. No. Applications/cc & yr	MRI	Use Limitations
<ul style="list-style-type: none"> - Application Type - Application Equipment 					
Do not contaminate water, food, or feed by storage or disposal. Do not feed straw to livestock. Do not graze or feed forage or hay. Groundwater restriction. Rotational/plant back crop restriction. Treated pulp may be fed to animals being finished for slaughter.					
CORN, FIELD					
Early preplant <ul style="list-style-type: none"> - Conservation tillage/Soil broadcast treatment - Granule applicator/Ground/Low pressure ground sprayer 	0.06875 lb ai/A	0.07031 lb ai/A/yr	NS	NS	REI: 12 h Geographic allowable: CO CT DE IA IL IN KS KY MA MD ME MI MN MO MT ND NE NH NJ NY OH PA RI SD TN VA VT WI WV WY
Foliar <ul style="list-style-type: none"> - Band treatment/Ground spray/Low volume spray (concentrate) - Band sprayer/Fixed-wing aircraft/Helicopter/Sprayer 	0.03478 lb ai/A	0.03478 lb/cc	NS	NS	REI: 48 h Geographic allowable: CO IA KS MN NE OK SD TX
Postemergence <ul style="list-style-type: none"> - Soil band treatment/Soil broadcast treatment - Band sprayer/Ground/Low pressure ground sprayer 	(L) 0.05781 lb ai/A	0.06938 lb/A/yr	NS	NS	REI: 48 h
Preemergence <ul style="list-style-type: none"> - Broadcast/Soil band treatment/Soil broadcast treatment/Soil incorporated treatment - Band sprayer/Granule applicator/Ground/Low pressure ground 	0.0693 lb ai/A	0.07031 lb/A/yr	NS	14 days	REI: 12 h Incorporate to a depth of 3 inches. Incorporate to a minimum depth of 2 inches.

Food/Feed Use Patterns of Flumetsulam.					
Application Timing – Application Type – Application Equipment	Max. Single Application Rate	Max. Seasonal Rate	Max. No. Applications/ cc & yr	MRI	Use Limitations
sprayer					

Food/Feed Use Patterns of Flumetsulam.					
Application Timing – Application Type – Application Equipment	Max. Single Application Rate	Max. Seasonal Rate	Max. No. Applications/ cc & yr	MRI	Use Limitations
Preplant – Soil band treatment/Soil broadcast treatment/Soil incorporated treatment/Soil treatment (surface) – Band sprayer/Granule applicator/Ground/Low pressure ground sprayer/Soil incorporation equipment	0.0693 lb ai/A	0.07 lb/cc 0.07031 lb/yr	NS	14 days	REI: 12 h Incorporate to a depth of 2 inches. Incorporate to a depth of 3 inches. Incorporate to a maximum depth of 3 inches. Incorporate to a minimum depth of 2 inches.
Limitations: <ul style="list-style-type: none"> 85 day(s) preharvest interval. 85 day(s) prefeeding interval. 85 day(s) pregrazing interval. 85 day(s) preharvest interval. Do not apply by aircraft. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply through any type of irrigation system. Do not apply to any body of water. Do not apply to muck soils. Do not apply when drift is likely to occur. Do not apply where runoff is likely to occur. Do not contaminate water by cleaning of equipment or disposal of equipment wash waters. Do not contaminate water, food, or feed by storage or disposal. Do not feed straw to livestock. Do not graze or feed forage or hay. Do not make more than 1 applications per crop cycle. Groundwater restriction. Rotational/plant back crop restriction. Treated pulp may be fed to animals being finished for slaughter. Geographic disallowable: Other 					

Food/Feed Use Patterns of Flumetsulam.					
Application Timing – Application Type – Application Equipment	Max. Single Application Rate	Max. Seasonal Rate	Max. No. Applications/cc & yr	MRI	Use Limitations
SOYBEANS (UNSPECIFIED)					
Early preplant – Conservation tillage/Soil band treatment/Soil broadcast treatment – Band sprayer/Granule applicator/Ground/Low pressure ground sprayer	1 (L) and 0.06875 lb ai/A	0.07031 lb ai/A/yr	NS	NS	REI: 12 h Geographic allowable: CO CT DE IA IL IN KS KY MA MD ME MI MN MO MT ND NE NH NJ NY OH PA RI SD TN VA VT WI WV WY
Postemergence – Broadcast – Low pressure ground sprayer	0.021 lb ai/A	0.012lb ai/A/cc	2/1 yr	14 days	REI: 12 h
Preemergence – Soil band treatment/Soil broadcast treatment – Band sprayer/Granule applicator/Ground/Low pressure ground sprayer	1 (L) and 0.06875 lb ai/A	0.07031 lb ai/A/yr	NS	NS	REI: 12 h
Preplant – Soil band treatment/Soil broadcast treatment/Soil incorporated treatment – Band sprayer/Granule applicator/Ground/Low pressure ground sprayer/Soil incorporation equipment	0.07031 lb ai/A	0.07 lb ai/A/cc 0.07031 lb ai/A/yr	NS	14 days	REI: 12 h Incorporate to a depth of 2 inches. Incorporate to a maximum depth of 3 inches. Incorporate to a minimum depth of 2 inches.
Limitations: 85 day(s) preharvest interval. 70 day(s) preharvest interval.					

Food/Feed Use Patterns of Flumetsulam.					
Application Timing	Max. Single Application Rate	Max. Seasonal Rate	Max. No. Applications/ cc & yr	MRI	Use Limitations
- Application Type - Application Equipment					85 day(s) preharvest interval. Do not apply by aircraft. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply through any type of irrigation system. Do not apply to muck soils. Do not apply when drift is likely to occur. Do not apply when wind velocity is 10 mph or greater. Do not apply where runoff is likely to occur. Do not contaminate water by cleaning of equipment or disposal of equipment wash waters. Do not contaminate water, food, or feed by storage or disposal. Do not feed green forage, hay, or straw to livestock. Do not feed straw to livestock. Do not graze or feed forage or hay from treated areas to livestock. Do not graze or feed forage or hay. Do not harvest treated crop for livestock forage, fodder or hay. Groundwater restriction. Rotational/plant back crop restriction. This pesticide is toxic to aquatic invertebrates. This product is toxic to fish. Treated pulp may be fed to animals being finished for slaughter. Geographic disallowable: Other
DRY BEANS¹					
Preplant² - Soil broadcast treatment/Soil incorporated treatment - Ground equipment	0.07031 lb ai/A	0.07031 lb ai/A	NS	NS	REI: Geographic allowable (Surface treatment): CO CT DE IA IL IN KS KY MA MD ME MI MN MO MT ND NE NH NJ NY OH PA RI SD TN VA VT WI WV WY Incorporate to a depth of 2 to 3 inches.

Food/Feed Use Patterns of Flumetsulam.					
Application Timing – Application Type – Application Equipment	Max. Single Application Rate	Max. Seasonal Rate	Max. No. Applications/cc & yr	MRI	Use Limitations
Preemergence ³ – Broadcast/Soil band treatment/Soil broadcast treatment – Ground equipment	0.0665 lb ai/A	0.0665 lb ai/A	NS	NS	REI:
<p>Limitations: 85 day(s) preharvest interval. Do not apply by aircraft. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply through any type of irrigation system. Do not apply to muck soils. Do not apply when drift is likely to occur. Do not apply when wind velocity is 10 mph or greater. Do not apply where runoff is likely to occur. Do not contaminate water by cleaning of equipment or disposal of equipment wash waters. Do not contaminate water, food, or feed by storage or disposal. Do not graze or feed forage, hay, or straw from treated areas to livestock. Groundwater restriction. Rotational/plant back crop restriction.</p>					
PRODUCT NUMBERS CONTAINED IN THIS REPORT ⁴					
000352-00593, 000352-00612, 062719-00222, 062719-00239, 062719-00240, 062719-00253, 062719-00264, 062719-00277, 062719-00299, 062719-00315					
HOMEOWNER PRODUCTS CONTAINED IN THIS REPORT					
None					
HEADER ABBREVIATIONS					
Site Name - The site name refers to the entity (crop, building, surface or article) where a pesticide is applied and/or which is being protected.					
Limitations - Precautionary statements related to the use of the product(s).					
Application Timing - The timing of pesticide application and is the primary application sort (not aggregated).					
Application Type - The type of pesticide application (aggregated).					
Application Equipment - The equipment used to apply pesticide (aggregated).					
Max. Single Appl. Rate to a Single Site - Maximum Dose for a single application to a single site. System calculated.					
Max Seasonal Rate - The maximum amount of pesticide that can be applied to a site in one growing season (/cc) and during the span of one year (/yr).					
Max. # Apps/cc & yr - Maximum Number of Applications per crop cycle and per year.					

Food/Feed Use Patterns of Flumetsulam.					
Application Timing	Max. Single Application Rate	Max. Seasonal Rate	Max. No. Applications/ cc & yr	MRI	Use Limitations
- Application Type					
- Application Equipment					
<p>M R I - Minimum Retreatment Interval (days) (at any rate). The minimum interval between pesticide application (days).</p> <p>R E I - ReEntry Interval - The minimum amount of time that must elapse before workers can reenter a treated area.</p> <p>PHI/PGI/PSI Use Limitations (May not apply to all Reg.#s) - Preharvest/Pregrazing/Preslaughter Interval use limitations pertinent to the application.</p> <p>Current As Of: - The label data for the listed products in this report is current of this date.</p> <p>ABBREVIATIONS</p> <p>AN - As needed</p> <p>NA - Not Applicable</p> <p>NS - Not Specified (on label)</p> <p>(L) - The dosage information provided is from the label in terms of product (e.g., ounces, gallons, or pounds of the product) because there was insufficient information (e.g., missing density, area, or active ingredient percentages) to provide converted dosage information. This report provides active ingredient percentage in the product for the reported chemical for all unconverted label dosage information if this information is available. This active ingredient percentage information is displayed next to the form code abbreviations (e.g., 80% WP).</p> <p>APPLICATION RATE</p> <p>cwt : Hundred Weight</p> <p>nnE-xx : nn times (10 power -xx), for instance, "1.234E-04" is equivalent to ".0001234"</p>					
End of Report					
For questions and comments please contact the OPP Label Data Team through e-mail.					

1. Use patterns for beans were not included in the table by BEAD because it is a proposed new use.
2. Preplant incorporated applications for dry beans are applicable for EPA Registration Nos. 062719-222, 062719-239, and 062719- 277. Preplant surface applications are applicable for Registration Nos. 062719-239 and 062719- 277.
3. Preemergence applications for dry beans are applicable for EPA Registrations Nos. 062719-239 and 062719- 277.
4. The following registration numbers were not included in the BEAD table for unknown reasons: 62719-224, 62719-278, and 62719-279.