UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

MEMORANDUM

Date: 10/15/2007

Subject: Cyfluthrin and beta-Cyfluthrin. Registration for Use on Grasses, Alfalfa, and Seed Treatment Use on Sugar Beets. Request for Replacement of Individual Cereal Grain Tolerances with Crop Group Tolerance for Cereal Grains (Except Rice), Crop Group 15, and Replacement of Individual Tolerances on Forage and Stover/Straw of Wheat, Corn, and Sorghum with Crop Group Tolerance for Forage, Fodder, and Straw of Cereal Grains, Crop Group 16 (Except Rice). Summary of Analytical Chemistry and Residue Data.

Petition Nos.	6E7058 (Grasses)
	6F7160 (Sugar Beets)
	7F7226 (Alfalfa)
	7F7200 (Cereal Grains and Forage, Fodder, and Hay of Cereal Grains)
DP Number:	339413
PC Codes:	128831 - Cyfluthrin
	118831 - Beta Cyfluthrin
40 CFR 180.	436
Chemical Class:	Pyrethroid

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This document was originally prepared under contract by Dynamac Corporation (1910 Sedwick Road, Building 100, Suite B, Durham NC 27713; submitted 04/06/2007). The document has been reviewed by the Health Effects Division (HED) and revised to reflect current Office of Pesticide Programs (OPP) policies.

Executive Summary

Cyfluthrin and beta-Cyfluthrin are pyrethroid insecticides registered to Bayer CropScience for control of various insect pests on a wide variety of crops. Both compounds are mixtures of four diastereomers, Isomers I-IV (see Table 1), with beta-cyfluthrin being enriched in Isomers II and IV. Permanent tolerances are established for residues of cyfluthrin (40 CFR §180.436) in/on a wide variety of plant commodities at levels ranging from 0.01 ppm in/on peanuts, tree nuts, and tuberous and corm vegetables to 600 ppm in/on aspirated grain fractions. Tolerances have been established for alfalfa at 5.0 ppm and alfalfa hay at 10.0 ppm. In addition, tolerances with regional registration have been established for grass forage (6 ppm) and hay (8 ppm). Tolerances are also currently in effect for animal commodities at levels ranging from 0.01 ppm in eggs and poultry fat, meat, and meat byproducts to 30 ppm in milk fat. The Agency previously concluded that tolerances for cyfluthrin will also cover beta-cyfluthrin provided that the use rates for beta-cyfluthrin are ½ the use rates of cyfluthrin.

Although a tolerance of 4.0 ppm is currently in effect for stored cereal grains, the registration was cancelled in 2004. The tolerance was allowed to remain in effect until the registered products cleared the channels of trade. Cyfluthrin is registered for foliar applications to field corn, sweet corn, sorghum, and wheat. As a result, tolerances are in effect for the various commodities associated with these cereal grains. These tolerances include those for the forage, stover, straw, and hay of field corn, sorghum, and wheat.

Interregional Research Project No. 4 (IR-4) submitted a petition (PP# 6E7058) proposing the use of cyfluthrin formulated as either a 2.0 lb/gal emulsifiable concentrate (EC) or 20% wettable powder (WP) and beta-cyfluthrin formulated as a 1 lb/gal EC on grasses grown throughout the U.S. The proposed use is for a maximum of four broadcast foliar applications using ground or aerial equipment at a rate of 0.044 lb ai/A/application for cyfluthrin, for a total of 0.176 lb ai/A/season. The proposed use rate for beta-cyfluthrin is ½ the rate of cyfluthrin. The proposed preharvest interval (PHI) is 0 days for grasses and 7 days for mixed stands of grass and alfalfa. In conjunction with this use, IR-4 is proposing the following permanent tolerances for cyfluthrin:

Grass, forage, fodder and hay, group 17, forage .....13.0 ppm
Grass, forage, fodder and hay, group 17, hay .....40.0 ppm

Bayer submitted a petition (PP# 7F7226) proposing an increased rate for the use of cyfluthrin on alfalfa. Tolerances are currently in effect for alfalfa at 5.0 ppm and alfalfa hay at 10.0 ppm. The proposed use is for a maximum of eight broadcast foliar applications using ground, aerial, or chemigation equipment at a rate of 0.044 lb ai/A/application, for a total of 0.35 lb ai/A/season. The proposed preharvest interval and pre-grazing interval is 7 days. The minimum retreatment interval is 5 days. In conjunction with this use, Bayer is proposing the following permanent tolerances for cyfluthrin:

Alfalfa, forage .....5.0 ppm
Alfalfa, hay .....15.0 ppm

Bayer also submitted a petition (PP# 6F7160) proposing the use of a multiple active ingredient (MAI) formulation containing 3.33 lb/gal of clothianidin and 0.44 lb/gal of beta-cyfluthrin (Poncho Beta, EPA Reg. No. 264-XXX) as a seed treatment for sugar beets. This product is formulated as a combination formulation of suspension concentrate and an oil based emulsion, also known as a suspoemulsion. The proposed use is restricted to commercial seed treaters, and applications using equipment for treating seeds at planting are prohibited. The proposed use rate is 0.017 lb ai (8 g) of beta-cyfluthrin per 100,000 seeds. This rate is equivalent to 0.009-0.012 lb ai/A, based on typical planting rates of 53,000-72,000 seeds per acre. In conjunction with this use, Bayer is proposing the following permanent tolerances for cyfluthrin:

Beet, sugar, roots .....0.09 ppm
Beet, sugar, dried pulp .....11.0 ppm

Bayer submitted a petition (PP# 7F7200) proposing a crop group tolerance for the Cereal Grains Crop Group, Except Rice (Crop Group 15). Bayer also proposed a tolerance for the Forage, Fodder, and Straw of Cereal Grains Crop Group (Crop Group 16). In conjunction with these uses, Bayer is proposing the following tolerances for cyfluthrin:

Grain, Cereal; Crop Group 15 (except Rice) .....4.0 ppm
Grain, Cereal, Forage, Fodder and Straw. Crop Group 16, (except Rice) .....7.0 ppm

The nature of cyfluthrin residues in plants and animals is understood based on adequate cotton, soybean, potato, apple, wheat, tomato, hen, and cow metabolism studies. Data from these studies indicate that the major detectable residue is cyfluthrin, which metabolizes slowly with little translocation. In plants and animals, metabolism of cyfluthrin involves hydrolysis of the ester linkage and hydroxylation of the aromatic ring system. The residue of concern for tolerance expression and for dietary risk assessment in plants and animals is cyfluthrin *per se*.

Adequate GC/electron capture detection (ECD) methods are available in PAM Vol. II for enforcing tolerances for cyfluthrin residues in/on plant and animal commodities. In the current grass, alfalfa, and sugar beet field trials, samples were analyzed using Bayer Method 108139-1 (GC/MS), which has been previously reviewed by the Agency and deemed adequate for data collection. This method was also adequately validated in conjunction with the analysis of samples from the grass, alfalfa, and sugar beet field trials. In grass, the validated LOQ for cyfluthrin residues is 0.05 ppm, and the statistically calculated LOD is 0.014 ppm for forage and 0.02 ppm for hay. In alfalfa, the validated LOQ is 0.01 ppm for both forage and hay. In sugar beet commodities, the validated LOQ for cyfluthrin residues is 0.01 ppm. The statistically

calculated LODs are 0.003 ppm for tops and roots and 0.0011-0.0018 ppm for processed fractions.

Adequate storage stability data are available from numerous raw and processed plant commodities indicating that cyfluthrin is stable in frozen storage for up to 35-38 months. These data support the current grass and alfalfa field trials in which samples were stored frozen for up to 16 months and 18 months, respectively. These data also support the current sugar beet field trials and processing study, as tops and roots were stored frozen for ≤13.5 months and processed fractions were stored frozen for <1 month.

The available grass field trial data are adequate and support the proposed use on grasses. The field trial data for the EC formulation of cyfluthrin will support the same use for the WP formulation, as previous studies indicate that the EC formulation results in higher residues than does the WP formulation. The field trial data for cyfluthrin also support the use of beta-cyfluthrin, as the proposed use rate for beta-cyfluthrin is ½ the proposed rate of cyfluthrin.

Following four broadcast foliar applications of cyfluthrin (EC) totaling 0.172-0.181 lb ai/A, residues of cyfluthrin were 3.79-10.4 ppm in/on grass forage harvested on the day of the last application (0 DAT) and 6.30-33.1 ppm in/on grass hay harvested at 0 DAT. Residues averaged 6.54 ppm in/on forage and 18.09 ppm in/on hay. In the two residue decline trials, average cyfluthrin residues declined steadily from 5.72 ppm in/on forage at 0 DAT to 2.52 ppm at 21 DAT. In hay, residues declined from 19.8 ppm at 0 DAT to 7.30 ppm at 21 DAT. The available data support tolerances of 12 ppm in/on forage and 50 ppm in/on hay of the Grass Forage, Fodder, and Hay Group.

The available alfalfa field trial data are adequate and support the proposed use on alfalfa. Twelve field trials were conducted to measure the magnitude of cyfluthrin residues in/on alfalfa following two foliar spray applications of BAYTHROID 2E to alfalfa at a target rate of 0.044 lb ai/A/application (0.043 to 0.047 lb ai/A/application) prior to each of four cuttings. The interval between applications was 5 to 9 days. The highest cyfluthrin residue was 5.9 ppm in/on alfalfa forage for all cuttings at commercial maturity at a PHI of 6 days (target PHI is 7 days). The maximum cyfluthrin residue in/on hay was 16.49 ppm in/on alfalfa hay for all cuttings at commercial maturity at a PHI of 7 days. The available data support tolerances of 5.0 ppm in/on alfalfa forage and 13 ppm in/on alfalfa hay. Because of the large number of samples (94-96 for each RAC), the tolerance spreadsheet recommends values that are lower than the highest residues.

The available sugar beet field trial data are adequate and support the proposed seed treatment use. Although the field trials were conducted using a MAI containing cyfluthrin rather than beta-cyfluthrin, the data for cyfluthrin also support the use of beta-cyfluthrin, as the proposed use rate for beta-cyfluthrin is ½ the rate of cyfluthrin used in the field trials. Following a seed treatment with cyfluthrin (1 lb/gal suspoemulsion) at 0.035 lb ai/100,000 seeds, cyfluthrin residues at normal crop maturity were <0.003-0.088 ppm in/on sugar beets roots, with only 3 out of 24 root samples having residues at or above the LOQ of 0.01 ppm (0.01, 0.025, and 0.088 ppm). Average cyfluthrin residues were 0.01 ppm in/on roots, and the highest average field trial (HAFT) residues were 0.049 ppm.

The available wheat, field corn, sweet corn, and sorghum field trial data are adequate and

support separate tolerances for the various cereal grain commodities. Bayer proposed a tolerance of 4.0 ppm for the Cereal Grains Crop Group, Except Rice (Crop Group 15). This tolerance is equivalent to the tolerance that was established based on the stored grains uses. The stored grains registrations have been cancelled, however. Because of differences in field trial values and harmonization with Codex MRLs, different tolerances are being recommended for the different cereal grains. A tolerance of 0.15 is being recommended for the grain of wheat, barley, oats, buckwheat, rye, and millet. In order to harmonize with the Codex MRL for maize, a tolerance of 0.05 ppm is being recommended for field corn grain and for sweet corn, kernel plus cob with husks removed. A tolerance of 4.0 ppm is being recommended for sorghum, grain.

Bayer proposed a tolerance of 7.0 ppm for the Forage, Fodder, and Straw of the Cereal Grains Crop Group, Except Rice (Crop Group 16). Forage data are available for wheat, field corn, sweet corn, and sorghum. The data set for each commodity was entered into HED's statistical tolerance generator. The generated tolerances for forage are as follows: wheat (4.0 ppm), field corn (3.0 ppm), sweet corn (25 ppm), and sorghum (4.0 ppm). The highest of these tolerances is that for sweet corn, 25 ppm. As a result, the recommended tolerance for the Forage of the Cereal Grains Crop Group, except Rice, is 25 ppm. The term fodder has been replaced with the term stover. Stover data are available for field corn, sweet corn, and sorghum. The data set for each commodity was entered into HED's statistical tolerance generator. The generated tolerances are as follows: field corn (3.5 ppm), sweet corn (30 ppm), and sorghum (3.5 ppm). The highest of these tolerances is that for sweet corn, 30 ppm. As a result, the recommended tolerance for the Stover of the Cereal Grains Crop Group, except Rice, is 30 ppm. Straw data are available for wheat only. HED's statistical tolerance generator was used to calculate the recommended tolerance for straw which was determined to be 7.0 ppm. As a result, the recommended tolerance for the Straw of the Cereal Grains Crop Group, except Rice, is 7.0 ppm. Hay data are also available for wheat only. HED's statistical tolerance generator was used to calculate the recommended tolerance for hay which was determined to be 6.0 ppm. As a result, the recommended tolerance for the Hay of the Cereal Grains Crop Group, except Rice, is 6.0 ppm.

The available sugar beet processing study is adequate, and indicates that cyfluthrin residues do not concentrate in refined sugar (<0.3x) or molasses (<0.2x), but can concentrate in dried pulp (12x). Based on HAFT residues of 0.049 ppm in roots and the 12x processing factor, the maximum expected residues in dried pulp would be 0.59 ppm, which supports a tolerance of 1.0 ppm for dried pulp.

Tolerances for commodities processed from cereal grains are based on the stored grains uses. These processed commodities include wheat bran, corn oil, rice bran, and rice hulls. As the stored grain uses have been cancelled, the tolerances for these processed commodities should now be based on the currently registered applications. The wheat bran tolerance of 6.5 ppm should be decreased to 0.5 ppm. The corn oil tolerance of 30 ppm should be revoked altogether. The 0.05 ppm tolerance for field corn grain will cover concentration of residues in corn oil. The only registered use on rice was the stored grain use. As the stored grain uses have been revoked, the tolerances for rice bran and rice hulls should be revoked.
The following livestock feed items are associated with these tolerance petitions: grass forage, grass hay, alfalfa forage, alfalfa hay, sugar beet dried pulp, sugar beet molasses, and the forage, stover, straw and hay of cereal grains. Based on recommended changes in tolerances for cereal grain and grass commodities, along with the recent changes in calculating livestock diets, the maximum dietary burden (MDB) for cyfluthrin residues was recalculated to be 21.0 ppm for beef

cattle, 27.1 ppm for dairy cattle, and 3.21 ppm for swine and poultry. As the MDB for poultry has not changed from earlier reviews, no changes in the current tolerances on eggs and poultry tissues are required. However, tolerances for other livestock commodities were reassessed because of the substantial reductions in the MDBs for cattle and swine. Based on the recalculated MDBs for beef cattle, dairy cattle, and swine, and the residue data from the adequate cattle feeding study, tolerances for milk, cattle, goat, hog, horse, and sheep commodities can be substantially reduced. The available cattle feeding study data support reducing the current livestock tolerances to 0.2 ppm for milk, 5.0 ppm for milk fat, 2.0 ppm for cattle fat, 0.10 ppm for cattle meat and meat byproducts, 0.05 ppm for meat and meat byproducts of goats, horses, and sheep, 2.0 ppm for fat of goats, horses, and sheep, 0.01 ppm for meat and meat byproducts of hogs, and 0.5 ppm for fat of hogs.

Regulatory requirements pertaining to rotational crops have been fulfilled, and the rotational crop restrictions on the current labels are adequate.

Regulatory Recommendations and Residue Chemistry Deficiencies

Aside from minor label revisions to the label for grasses, no major deficiencies were noted in the subject petitions that would preclude establishing permanent tolerances for cyfluthrin on grass forage, grass hay, alfalfa forage, sugar beet roots, or sugar beet dried pulp. No major deficiencies were noted that would preclude increasing the alfalfa hay tolerance. HED recommends establishing permanent tolerances for cyfluthrin at 12 ppm in/on forage and at 50 ppm in/on hay of the Grass, Forage, Fodder, and Hay Group. HED recommends establishing a permanent tolerance for alfalfa forage at 5 ppm and increasing the alfalfa hay tolerance from 5.0 to 13 ppm. In addition, HED recommends establishing permanent tolerances for cyfluthrin at 0.10 ppm in/on sugar beet roots and at 1.0 ppm in dried pulp. These tolerance levels are also appropriate to cover the proposed use of beta-cyfluthrin. As discussed below, a separate section is recommended in the CFR for beta-cyfluthrin tolerances.

- The proposed label directions for grasses and alfalfa allow for ultra-low volume aerial applications using a minimum of 1 qt/A of vegetable oil as the carrier. However, no residue data were submitted supporting this type of use. Therefore, this type of application should be removed from the use directions.

HED does not object to the establishment of tolerances for field corn, sweet corn, sorghum, or the equivalent of a crop subgroup tolerance for wheat, barley, buckwheat, millet, oats, and rye. HED also does not object to the establishment of crop group tolerances for the forage, fodder, hay and straw of cereal grains (except Rice). The recommended tolerances for the various cereal grain commodities are listed in Table 9. As the stored grain registrations have been cancelled and crop group tolerances are being established, changes need to be made to several current tolerances. The tolerance for wheat bran should be decreased from 6.5 ppm to 0.5 ppm. The tolerances for cattle meat and cattle meat byproducts should be decreased from 0.40 ppm to 0.10 ppm. The tolerance for cattle fat should be decreased from 10 ppm to 2.0 ppm. In addition, the following tolerances should be revoked: refined field corn oil, rice bran, rice hulls, wheat forage, wheat hay, wheat straw, field corn forage, field corn stover, popcorn stover, sweet corn forage, sweet corn stover, sorghum grain forage, and sorghum grain stover. See Table 9, "Tolerance Summary for Cyfluthrin," for the recommended tolerance changes.

The recommended tolerances should be included in 40CFR§180.436(a)(1), tolerances for cyfluthrin. In addition, a separate section under 180.436 should be established for tolerances for beta-cyfluthrin, analogous to the tolerances for lambda-cyhalothrin and gamma-cyhalothrin in §180.438. The tolerances associated with the present petitions should be included in this new beta-cyfluthrin section as well. The section for beta-cyfluthrin needs to be established because registrations for cyfluthrin on these commodities might be cancelled at some point in the future. The tolerances for cyfluthrin and beta-cyfluthrin should be established at the same levels. The recommended wording for the beta-cyfluthrin tolerance expression is as follows:
"Tolerances are established for residues of the insecticide beta-cyfluthrin [mixture comprising the enantiomeric pair (R)-α-cyano-4-fluoro-3-phenoxybenzyl (1S,3S)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate and (S)-α-cyano-4-fluoro-3-phenoxybenzyl (1R,3R)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate with the enantiomeric pair (R)-α-cyano-4-fluoro-3-phenoxybenzyl (1S,3R)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate and (S)-α-cyano-4-fluoro-3-phenoxybenzyl (1R,3S)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate] in or on the following commodities:"

Revised Sections F should be submitted for the subject petitions proposing separate tolerances for cyfluthrin and beta-cyfluthrin using the commodity names and tolerance levels specified in Table 9.

HED also recommends that, at some point in the future, tolerances be established for all food uses of beta-cyfluthrin (i.e., on those commodities not included in the present actions).

Background

Cyfluthrin and beta-Cyfluthrin are related pyrethroid insecticides used for the control of various Lepidopterous pests, beetles, lygus and plant bugs, grasshoppers, leafhoppers, and white flies on a wide variety of field, vegetable, tree fruit, and vine crops. Both compounds are mixtures of the same four diastereomers, Isomers I-IV, two in the *cis* configuration (Isomers I and II) and two in the *trans* configuration (Isomers III and IV). Cyfluthrin is comprised of approximately equal parts of Isomers I (25%), II (19%), III (34%) and IV (23%), whereas beta-cyfluthrin is enriched in Isomers II (~35%) and IV (~62%), and contains only minor amounts of Isomers I and III (<3% total). Both cyfluthrin and beta-cyfluthrin are registered to Bayer for use on a variety of food/feed crops.

Permanent tolerances are established for residues of cyfluthrin in/on a wide variety of plant commodities at levels ranging from 0.01 ppm in/on peanuts, tree nuts, and tuberous and corm vegetables to 600 ppm in/on aspirated grain fractions (40 CFR §180.436(a)(1)). Tolerances have been established for alfalfa at 5.0 ppm and alfalfa hay at 10.0 ppm. In addition, permanent tolerances with a regional registration have also been established for cyfluthrin at 6 ppm in/on grass forage and 8 ppm in/on grass hay (40 CFR §180.436(c)). Cyfluthrin tolerances on animal commodities are established at levels ranging from 0.01 ppm in eggs and poultry fat, meat, and meat byproducts to 30 ppm in milk fat. A tolerance of 4.0 ppm is established for the cereal grains crop group based on application of cyfluthrin to stored grains. In 2004, HED recommended that the tolerance for stored grains be revoked. Tolerances are also established for various animal feed items associated with the cereal grains (i.e., forage, stover, hay, and straw). In addition, a tolerance of 0.05 ppm is established for cyfluthrin in animal feeds and processed foods as a result of its use in food- and feed-handling establishments (40 CFR §180.436(a)(2)

and (a)(3)). The tolerances for cyfluthrin also cover the use of beta-cyfluthrin, although HED is now recommending a separate section for beta-cyfluthrin as discussed above.

Both cyfluthrin and beta-cyfluthrin are currently registered for use on grasses; however, this use is restricted to California, Idaho, Oregon, and Washington State. In one of the current petition (PP# 6E7058), IR-4 has proposed expanding the use on grasses to cover the entire U.S., and establishing tolerances on forage and hay of the Grass, Forage, Fodder and Hay Group (Group 17).

Bayer submitted a petition (PP# 7F7226) proposing an increased rate for the use of cyfluthrin on alfalfa. Tolerances are currently in effect for alfalfa at 5.0 ppm and alfalfa hay at 10.0 ppm. The proposed use is for a maximum of eight broadcast foliar applications using ground, aerial, or chemigation equipment at a rate of 0.044 lb ai/A/application, for a total of 0.35 lb ai/A/season. The proposed preharvest interval and pre-grazing interval is 7 days. The minimum retreatment interval is 5 days.

In another petition (PP#6F7160), Bayer is proposing a seed treatment use for beta-cyfluthrin on sugar beets, as a component of a MAI formulation that also contains clothianidin. In conjunction with this use, Bayer is proposing establishment of cyfluthrin tolerances on sugar beet roots and dried pulp. In petition number 7F7200, Bayer is proposing tolerances for the Cereal Grains Crop Group (except Rice) as well as the Forage, Fodder, and Straw of the Cereal Grains Crop Group (except Rice).

The nomenclature and physicochemical properties of cyfluthrin and beta-cyfluthrin are presented below in Tables 1 and 2.

Table 1. Cyfluthrin and β-Cyfluthrin Nomenclature.

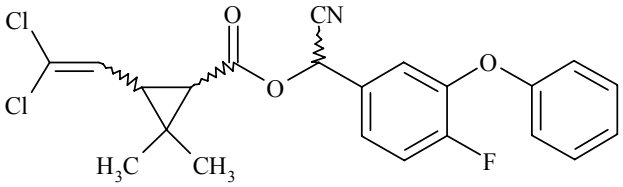
Table 1. Cyfluthrin and β-Cyfluthrin Nomenclature.		
Compound	 Diastereomer I (1R,3R,αR + 1S,3S,αS; 1:1; cis) Diastereomer II (1R,3R,αS + 1S,3S,αR; 1:1; cis) Diastereomer III (1R,3S,αR + 1S,3R,αS; 1:1; trans) Diastereomer IV (1R,3S,αS + 1S,3R,αR; 1:1; trans)	
	Cyfluthrin: Isomer I (23-27%), Isomer II (17-21%), Isomer III (32-36%), and Isomer IV (21-25%)	**beta-Cyfluthrin**: Isomer I (<2%), Isomer II (30-40%), Isomer III (<3%), and Isomer IV (57-60%)
Common names	Cyfluthrin and beta-Cyfluthrin	
Company experimental name	Baythroid, FCR1272	
IUPAC names	**Cyfluthrin**: (RS)-α-cyano-4-fluoro-3-phenoxybenzyl (1RS,3RS;1RS,3SR)-3-(2,2-dichlorovinyl)-2,2- dimethylcyclopropanecarboxylate **beta-Cyfluthrin:** enantiomeric pair (R)-α-cyano-4-fluoro-3-phenoxybenzyl (1S,3S)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate and (S)-α-cyano-4-fluoro-3-phenoxybenzyl (1R,3R)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate in ratio 1:2 with the enantiomeric pair (R)-α-cyano-4-fluoro-3-phenoxybenzyl (1S,3R)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate and (S)-α-cyano-4-fluoro-3-phenoxybenzyl (1R,3S)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate [These are the chemical names for the major isomers (II and IV) comprising >95% of beta-cyfluthrin.]	
CAS name	cyano(4-fluoro-3-phenoxyphenyl)methyl 3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate	
CAS registry number	68359-37-5	
End-use products (EPs)	Cyfluthrin: Baythroid® 2 (2 lb/gal EC; EPA Reg. No. 264-745) Renounce® 20WP (20% WP; EPA Reg. No. 264-784) beta-Cyfluthrin: Baythroid® XL (1 lb/gal EC; EPA Reg. No. 264-840)	

Table 2. Physicochemical Properties of Technical Grade Cyfluthrin.		
Parameter	Value	Reference
Melting point/range (°C)	Isomer I: 57 Isomer II: 73-74 Isomer III: 65-66 Isomer IV: 101-102	MRID 40544902
pH	not measurable because of low solubility in water	
Density (g/mL at 20ºC)	1.28	
Water solubility (µg/L at 20ºC)	Isomer I: 2.2 Isomer II: 1.9 Isomer III: 2.2 Isomer IV: 2.9	
Solvent solubility (g/L room temperature)	Methylene chloride >200 Toluene >200 Hexane 10-20 Isopropanol 20-50	
Vapor pressure (20 or 25°C)	7.2×10^{-9} Pa	
Dissociation constant, pK_a	does not dissociate	
Octanol/water partition coefficient, Log(K_{OW})	Isomer I: 6 Isomer II: 5.9 Isomer III: 6 Isomer IV: 5.9	
UV/visible absorption spectrum	Absorption maxima: primary: 196 nm, secondary 275 nm	

860.1200 Directions for Use

There are two cyfluthrin end-use products (EPs) and one beta-cyfluthrin EP currently registered to Bayer for use on food/feed crops. The cyfluthrin EPs are a 2 lb/gal EC marketed under the trade name Baythroid® 2 (EPA Reg. No. 264-745) and a 20% WP marketed under the trade name Renounce® 20WP (EPA Reg. No. 264-784). The beta-cyfluthrin EP is a 1 lb/gal EC marketed under the trade name Baythroid® XL (EPA Reg. No. 264-840). Example use directions for the proposed use on grasses were provided for each of these labels and are summarized in Table 3. Bayer proposed Baythroid® XL for use on the cereal grains (except rice). The use directions appearing on the label are given in Table 3.

For the seed treatment of sugar beets, Bayer is proposing use of a MAI formulation containing 3.33 lb/gal of clothianidin and 0.44 lb/gal of beta-cyfluthrin formulated as a suspoemulsion. A suspoemulsion is a heterogeneous preparation consisting of a stable dispersion of the active ingredient in the form of solid particles and fine globules in a continuous water phase. A copy of the proposed label was provided, and the proposed use on sugar beet seeds is summarized in Table 3.

Table 3. Summary of Directions for Use of Cyfluthrin and beta-Cyfluthrin.

Applic. Timing, Type, and Equip.	Formulation [EPA Reg. No.]	Applic. Rate (lb ai/A)	Max. No. Applic. per Season	Max. Seasonal Applic. Rate (lb ai/A)	PHI (days)	Use Directions and Limitations [1]
Grasses (pasture/rangeland/grass for seed/grass for hay/grass in mixed stands with alfalfa)						
Broadcast foliar applications during crop development using ground or aerial equipment	2 lb/gal EC [264-745] 20% WP [264-784]	0.044	4	0.176	0 (7) [2]	For aerial ultra-low volume application, apply in a minimum of 1.0 qt/A of vegetable oil.
	1 lb/gal EC [264-840]	0.022		0.089		
Alfalfa						
Broadcast foliar applications during crop development using ground or aerial equipment	2 lb/gal EC [264-745]	0.044	8	0.35	7	For aerial ultra-low volume application, apply in a minimum of 1.0 qt/A of vegetable oil.
Sugar Beets						
Seed Treatment[3]	0.44 lb/gal suspoemulsion [4] [264-XXX]	0.017 lb/100,000 seeds	1	0.009-0.012[5]	NS	All seed treated with this product must be conspicuously colored at the time of treatment. Do not use treated seed for food, feed or oil processing.

Wheat, Barley, Buckwheat, Millet, Oats, Rye, and Triticale						
Broadcast foliar applications during crop development using ground or aerial equipment	1 lb/gal EC [264-840]	0.019	2	0.038	30	For aerial ultra-low volume application, apply in a minimum of 1.0 qt/A of vegetable oil.
Field Corn, Popcorn, Seed Corn, Teosinte						
Broadcast foliar applications during crop development using ground or aerial equipment	1 lb/gal EC [264-840]	0.022	4	0.088	21 Grain, Stover 0 Forage	For aerial ultra-low volume application, apply in a minimum of 1.0 qt/A of vegetable oil.
Sweet Corn Foliar Applications						
Broadcast foliar applications during crop development using ground or aerial equipment	1 lb/gal EC [264-840]	0.022	10	0.22	0	For aerial ultra-low volume application, apply in a minimum of 1.0 qt/A of vegetable oil.
Sweet Corn Soil Applications						
Apply in water or liquid pop-up fertilizer at planting	1 lb/gal EC [264-840]	0.022	1	0.022	N/A	Apply in a minimum of 2 GPA of total mix volume when applied in water
Sorghum Foliar Applications						
Broadcast foliar applications during crop development using ground or aerial equipment	1 lb/gal EC [264-840]	0.022	3	0.066	14	For aerial ultra-low volume application, apply in a minimum of 1.0 qt/A of vegetable oil.

1 Rotational crops may be replanted as soon as practical after the last application. Maximum seasonal use rates resulting from combined use of cyfluthrin and beta-cyfluthrin products are not to exceed the specified maximum seasonal application rate for cyfluthrin.

2 The 7-day PHI is for applications to mixed stands of grass and alfalfa.

3 For use only in liquid or slurry seed treating equipment by commercial seed treaters. Do not use in farm equipment for seed treatment at the time of planting.

4 This formulation is a suspo-emulsion, which is a heterogeneous preparation consisting of a stable dispersion of the active ingredient in the form of solid particles and fine globules in a continuous water phase. It is an MAI that also contains 3.33 lb/gal of clothianidin.

5 Maximum field use rate based on seeding rates of ~53,000-72,000 seeds per acre.

Conclusions. The proposed label directions for grasses and alfalfa are adequate and, with the exception of the ultra-low volume application, are supported by the available field trial data using the 2 lb/gal EC formulation of cyfluthrin. The field trial data will also support the use of the 20% WP formulation of cyfluthrin. Side-by-side tests comparing the EC and WP formulations on numerous crops are available indicating that residues resulting from application of the EC are equal to or greater than residues resulting from the application of the WP (DP# 290921, Y. Donovan, 12/6/04). In accordance with an earlier Agency decision (2/2006), the data from the cyfluthrin 2 lb/gal EC also support the use of beta-cyfluthrin at ½ the use rate of cyfluthrin.

In addition, the inclusion of applications to mixed stands of grass and alfalfa is allowable as the labels include separate use directions for both grass and alfalfa at the same use rate and the more restrictive 7-day PHI for alfalfa is specified for mixed stands. However, no data were submitted supporting the ultra-low volume application to grasses and alfalfa; therefore, this type of application should be removed from the labels.

The proposed label directions for sugar beets are adequate and are supported by the available field trial data. Although the field trials were conducted using seeds treated with a similar MAI containing cyfluthrin, the proposed use rate for beta-cyfluthrin is ½ the rate of cyfluthrin used in the field trials.

The proposed label directions for cereal grains (except rice) are adequate and, with the exception of the ultra-low volume application, are supported by the available field trial data using the 2 lb/gal EC formulation of cyfluthrin. The field trial data will also support the use of the 20% WP formulation of cyfluthrin. In accordance with an earlier Agency decision (2/2006), the data from the cyfluthrin 2 lb/gal EC also support the use of beta-cyfluthrin at ½ the use rate of cyfluthrin.

860.1300 Nature of the Residue - Plants

The Agency previously concluded that the nature of the residues of cyfluthrin in plants is adequately understood based on plant metabolism studies on cotton, soybeans, potatoes, apples, wheat, and tomatoes. Data from those studies show the major detected residue is parent cyfluthrin, which metabolizes slowly with little translocation. The residue of concern in plants is cyfluthrin *per se*.

The nature of the residue was similar in all plant matrices. Parent comprised 38-98% of the TRR in cotton, soybeans, potatoes, and apples (PP# 4F3046, 5/18/84, K. Arne and PP# 5G3307, 12/23/85, L. Propst), and in wheat and tomato (PP# 9F3731/ 9H5574, H. Fonouni, 11/17/89). Other metabolites generally comprised <10% of the TRR. These metabolites include FPBalc, FPBald, FPBacid, FPBamide, FPB methyl ester, and 4'-OH-FPBacid, which arise from hydrolysis of the ester linkage and hydroxylation of the aromatic ring system.

860.1300 Nature of the Residue - Livestock

The Agency previously concluded that the nature of the residues of cyfluthrin in animals is adequately understood based on livestock metabolism studies on poultry and cows. The residue of concern in animals is cyfluthrin *per se*.

In lactating cows and laying hens, parent comprised 56-100% of the TRR in cow tissues and milk, 28-56% of the TRR in poultry muscle, fat, skin and eggs, and 9-12% of the TRR in poultry liver and kidney. Other metabolites; FPBalc, FPBald, FPBacid, and 4'-OH-FPBacid, comprised 0-43% of the TRR in cow tissues and milk, and 0-19% of the TRR in poultry tissues and eggs (PP# 4F3046, 5/18/84, K. Arne, PP# 4G2976, 2/23/84, R. Loranger, and PP# 9F3731/ 9H5574, H. Fonoumi, 11/17/89).

860.1340 Residue Analytical Methods

Adequate GC/ECD methods are available in PAM Vol. II for enforcing tolerances for cyfluthrin residues in/on plant commodities (Method 85823) and animal commodities (Method 85883). The limit of detection for cyfluthrin in both methods is 0.01 ppm in the plant and animal commodities tested. This method does not distinguish between cyfluthrin and beta-cyfluthrin.

In the current grass, alfalfa, and sugar beet field trials as well as the sugar beet processing study, samples were analyzed for residues of cyfluthrin using Bayer Method 108139-1 (GC/MS), which was developed for determining residues of cyfluthrin in a wide variety of plant matrices. This method was previously reviewed by the Agency and deemed adequate for data collection (D290921, Y. Donovan, 12/16/04). The method was adequately validated on grass, alfalfa, and sugar beet commodities in conjunction with the analysis of field trial and processing study samples. For a discussion of analytical methods used for cereal grain commodities, see Memo, D290921, Y. Donovan, 12/16/2004.

For Method 108139-1, residues are extracted from homogenized samples with methanol:1.2 N HCl (4:1, v:v) and filtered, and the [$^{2}H_{6}$]-cyfluthrin internal standard is added. The extract is concentrated to an aqueous remainder, diluted with water, and partitioned with acetone:dichloromethane (1:2, v/v). Residues in the resulting organic phase are filtered through anhydrous sodium sulfate, concentrated, and reconstituted in hexane. Residues are further purified using a Florisil column eluted sequentially with hexane and hexane:acetone (9:1, v/v). Residues in the final eluate are concentrated to dryness, redissolved in toluene, and analyzed by GC/MS. Residues of cyfluthrin (m/z 207) are quantified using the $^{2}H_{6}$-cyfluthrin (m/z 216) as an internal standard. The validated LOQ for cyfluthrin residues in grass forage and hay is 0.05 ppm, and the statistically calculated LOD is 0.014 ppm for forage and 0.020 ppm for hay. The LOQ for cyfluthrin in alfalfa forage and hay is 0.01 ppm. The validated LOQ for cyfluthrin residues is 0.01 ppm for all sugar beet commodities, and the statistically calculated LODs are 0.003 ppm for tops and roots and 0.0011-0.0018 ppm for processed fractions. This method does not distinguish between cyfluthrin and beta-cyfluthrin.

860.1360 Multiresidue Methods

Data pertaining to the recovery of cyfluthrin using FDA's multiresidue methods were submitted (Mobay Report 94892; MRID 40355901). These multiresidue screening data were forwarded to FDA (PP#4F3046, M. Bradley, 12/4/87). The FDA Pestrack Data Base (PAM Vol. I, Appendix, dated 11/6/90) indicates that complete recovery has been obtained for cyfluthrin using FDA multiresidue methods.

860.1380 Storage Stability

Storage stability data are available from numerous raw and processed commodities indicating that cyfluthrin is stable in frozen storage for up to 35-38 months (D198397, J. Garbus, 5/25/95; D290921, Y. Donovan, 12/16/04). The available studies include storage stability data on lettuce, potato tubers, dried potato peel, and sugarcane molasses. These data support the current grass and alfalfa field trials in which samples were stored frozen for up to 16 months and 18 months, respectively. These data also support the maximum storage intervals for sugar beet tops and

roots from the field trials (13.5 months) as well as for roots (13 months) and processed fractions (<1 month) from the processing study.

860.1400 Water, Fish, and Irrigated Crops

This guideline requirement is not relevant to the current petition as the proposed use on grasses is non-aquatic.

860.1460 Food Handling

This guideline requirement is not relevant to the current petition as no new uses are being proposed for food/feed handling establishments.

860.1480 Meat, Milk, Poultry, and Eggs

The dietary burdens for cyfluthrin residues in livestock diets were recently calculated in conjunction with petitions for use of cyfluthrin on a number of crops and crop groups (D290921, Y. Donovan, 12/16/04). The calculated MDBs under these earlier petitions were 158 ppm for beef and dairy cattle, 3.2 ppm for poultry and 123 ppm for swine. These high levels of dietary exposure were driven largely by the 600 ppm tolerance for aspirated grain fractions resulting from the post-harvest use of cyfluthrin on stored grains. Subsequent to the 12/16/2004 review of Y. Donovan, the post-harvest uses for cyfluthrin on stored grains were cancelled. The Agency recommended a number of future changes to tolerances on raw and processed cereal grain commodities, once the products registered for this use clear the channels of trade (D321638, Y. Donovan, 7/15/05). Changes were also recommended for future tolerances on livestock commodities.

After these recommendations were made, HED revised its guidance on calculating potential residues in livestock diets and has updated the types and percentages of feedstuffs listed in Table 1 of Guideline 860.1000 (draft memo 10/2006). Therefore, the potential dietary burden of cyfluthrin for livestock has been recalculated using the recommended changes to tolerances for grain commodities, the recommended tolerances for the forage and hay of grass and alfalfa, and the recent guidance on constructing a reasonably balanced diet for livestock. The dietary exposure of livestock to cyfluthrin residues was recalculated to be 21.0 ppm for beef cattle, 27.1 ppm for dairy cattle, and 3.21 ppm for swine and poultry (Table 4). The MDBs for cattle and swine were substantially reduced, and there was no effect on the dietary exposure of poultry.

The only livestock feedstuffs associated with the sugar beet tolerance petition are sugar beet dried pulp and molasses. As cyfluthrin residues in dried pulp and molasses are substantially lower than in the feedstuffs they would replace in the calculated diets, the proposed use on sugar beets will not increase the MDB of livestock for cyfluthrin residues.

Table 4. Calculation of Maximum Dietary Burdens of Cyfluthrin Residues to Livestock.					
Feedstuff	Dietary Component	% Dry Matter[1]	% Diet[1]	Established/ Recommended Tolerance (ppm)	Dietary Contribution (ppm)[2]
Beef Cattle					
Grass, hay	R	88	15	50	8.5
Sorghum, grain	CC	86	75	4.0	3.5
Grain, aspirated fraction	CC	85	5	150 [3]	8.8
Cotton, undelinted seed	PC	88	5	1.0	0.06
TOTAL BURDEN			**100**		**20.9**
Dairy Cattle					
Grass, hay	R	88	40	50	22.7
Grass, forage	R	25	5	12	2.40
Sorghum, grain	CC	86	40	4.0	1.86
Corn, field, grain	CC	88	5	0.05	0.003
Cotton, undelinted seed	PC	88	10	1.0	0.12
TOTAL BURDEN			**100**		**27.1**
Poultry and Swine					
Sorghum, grain	CC	NA	80	4.0	3.2
Soybean seed	CC	NA	20	0.03	0.006
TOTAL BURDEN			**100**		**3.21**

[1] Potential dietary burdens for livestock were determined using recent Agency guidance on calculating reasonably balanced livestock diets (draft memo, 10/2006).

[2] Contribution = ([tolerance /% DM] X % diet) for beef and dairy cattle; contribution = ([tolerance] X % diet) for poultry and swine.

[3] Based on tolerance reduction (to 150 ppm) for aspirated grain fractions (D321368, Y. Donovan, 7/15/05).

An adequate ruminant feeding study is available (D216660, J. Garbus, 3/17/96) in which dairy cows were dosed orally for up to 28 days with cyfluthrin at levels equivalent to 15, 50, or 150 ppm in the diet. These dose levels are equivalent to 0.72x, 2.4x and 7.2x the MDB for beef cattle and 0.55x, 1.8x and 5.5x the MDB for dairy cattle. Residues of cyfluthrin in milk and tissues from the feeding study are listed in Table 5. The maximum cyfluthrin residue in milk from the 50 ppm dose group (1.8x MDB) was 0.27 ppm. The maximum cyfluthrin residues in tissues from the 50 ppm dose group (2.4x MDB) were, <0.01 ppm in liver, 0.07 ppm in kidney and muscle, and 3.30 ppm in fat. Based on the MDBs for beef and dairy cattle, the estimated residues at a 1x feeding level would be 0.15 ppm in milk (3.75 ppm in milk fat), <0.01 ppm in liver, 0.029 ppm in kidney and muscle, and 1.4 ppm in fat. These residue levels support reducing the current livestock tolerances to 0.05 ppm for meat and meat byproducts of goats, horses, and sheep, and 2.0 ppm for fat of goats, horses, and sheep. Tolerances for cattle commodities need to consider the additional residues from dermal uses as discussed below.

Cyfluthrin is also registered as a pour-on (dermal) application to cattle (Cyclence Pour-On Insecticide). The current tolerances for cattle commodities and milk include the residue contribution from the pour-on application. As the stored grain uses have been cancelled, however, the cattle commodity tolerances need to be reassessed. The registrant submitted the results of two studies in which residues in milk and tissues were measured after pour-on applications were made to cattle (MRIDs 41555702 and 41555703). The residue levels that were found in the tissues and milk are listed in the cyfluthrin Metabolism Assessment Review

Committee briefing memo (J. Morales, 8/12/96). The greatest residue value in milk was found 1.3 days after the third application at 0.9 mg ai/kg body weight. The residue value was 0.039 ppm. When this number is added to the dietary residue value of 0.15 ppm, the total maximum expected residue in milk is 0.19 ppm. Whole milk is approximately 4% milk fat, so the maximum expected residue in milk fat would be 4.7 ppm. The tolerance for whole milk should therefore be reduced from 1.0 ppm to 0.20 ppm, and the tolerance for milk fat should be reduced from 30 ppm to 5.0 ppm. The greatest residue value in meat was found after the fifth application at 0.9 mg ai/kg body weight. The residue value was 0.022 ppm. When this number is added to the dietary residue value of 0.029 ppm, the total maximum expected residue in beef meat is 0.051 ppm. The tolerance for cattle meat should therefore be reduced from 0.40 ppm to 0.10 ppm. The greatest residue value in fat was found after the fifth application at 0.9 mg ai/kg body weight. The residue value was 0.24 ppm. When this number is added to the dietary residue value of 1.4 ppm, the total maximum expected residue in beef fat is 1.64 ppm. The tolerance for cattle fat should therefore be reduced from 10 ppm to 2.0 ppm. The greatest residue value in kidney was found after the fifth application at 0.9 mg ai/kg body weight. The residue value was 0.023 ppm. When this number is added to the dietary residue value of 0.029 ppm, the total maximum expected residue in beef kidney is 0.052 ppm. The greatest residue value in liver was found after the fifth application at 0.9 mg ai/kg body weight. The residue value was 0.0015 ppm. When this number is added to the dietary residue value of <0.01 ppm, the total maximum expected residue in beef liver is 0.0115 ppm. Based on the maximum expected residues in kidney and liver, the tolerance for cattle meat byproducts should be reduced from 0.40 ppm to 0.10 ppm.

Although the current petition is for grass, and grass commodities are not fed to swine, other regulatory changes have substantially reduced the potential dietary exposure of swine; therefore, the tolerances for hog commodities were also reassessed. Based on the MDB for swine (3.21 ppm), the dose levels in the cattle feeding study are equivalent to 4.7x, 15.6x, and 47x the MDB for swine. Considering the residue data from the 15 ppm dose level (4.7x) of the cattle feeding study, the estimated residues at a 1x feeding level for swine would be <0.01 ppm in liver, kidney, and muscle, and 0.29 ppm in fat. Based on these residue levels, and considering that cyfluthrin residues were detected in kidney and muscle from the 50 ppm dose group (15.6x), the available data support reducing the current tolerances to 0.01 ppm for meat and meat byproducts of hogs and 0.5 ppm for fat of hogs.

As the potential dietary exposure of poultry to cyfluthrin residues (3.2 ppm) has remained unchanged from earlier evaluations of livestock tolerances, no reassessment of poultry tolerances is required. The current tolerances of 0.01 ppm for cyfluthrin residues in eggs and poultry tissues are adequate. The recommended revised tolerances for animal commodities are listed in Table 8.

Table 5. Residues of Cyfluthrin in Milk and Tissues of Dairy Cattle Dosed Orally for 28 Consecutive Days at Levels Equivalent to 15, 50, and 150 ppm in the Diet. [1]

Commodity	Cyfluthrin Residues (ppm)		
	15 ppm dose group	50 ppm dose group	150 ppm dose group
Milk Day 7	0.07, 0.07, 0.08	0.20, 0.21, 0.26	0.49, 0.50, 0.68
Day 14	0.06, 0.07, 0.10	0.20, 0.24, 0.27	0.41, 0.56, 0.89
Day 21	0.04, 0.05, 0.07	0.16, 0.20, 0.22	0.50, 0.65, 0.96
Day 28	0.06, 0.06, 0.06	0.08, 0.13, 0.16	0.43, 0.44, 0.49
Liver	<0.01, <0.01, <0.01	<0.01, <0.01, <0.01	<0.01, 0.01, 0.03

Kidney	<0.01, <0.01, 0.01	<0.01, 0.02, 0.07	0.02, 0.05, 0.07
Muscle	<0.01, <0.01, 0.01	0.02, 0.03, 0.07	0.04, 0.05, 0.11
Fat	0.98, 1.15, 1.36	2.18, 2.58, 3.30	3.99, 6.49, 9.94

[1] Data from D216660, J. Garbus, 3/17/96.

860.1500 Crop Field Trials

Grasses

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IR-4 submitted crop field trials supporting the use of cyfluthrin (EC) on grasses across the U.S. The results from this study are discussed below and summarized in Table 6.

Table 6. Summary of Residue Data from Crop Field Trials with Cyfluthrin (2 lb/gal EC).

Crop matrix	Total Applic. Rate (lb ai/A)	PHI (days)	Residue Levels (ppm)						
			n	Min.	Max.	HAFT [1]	Median (STMdR)	Mean (STMR)	Std. Dev.
Grasses (proposed use = 0.178 lb ai/A total application rate, 0-day PHI)									
Forage	0.172-0.181	0	24	3.79	10.40	9.39	6.02	6.54	1.77
Hay	0.173-0.180	0	24	6.30	33.10	31.90	15.50	18.09	7.42

[1] HAFT = Highest average field trial result.

In 12 field trials conducted in Zones 1, 2, 3, 4, 5, 8, 10, 11, and 12 during 2004, cyfluthrin (2 lb/gal EC) was applied to a variety of grasses (fescue, Bermuda, and bluegrass) as four broadcast foliar applications during vegetative development at rates of 0.042-0.046 lb ai/A/application and RTIs of 4-6 days, for a total of 0.172-0.181 lb ai/A. Applications were made using ground equipment in volumes of 12-22 gal/A, and did not include the use of any spray adjuvants. Single control and duplicate treated samples of forage and hay were cut at each test site at 0 DAT, and at two sites, duplicate treated samples were harvested at 0, 7, 14, and 21 DAT to assess residue decline. Forage samples were immediately placed in frozen storage, and hay samples were field-dried for 2-20 days prior to collection. Samples were stored frozen for up to 485 days, an interval that is supported by available storage stability data.

Bayer Method 108139-1 (GC/MS), which was used to determine residues of cyfluthrin in/on grass forage and hay, was adequately validated in conjunction with the analysis of field trial samples. The validated LOQ for cyfluthrin residues is 0.05 ppm in/on both forage and hay, and the calculated LOD is 0.014 ppm for forage and 0.020 ppm for hay.

Following four broadcast foliar applications of cyfluthrin (EC) totaling 0.172-0.181 lb ai/A, residues of cyfluthrin at 0 DAT were 3.79-10.40 ppm in/on 24 samples of grass forage and 6.30-33.10 ppm in/on 24 samples of grass hay. Average residues were 6.54 ppm in/on forage and 18.09 ppm in/on hay at 0 DAT. In the two residue decline trials, average cyfluthrin residues declined steadily from 5.72 ppm in/on forage at 0 DAT to 2.52 ppm at 21 DAT. In hay, residues declined from 19.8 ppm at 0 DAT to 7.30 ppm at 21 DAT.

Conclusions. The available field trial data are adequate. The number and geographic distribution of the field trials are adequate, and the appropriate samples were collected at the proposed PHI. The samples were analyzed using an adequate analytical method and the sample storage intervals are supported by the available storage stability data.

The available field trial data support the use of up to four broadcast foliar applications of cyfluthrin (EC) to grasses grown throughout the U.S. at a maximum single application rate of 0.044 lb ai/A, with a minimum RTI of 5 days, for a maximum of 0.178 lb ai/A/season. The data also support a 0-day PHI for cutting of both forage and hay. The available data support tolerances of 50 ppm on grass hay and 12 ppm on grass forage.

These field trial data also support the use of the WP formulation on grass, as previous side-by-side tests on numerous crops using EC and WP formulations of cyfluthrin have shown that use of the EC formulation typically results in higher crop residues than use of the WP. Also, in accordance with an earlier Agency decision (2/2006), the current field trial data for cyfluthrin (EC) support the use of beta-cyfluthrin at a maximum of 0.022 lb ai/A/application for a total of 0.089 lb ai/A/season.

Alfalfa

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Bayer CropScience submitted crop field trials supporting the use of cyfluthrin (EC) on alfalfa. The results from this study are discussed below and summarized in Table 7.

TABLE 7. Summary of Residue Data from Alfalfa Field Trials with Cyfluthrin.

Commodity	Total Applic. Rate[1] (lb ai/A)	PHI (days)	Residue Levels (ppm)[2]						
			n	Min.	Max.	HAFT[3]	Median (STMdR)	Mean (STMR)	Std. Dev.
Field Trial Data									
Alfalfa Forage	0.087-0.091	5-8	96	0.011	5.882	5.65	1.495	1.792	1.1
Alfalfa Hay	0.087-0.091	5-8	94	1.802	16.494	15.27	4.172	4.734	2.4

[1] Total application rate is for the two applications preceding each of the four cuttings.
[2] Half the limit of quantitation was used if the residue was less than the LOQ.
[3] HAFT = Highest Average Field Trial.

Twelve field trials were conducted to measure the magnitude of cyfluthrin [cyano(4-fluoro-3-phenoxyphenyl)methyl-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropane-carboxylate] residues in/on alfalfa following two foliar spray applications of BAYTHROID 2E to alfalfa at a target rate of 0.044 lb ai/A/application (0.043 to 0.047 lb ai/A/application) prior to each of four cuttings. The interval between applications was 5 to 9 days. BAYTHROID 2E is an emulsifiable concentrate formulation containing 240 g ai/L (2.0 lb ai/gal). For all trials, the first application prior to each of the four cuttings (applications 1, 3, 5, and 7) was made at BBCH growth stages 24 to 61 (BBCH 24: four side shoots visible; BBCH 61: 10% of flowers open or 10% of plants in bloom) or when the plants were 12 to 15 inches in height. There were no adjuvants added to the spray mixture. All applications were made using ground-based equipment.

In each of the field trials, duplicate composite samples of both alfalfa forage and hay were collected at each of four cuttings at commercial maturity at a pre-harvest interval (PHI) of 5 to 8 days after the application just preceding cutting (applications 2, 4, 6, and 8). Single composite samples of both alfalfa forage and hay were collected at the first cutting from the control plots when the forage and hay were at commercial maturity, 5 to 8 days following the last treatment to the corresponding treated plot.

The residue of cyfluthrin was quantitated in alfalfa forage and hay by gas chromatography/mass spectrometry (GC/MS) using a stable isotopically labeled internal standard. The limit of quantitation (LOQ) for cyfluthrin residue was 0.01 ppm for both alfalfa forage and hay.

The registrant has submitted storage stability studies on several different crops. Residues were stable for at least 19 months in all of these studies. The alfalfa forage and hay analyzed in this study were held in frozen storage for a maximum of 18 months prior to extraction.

The HAFT cyfluthrin residue was 5.65 ppm in/on alfalfa forage (37% dry matter) for all cuttings at commercial maturity at a PHI of 6 days (target PHI is 7 days). The maximum cyfluthrin residue was 5.88 ppm in/on alfalfa forage (37% dry matter) for all cuttings at commercial maturity at a PHI of 6 days. The HAFT cyfluthrin residue was 15.27 ppm in/on alfalfa hay (74% dry matter) for all cuttings at commercial maturity at a PHI of 7 days (target PHI is 7 days). The maximum cyfluthrin residue was 16.49 ppm in/on alfalfa hay (74% dry matter) for all cuttings at commercial maturity at a PHI of 7 days.

Sugar Beets

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Bayer submitted field trials depicting the use of cyfluthrin (1 lb/gal suspoemulsion) as a seed treatment on sugar beets. The results from these trials are discussed below and summarized in Table 8.

Table 8. Summary of Residue Data from Sugar Beet Field Trials with Cyfluthrin (Suspo-Emulsion)

Crop matrix	Total Applic. [1] Rate (lb ai/A)	DAP [2]	Residue Levels (ppm) [3]						
			n	Min.	Max.	HAFT [4]	Median (STMdR)	Mean (STMR)	Std. Dev.
Sugar beet (proposed use = 0.017 lb ai/100,000 seeds) [5]									
Roots	0.019-0.025	109-179	24	<0.01	0.088	0.049	0.01	0.01	0.018
Tops			24	<0.01	<0.01	0.01	0.01	0.01	N/A

[1] Use rate for cyfluthrin was 0.035 lb ai/100,000 seeds; field use rate was calculated based on actual seeding rates.
[2] DAP = days after planting; no PHI is proposed as the application is a seed treatment.
[3] The validated LOQ for cyfluthrin is 0.01 ppm in/on sugar beet roots and tops, and the statistically calculated LOD is 0.003 ppm for both roots and tops. For calculating the median, mean, and standard deviation, the LOQ was used for residue values of <LOQ.
[4] HAFT = Highest Average Field Trial.
[5] Proposed use rate is for beta-cyfluthrin, and is equivalent to 0.009-0.012 lb ai/A.

Twelve sugar beet field trials were conducted in Zones 5, 7, 8, 9, 10, and 11 during 2004. For each test, sugar beet seeds were treated using a commercial Hege 11 Seed Treater with a suspoemulsion formulation containing both cyfluthrin (1 lb/gal) and clothianidin (4 lb/gal). Seeds were treated at a rate equivalent to 0.035 lb of cyfluthrin per 100,000 seeds. Based on the actual seeding rates used in the field trials (52,870-71,320 seeds/A), this rate was equivalent to 0.019-0.025 lb ai cyfluthrin/A. Single control and duplicate treated samples of sugar beet roots and tops were harvested from each trial at the earliest possible commercial maturity, 109-179 DAP. Samples were stored frozen for up to 13.5 months prior to analysis, an interval supported by available storage stability data.

Bayer Method 108139-1 (GC/MS), which was used to determine cyfluthrin residues in/on sugar beet roots and tops, was adequately validated in conjunction with the analysis of field trial samples. The validated LOQ for cyfluthrin residues is 0.01 ppm in/on both roots and tops, and the calculated LOD is 0.003 ppm for both matrices.

Following a seed treatment with cyfluthrin (suspoemulsion) at 0.035 lb ai/100,000 seeds, cyfluthrin residues at normal crop maturity were non-detectable (<0.003 ppm) in/on all 24 samples of sugar beet tops and <0.003-0.088 ppm in/on 24 samples of sugar beet roots. Only 3 out of 24 root samples had residues above the LOQ of 0.01 ppm (0.01, 0.025, and 0.088 ppm). Average residues were 0.01 ppm in/on tops and roots, and the HAFT residues were 0.049 ppm for roots and 0.01 ppm for tops. Sugar beet tops are no longer a regulated feedstuff (revised Table 1, memo 10/2006).

Conclusions. The available field trial data are adequate. The number and geographic distribution of the field trials are adequate, and the appropriate samples were collected at normal crop maturity. The samples were analyzed using an adequate analytical method and the sample storage intervals are supported by the available storage stability data. The available data support the use of cyfluthrin (suspoemulsion) as a seed treatment for sugar beets at a rate of 0.035 lb ai/100,000 seeds, or the use of beta-cyfluthrin at a rate of 0.017 lb ai/100,000 seeds. The residue data on roots support a tolerance of 0.10 ppm. For both roots and tops, most of the field trial values were below the LOQ. As a result, HED's statistical tolerance generator was not used to determine tolerances.

Cereal Grains Except Rice (Crop Group 15)

A tolerance of 4.0 ppm is currently in effect for the Cereal Grain Crop Group (Group 15). This tolerance covers residues resulting from stored grain uses as well as from foliar applications. In 2004, HED recommended that the stored grain uses be cancelled (Memo, D290921, Y. Donovan, 12/16/2004). As it would take time for the products used on stored grains to clear the channels of trade, HED recommended that RD not cancel the registrations for the stored grains uses until the products had cleard the channels of trade (Memo, D321638, Y. Donovan, 7/15/2005). HED has reviewed field trial data for foliar applications to wheat, field corn, sweet corn, and sorghum. The reviews were prepared between 1989 and 2004.

Field trial data for foliar applications to wheat were submitted and reviewed in the memorandum D290921 of Y. Donovan (12/16/2004). In this memorandum, HED recommended that the cereal grain crop group tolerance of 4.0 ppm be revoked and that a tolerance of 0.2 ppm be established for wheat grain. HED currently uses a statistical tolerance generator to determine recommended tolerances. The statistically generated tolerance for wheat grain is 0.15 ppm. As a result, HED recommends that the wheat grain tolerance be established at 0.15 ppm rather than 0.2 ppm. This 0.15 ppm tolerance should be extended to the following cereal grains: barley, buckwheat, millet, oats, and rye.

Field trial data for field corn have been submitted and reviewed. Cyfluthrin is registered for use on field corn for at-planting soil applications (Memo, D171140, M. Nelson, 3/8/93) as well as for foliar applications (Memo, D250002, Y. Donovan, 8/15/2002). It was concluded that the existing corn grain tolerance of 0.01 ppm was adequate to cover the existing at-planting use plus the proposed foliar uses. In 2002, HED did not recommend harmonizing the field corn grain

tolerance with the Codex MRL of 0.05 ppm because a tolerance of 4.0 ppm was pending as a result of the stored grain use. The stored grain registrations have been cancelled, however. As a result, HED now recommends that the field corn grain tolerance be harmonized with the Codex MRL. Therefore, HED recommends in favor of a tolerance of 0.05 ppm for field corn grain. The recommended tolerances for animal feed items associated with field corn are discussed in the following section, Forage, Fodder, and Straw of Cereal Grains Group (Crop Group 16).

Field trial data for sweet corn were evaluated in HED reviews prepared by H. Fonouni (11/17/89) and J. Garbus (D198397, 5/26/95). A tolerance of 0.05 ppm was established for sweet corn, kernel plus cob with husks removed. This tolerance is currently in effect and is equivalent to the Codex MRL of 0.05 ppm for maize. HED recommends that this tolerance remain in effect. Tolerances are also in effect for sweet corn forage and stover. HED's recommendations concerning these tolerances are discussed in the following section, Forage, Fodder, and Straw of Cereal Grains Group (Crop Group 16).

In 1996, HED recommended in favor of a tolerance of 4.0 ppm for residues in sorghum grain resulting from foliar applications (Memo, D220494, G. Otakie, 3/5/96). In 2004, HED recommended that the sorghum grain tolerance be re-established based on its pre-harvest uses (D290921, Y. Donovan, 12/16/2004). This tolerance is equivalent to the cereal grain crop group tolerance being cancelled, i.e., 4.0 ppm. It is the current policy of HED to recommend tolerances that are generated using HED's "Guidance for Setting Pesticide Tolerances Based on Field Trial Data." The recommended tolerance for sorghum grain based on this guidance is 3.5 ppm. The recommended tolerances for animal feed items associated with sorghum are discussed in the following section, Forage, Fodder, and Straw of Cereal Grains Group (Crop Group 16).

Rice is a member of the cereal grains crop group. As the 4.0 ppm tolerance resulting from the stored grain use is being revoked, a tolerance for rice grain will no longer be in effect. There are no registrations for foliar application of cyfluthrin to rice.

Forage, Fodder, and Straw of Cereal Grains Group Except Rice (Crop Group 16)

Field trial data have been submitted for wheat forage, fodder, and straw (D290925, Y. Donovan, 12/16/2004), field corn forage and fodder (D250002, Y. Donovan, 8/15/2002), sweet corn forage and stover (H. Fonouni, 11/17/89 and J. Garbus, D198397, 5/26/95), and sorghum forage and stover (D220494, G. Otakie, 3/5/96). The data were reviewed in the specified memos and deemed to be adequate. Tolerances were established based on these data and these tolerances are currently in effect. These tolerances include the following: wheat forage (5.0 ppm), wheat hay (6.0 ppm), wheat straw (6.0 ppm), field corn forage (3.0 ppm), field corn stover (6.0 ppm), popcorn stover (6.0 ppm), sweet corn forage (15 ppm), sweet corn stover (30 ppm), sorghum grain forage (2.0 ppm), and sorghum grain stover (5.0 ppm). The registrant has requested tolerances for Crop Group 16, the Forage, Fodder, and Hay of the Cereal Grains (Except Rice) Group. The registrant proposed one tolerance for the entire crop group, 7.0 ppm.

Forage

Forage field trial data are available for wheat, field corn, sweet corn, and sorghum. The individual field trial values that were obtained for the forage of each commodity were entered into HED's statistical tolerance generator to determine what the recommended tolerance for each one would be. These tolerances are as follows: wheat (4.0 ppm), field corn (3.0 ppm), sweet corn (25 ppm), and sorghum (4.0 ppm). The highest of these four values is that for sweet corn, 25 ppm. Forage data were collected in 1988 (MRID 41001607) and 1990 (MRID 42864604). The values that were obtained are as follows (in ppm, ascending order): 2.97, 3.04, 3.08, 3.73, 6.54, 6.84, 7.50, 7.71, 7.73, 8.59, 9.89, 10.5, 11.6, 12.0, 13.6, and 53.2. J. Garbus, in his memo, D198397 (5/26/95), stated that HED considered the 53.2 ppm value to be aberrant. HED recommended in favor of a tolerance of 15 ppm for sweet corn forage and this tolerance is still in effect. The mean of the forage field trial values (including the 53.2 ppm value) is 10.5 ppm with a standard deviation of 11.9. The high value is 3.6 standard deviations from the mean. Therefore, HED is in agreement with the previous determination that the value is aberrant. When the remaining 15 field trial values were entered into HED's statistical tolerance generator, the recommended tolerance that was obtained was 25 ppm. As a result, the recommended tolerance for the forage of the Cereal Grains Crop Group (Except Rice) is 25 ppm. Although residues differ by more than 5x among the forages, HED considers a crop group tolerance to be appropriate, as only livestock feeds are involved.

Stover

Stover field trial data are available for field corn, sweet corn, and sorghum. The individual field trial values that were obtained for the stover of each commodity were entered into HED's statistical tolerance generator to determine what the recommended tolerance for each one would be. These recommended tolerances are as follows: field corn (3.5 ppm), sweet corn (30 ppm), and sorghum (3.5 ppm). The highest of these four values is that for sweet corn, 30 ppm. As a result, the recommended tolerance for the stover of the Cereal Grains Crop Group Except Rice is 30 ppm. A tolerance of 30 ppm is currently in effect for sweet corn stover. This tolerance should be extended to the stover of the other cereal grains (except rice).

Hay

The only commodity for which hay field trial data are available is wheat (D290921, Y. Donovan, 12/16/2004). The recommended tolerance for hay was determined using HED's statistical tolerance generator. This tolerance is 6.0 ppm and should be applied to the hay of the Cereal Grains Crop Group Except Rice.

Straw

The only commodity for which straw field trial data are available is wheat (D290921, Y. Donovan, 12/16/2004). The recommended tolerance for straw was determined using HED's statistical tolerance generator. This tolerance is 7.0 ppm and should be applied to the straw of the Cereal Grains Crop Group Except Rice.

As crop group tolerances are being established for the forage, stover, hay, and straw of the cereal grains commodities, the individual tolerances that are currently in effect should be revoked. These tolerances include the following: wheat forage (5.0 ppm), wheat hay (6.0 ppm), wheat straw (6.0 ppm), field corn forage (3.0 ppm), field corn stover (6.0 ppm), popcorn stover (6.0

ppm), sweet corn forage (15 ppm), sweet corn stover (30 ppm), sorghum grain forage (2.0 ppm), and sorghum grain stover (5.0 ppm).

860.1520 Processed Food and Feed

Grass

There are no regulated processed commodities associated with grass.

Sugar Beets

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For the sugar beet processing study, sugar beet seeds were treated with a suspoemulsion formulation containing both cyfluthrin (1 lb/gal) and clothianidin (4 lb/gal), and the treated seeds were planted at a field site in Minnesota during 2004. The application rate for cyfluthrin was 0.176 lb ai/100,000 seeds (5x rate), which is equivalent to 0.094 lb ai/A based on the actual seeding rate used at the field site (52,900 seeds/A). Single bulk control and treated samples of sugar beet roots were harvested at normal commercial maturity, 147 DAP, and placed in frozen storage. After approximately 13 months of storage, roots were processed into molasses, refined sugar, and dried pulp using simulated commercial procedures. Root samples were stored frozen for approximately 13 months prior to analysis, and the frozen processed commodities were analyzed within 1 month of collection. These storage intervals are supported by the available storage stability data.

Bayer Method 108139-1 (GC/MS), which was used to determine cyfluthrin residues in/on sugar beet roots and processed fractions, was adequately validated in conjunction with the analysis of processing study samples. The validated LOQ for cyfluthrin residues is 0.01 ppm in/on roots and all processed fractions, and the statistically calculated LODs are 0.003 ppm in roots and 0.0011-0.0018 ppm in sugar beet processed fractions.

Following the seed treatment (5x cyfluthrin rate), cyfluthrin residues in/on sugar beet roots (RAC) at commercial maturity were 0.0054 ppm, which is below the LOQ, but above the LOD. Residues were not detected in refined sugar (<0.0018 ppm) and molasses (<0.0011 ppm), but were quantifiable in dried pulp (0.064 ppm).

Conclusions. The available sugar beet processing study is adequate. Using all values ≥LOD for each commodity, the processing factors were calculated to be <0.3x for refined sugar, <0.2x for molasses, and 12x for dried pulp.

Cereal Grains Crop Group Except Rice

In 2004, HED recommended in favor of a tolerance of 0.5 ppm for wheat bran. That tolerance was based on the highest average field trial value (HAFT) of 0.17 ppm and a concentration factor of 1.6x. The recommended tolerance was 0.5 ppm. A tolerance of 6.5 ppm was in effect

because of the stored grains use. As the stored grains use has been cancelled, HED recommends that the current tolerance of 6.5 ppm for wheat bran be revoked and that the previously recommended tolerance of 0.5 ppm be established.

An acceptable field corn processing study was submitted and reviewed by Y. Donovan (D250002, 8/15/2002). Residues of cyfluthrin were below the LOQ of 0.01 ppm in all six samples of grain treated at 5.7x the proposed application rate. Residues were not measured in the processed commodities. It was concluded that residues in processed commodities would not exceed 0.01 ppm. The current corn oil tolerance of 30 ppm was established in conjunction with the stored grains uses. As the stored grain uses have been cancelled, the field corn refined oil tolerance should be revoked. The corn grain tolerance of 0.05 ppm will be high enough to cover residues in field corn, refined oil.

Tolerances are currently in effect for rice bran (6.0 ppm) and hulls (18 ppm). Rice is a member of the cereal grains crop group. The bran and hulls tolerances result from the stored grains use. As the 4.0 ppm tolerance resulting from the stored grain use is being revoked, the tolerances for rice bran and hulls should also be revoked. There are no registrations for foliar application of cyfluthrin to rice.

860.1650 Submittal of Analytical Reference Standards

Analytical reference standards for both cyfluthrin and beta-cyfluthrin are available at the EPA National Pesticide Standards Repository.

860.1850/860.1900 Confined and Field Accumulation in Rotational Crops

Rotational crop data supporting planting as soon as practical were reviewed by EFED in 1989/1990 based on correspondence provided by RD. Although there were questions about storage stability of residues in wheat forage, the registrant provided information on stored potato and soybean leaves to resolve the issue. In a letter from George LaRocca (RD) to Mobay Chemical Corporation dated 5/9/90, the labeling bearing the proposed rotational crop statement (i.e., planting as soon as practical) was accepted. Pyrethroids show very little uptake of the parent compounds into rotational crops. Cyfluthrin's plantback interval, "as soon as practical," is consistent with that of the other pyrethroids.

Because of the presence of clothianidin in the proposed MAI formulation, the rotational crop restrictions on the proposed label are actually more restrictive than those on the labels for products containing only cyfluthrin or beta-cyfluthrin. Therefore, the proposed rotational crop restrictions are adequate to cover the beta-cyfluthrin component of the MAI.

860.1550 Proposed Tolerances

HED has determined that cyfluthrin *per se* is the residue of concern for both tolerance enforcement and risk assessment. Permanent tolerances are established for residues of cyfluthrin in/on a wide variety of plant commodities at levels ranging from 0.01 ppm in/on peanuts, tree nuts, and tuberous and corm vegetables to 600 ppm in/on aspirated grain fractions (40 CFR

§180.436(a)(1)). Cyfluthrin tolerances on animal commodities are established at levels ranging from 0.01 ppm in eggs and poultry fat, meat, and meat byproducts to 30 ppm in milk fat. In addition, a tolerance of 0.05 ppm is established for cyfluthrin in animal feeds and processed foods as a result of its use in food- and feed-handling establishments (40 CFR §180.436(a)(2) and (a)(3)). Permanent tolerances with a regional registration have also been established for cyfluthrin at 6 ppm in/on grass forage and 8 ppm in/on grass hay (40 CFR §180.436(c)). The tolerances for cyfluthrin also cover similar uses of beta-cyfluthrin, although HED now recommends that a separate section be established for the beta-cyfluthrin tolerances. The tolerances proposed for grass forage and hay by the petitioner are listed in Table 9, along with the Agency's recommended tolerance levels.

The recommended tolerance levels for grass forage and hay were determined using recent Agency Guidance (*Guidance for Setting Pesticide Tolerances Based on Field Trial Data* SOP), as residues in all samples of forage and hay were above the LOQ. The appropriate tolerances for grass forage and hay were determined to be 12 and 50 ppm, respectively (Attachment 2).

The recommended tolerance levels for alfalfa forage and hay were also determined using recent Agency Guidance (*Guidance for Setting Pesticide Tolerances Based on Field Trial Data* SOP), as residues in all samples of forage and hay were above the LOQ. The appropriate tolerances for alfalfa forage and hay were determined to be 5.0 and 13 ppm, respectively (Attachment 2).

As the majority of the sugar beet root samples (21 out of 24) had residues <LOQ, HED's statistical tolerance generator was not used to determine the recommended tolerance. The recommended tolerance of 0.10 ppm for roots is based on the maximum residues detected in roots (0.088 ppm). No tolerance is required for sugar beet tops, as sugar beet tops are no longer a regulated livestock feedstuff. The results from the sugar beet processing study indicate that separate tolerances are not required for sugar and molasses, as cyfluthrin residues did not concentrate in these fractions. However, cyfluthrin residues concentrated by 12x in dried pulp. Based on HAFT residues of 0.049 ppm in roots and the 12x processing factor, the maximum expected residues in dried pulp would be 0.59 ppm, which supports a tolerance of 1.0 ppm for dried pulp.

Bayer proposed a tolerance of 4.0 ppm for the Cereal Grains Crop Group, Except Rice (Crop Group 15). This tolerance is equivalent to the tolerance that was established based on the stored grains uses. The stored grains registrations have been cancelled, however. Because of differences in field trial values and harmonization with Codex MRLs, different tolerances are being recommended for the different cereal grains. A tolerance of 0.15 is being recommended for the grain of wheat, barley, oats, buckwheat, rye, and millet. In order to harmonize with the Codex MRL for maize, a tolerance of 0.05 ppm is being recommended for field corn grain and for sweet corn, kernel plus cob with husks removed. A tolerance of 4.0 ppm is being recommended for sorghum, grain.

Bayer proposed a tolerance of 7.0 ppm for the Forage, Fodder, and Straw of the Cereal Grains Crop Group, Except Rice (Crop Group 16). Forage data are available for wheat, field corn, sweet corn, and sorghum. The data set for each commodity was entered into HED's statistical tolerance generator. The highest of these tolerances is that for sweet corn, 25 ppm. As a result, the recommended tolerance for the Forage of the Cereal Grains Crop Group, except Rice, is 25 ppm. The term fodder has been replaced with the term stover. Stover data are available for field corn, sweet corn, and sorghum. The data set for each commodity was entered into HED's

statistical tolerance generator. The highest of these tolerances is that for sweet corn, 30 ppm. As a result, the recommended tolerance for the Stover of the Cereal Grains Crop Group, except Rice, is 30 ppm. Straw data are available for wheat only. HED's statistical tolerance generator was used to calculate the recommended tolerance for straw which was determined to be 7.0 ppm. As a result, the recommended tolerance for the Straw of the Cereal Grains Crop Group, except Rice, is 7.0 ppm. Hay data are also available for wheat only. HED's statistical tolerance generator was used to calculate the recommended tolerance for hay which was determined to be 6.0 ppm. As a result, the recommended tolerance for the Hay of the Cereal Grains Crop Group, except Rice, is 6.0 ppm.

Considering the recommended changes in tolerances for grain commodities, the new tolerances for grass forage and hay, and recent regulatory changes in calculating livestock diets, the MDB for cyfluthrin residues was recalculated to be 20.9 ppm for beef cattle, 27.1 ppm for dairy cattle, and 3.21 ppm for swine and poultry. As the calculated dietary exposure of poultry has not changed from earlier reviews, no changes in the current tolerances on eggs and poultry tissues are required. However, tolerances of other livestock commodities were reassessed based on the substantial reductions in the MDBs for cattle and swine.

Based on the calculated MDBs for beef cattle (20.9 ppm), dairy cattle (27.1 ppm) and swine (3.21 ppm) and the residue data from the adequate cattle feeding study, tolerances on milk, cattle, goat, hog, horse, and sheep commodities can be substantially reduced. The available data support reducing the current livestock tolerances to 0.2 ppm for milk, 5.0 ppm for milk fat, 0.10 ppm for meat and meat byproducts of cattle, 0.05 ppm for meat and meat byproducts of goats, horses, and sheep, 2.0 ppm for fat of cattle, goats, horses, and sheep, 0.01 ppm for meat and meat byproducts of hogs, and 0.5 ppm for fat of hogs.

With regard to international MRLs for cyfluthrin, harmonization of the proposed tolerances is not an issue for grass forage, grass hay, sugar beet roots, and sugar beet dried pulp, as there are no established for proposed Canadian, Mexican or Codex MRLs for cyfluthrin residues on grass or sugar beet commodities (See Attachment 1).

The recommended tolerances in Table 9 should be established for both cyfluthrin and beta-cyfluthrin.

Table 9. Tolerance Summary for Cyfluthrin.

Commodity	Established Tolerance (ppm)	Proposed Tolerance (ppm)	Recommended Tolerance (ppm)	Comments; Correct Commodity Definition
Grass, forage, fodder and hay, group 17, forage	6.0 [1]	13.0	12	Adequate grass field trial data are available.
Grass, forage, fodder and hay, group 17, hay	8.0 [1]	40.0	50	

Alfalfa, forage	-	5.0	5.0	Adequate alfalfa field trial data are available.
Alfalfa, hay	10.0	15.0	13	
Beet, sugar, roots	-	0.09	0.10	Adequate field trial data are available
Beet, sugar, dried pulp	-	11	1.0	Maximum expected residues are 0.59 ppm based on HAFT residues of 0.049 ppm and a 12x processing factor for dried pulp.
Grain, cereal; Crop Group 15 (except Rice)	4.0	4.0	0.15	Wheat grain, barley grain, buckwheat grain, millet grain, oat grain, rye grain
Grain, cereal; Crop Group 15 (except Rice)	4.0	4.0	0.05	Corn, field, grain
Grain, cereal; Crop Group 15 (except Rice)	4.0	4.0	0.05	Corn, sweet, kernel plus cob with husks removed
Grain, cereal; Crop Group 15 (except Rice)	4.0	4.0	3.5	Sorghum, grain, grain
Wheat, bran	6.5	-	0.5	Stored grain uses have been revoked
Corn, field, refined oil	30.0	-	-	The field corn, grain tolerance will cover residues in corn oil
Rice, bran	6.0	-	-	Stored grain uses have been revoked
Rice, hulls	18.0	-	-	Stored grain uses have been revoked
Grain, cereal, forage, fodder and straw, Crop Group 16 (except Rice)	-[2]	7.0	25	Grain, cereal, forage, fodder, and hay, group 17, forage, except Rice
Grain, cereal, forage, fodder and straw, Crop Group 16 (except Rice)	-[3]	7.0	30	Grain, cereal, forage, fodder, and hay, group 17, stover, except Rice
Grain, cereal, forage, fodder and straw, Crop Group 16 (except Rice)	-[4]	7.0	7.0	Grain, cereal, forage, fodder, and hay, group 17, straw, except Rice
Grain, cereal, forage, fodder and straw, Crop Group 16 (except Rice)	-[5]	7.0	6.0	Grain, cereal, forage, fodder, and hay, group 17, hay, except Rice
Wheat, forage	5.0	-	-	Crop group tolerance is being established for Forage of Grain, Cereal, except Rice (Crop Group 16)
Corn, field, forage	3.0	-	-	
Corn, sweet, forage	15	-	-	
Sorghum, grain, forage	2.0	-	-	
Corn, field, stover	6.0	-	-	Crop group tolerance is being established for Stover of Grain, Cereal, except Rice (Crop Group 16)
Corn, pop, stover	6.0	-	-	
Corn, sweet, stover	30.0	-	-	
Sorghum, grain, stover	5.0	-	-	

Wheat, hay	6.0	-	-	Crop group tolerance is being established for Hay of Grain, Cereal, except Rice (Crop Group 16)
Wheat, straw	6.0	-	-	Crop group tolerance is being established for Straw of Grain, Cereal, except Rice (Crop Group 16)
Cattle, fat	10	NA	2.0	Based on the recalculated MDBs for beef cattle (20.9 ppm), dairy cattle (27.1 ppm) and swine (3.21 ppm) and the residue data from the available cattle feeding study, tolerances for livestock commodities can be substantially reduced.
Cattle, meat	0.4	NA	0.10	
Cattle, meat byproducts	0.4	NA	0.10	
Goat, fat	10	NA	2.0	
Goat, meat	0.4	NA	0.05	
Goat, meat byproducts	0.4	NA	0.05	
Hog, fat	10	NA	0.5	
Hog, meat	0.4	NA	0.01	
Hog, meat byproducts	0.4	NA	0.01	
Horse, fat	10	NA	2.0	
Horse, meat	0.4	NA	0.05	
Horse, meat byproducts	0.4	NA	0.05	
Milk	1.0	NA	0.2	
Milk, fat	30	NA	5.0	
Sheep, fat	10	NA	2.0	
Sheep, meat	0.4	NA	0.05	
Sheep, meat byproducts	0.4	NA	0.05	

NA = not applicable
[1] Regionally restricted tolerances for grass grown in CA, OR, ID and WA.
[2] Forage tolerances are established for wheat (5.0 ppm), field corn (3.0 ppm), sweet corn (15 ppm), and sorghum (2.0 ppm)
[3] Stover tolerances are established for field corn (6.0 ppm), popcorn (6.0 ppm), sweet corn (30 ppm), and sorghum (5.0 ppm)
[4] A Straw tolerance is established for wheat (6.0 ppm)
[5] A hay tolerance is established for wheat (6.0 ppm)
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D321638, Cyfluthrin. Addendum to HED's Memo of 12/16/04, D290921, "Summary of Analytical Chemistry and Residue Data. Petition Numbers: 2F6445, 2F6479, 1F6290, 1E6318, 3E6583, and 3E6776," Y. Donovan, 12/16/04.

Attachments:

Attachment 1 - International Residue Limit Status Sheet
Attachment 2 - Tolerance Assessment Calculations

Attachment 1. International Residue Limit Status Sheet

INTERNATIONAL RESIDUE LIMIT STATUS

Chemical Name: cyano(4-fluoro-3-phenoxyphenyl) methyl 3-(2,2-dichloro ethenyl)-2,2-dimethyl cyclopropane- carboxylate	Common Name: Cyfluthrin	X Proposed tolerance □ Reevaluated tolerance □ Other	Date: 4/05/07

Codex Status (Maximum Residue Limits)	U. S. Tolerances
□ No Codex proposal step 6 or above X No Codex proposal step 6 or above for the crops requested	Petition Number: 6E7058 DP Number: 331951 Other Identifier:
Residue definition (step 8/CXL): Cyfluthrin	Reviewer/Branch: D. Dotson/RAB2
	Residue definition: Cyfluthrin

Crop(s)	MRL (mg/kg)	Crop(s)	Recommended Tolerance (ppm)
Apple	0.5	Grass, forage, fodder and hay, group 17, forage	12
Cattle Milk	0.01	Grass, forage, fodder and hay, group 17, hay	50
Cotton Seed	0.05	Beet, sugar, roots	0.10
Maize	0.05	Beet, sugar, dried pulp	1.0
Peppers, sweet	0.2		
Rape Seed	0.05		
Tomato	0.5		

Limits for Canada		**Limits for Mexico**	
□ No Limits X No Limits for the crops requested		□ No Limits X No Limits for the crops requested	
Residue definition: Cyfluthrin		Residue definition: Cyflutrin	
Crop(s)	MRL (mg/kg)	Crop(s)	MRL (mg/kg)
Milk, fat	15	Algodonero (cotton)	0.50
Fat of cattle, goats, hogs, horses, poultry and sheep	5	Chile (peppers)	0.5
Milk	0.5	Jitomate (tomatoes)	0.2
Meat and meat by-products of cattle, goats, hogs, horses, poultry and sheep	0.4	Maiz (corn)	0.01
Eggs	0.01	Papa (potatoes)	0.1
		Soya (soybeans)	0.1

Notes/Special Instructions:

Attachment 2. Tolerance Assessment Calculations.

The Agency's *Guidance for Setting Pesticide Tolerances Based on Field Trial Data* was utilized for determining appropriate tolerance levels on grass forage and hay as well as most of the cereal grain commodities. The datasets used to establish tolerances for cyfluthrin residues on grass and cereal grain commodities consist of field trial data representing applications of the appropriate formulations at approximately 1x the maximum proposed use rates. As specified by the *Guidance for Setting Pesticide Tolerances Based on Field Trial Data* SOP, the field trial application rates were within 25% of the maximum label application rate, and the PHIs are consistent with the appropriate stage of maturity and the proposed PHIs for each commodity. The residue values used to calculate the tolerances are provided in Tables II-1 and II-2

The application rates to grass, alfalfa, and cereal grains were 1x the maximum proposed use rate for cyfluthrin. The application rates for cyfluthrin are twice as high as the application rates for beta-cyfluthrin. The tolerance levels for cyfluthrin apply to beta-cyfluthrin as well.

Most of the field and sweet corn grain field trial samples had residues that were below the LOQ of 0.01 ppm. The sweet corn data were submitted in MRID 41001607, "Baythroid – Magnitude of the Residue on Sweet Corn and Sweet Corn Processed Products," 1988. Thirteen samples of kernel plus cobs with husks removed were analyzed. Eleven of these samples had residues that were below the LOQ. Of the other two samples, one had a residue value of 0.01 ppm and the other had a residue value of 0.02 ppm. Field corn data were submitted in MRID 44629605, "Baythroid 2 – Magnitude of the Residues in Field Corn, Lab Project No.: BD19CO05/108115," 1998. Sixty-eight samples were analyzed and residues were below the LOQ in all 68. As a result, the tolerance spreadsheet was not used to determine the recommended tolerance. For field corn grain and sweet corn, kernel plus cob with husks removed, the recommended tolerance was harmonized with the Codex MRL for maize of 0.05 ppm.

Table II-1: Data table for residues of cyfluthrin in grass forage and hay.		
Regulator:	EPA	
Chemical:	Cyfluthrin	
Crop:	Grass Forage	Grass Hay
PHI:	0 days	
App. Rate:	0.172-0.181 lb ai/A	0.173-0.180 lb ai/A
Submitter:	IR-4	
MRID Citation:	MRID 4795801	
	Residues	**Residues**
	6.01	22.1
	9.02	25.1
	5.92	18.8
	6.23	24.1
	5.43	12.6
	10.4	33.1
	3.82	10.1
	8.03	15.3
	5.85	12.8
	8.7	26.8
	4.36	15.6
	3.79	6.3
	6.55	21.7
	8.57	28.9
	5.96	18.2
	6.51	24
	4.99	12.6
	8.38	30.7
	5	11
	9.33	15.3
	6.03	15
	6.71	10.6
	5.77	15.4
	5.72	7.98

Table II – 2. Field Trial Values					
Wheat Grain (ppm)	**Wheat Hay** (ppm)	**Wheat Straw** (ppm)	**Sorghum Grain** (ppm)	**Sweet Corn Forage** (ppm)	**Sweet Corn Stover** (ppm)
0.046	2.29	2.18	0.77	6.54	1.67
0.062	2.60	4.99	0.30	11.6	2.11
0.019	2.48	3.98	3.48	3.73	1.90
0.028	3.29	3.40	0.22	9.89	4.96
0.026	1.88	1.60	0.07	13.6	5.61
0.034	2.23	1.55	0.38	7.5	0.53
0.058	2.82	2.28	0.13	3.08	3.64
0.058	2.14	1.01		8.59	1.42
0.024	1.76	1.02		6.84	21.6
0.022	1.98	0.87		12.0	28.4
0.092	3.81	0.93		10.5	22.6
0.082	2.87	0.96		7.71	
0.033	3.52	0.59			
0.039	5.72	0.54			
0.155	2.24	1.64			
0.180	2.48	1.94			
0.040	2.65	0.91			
0.040	2.84	0.88			
0.026	2.79	1.21			
0.024	3.10	2.07			
0.074	2.10	0.61			
0.096	2.03	0.63			
0.017	2.49	1.55			
0.011	3.12	1.63			
0.014	2.86	1.12			
0.017	4.14	1.15			
0.047	3.22	1.88			
0.068	2.76	2.03			
0.058	3.96	1.59			
0.050	3.50	1.18			
0.025	2.69	5.08			
0.029	2.89	4.38			
0.027	3.90	1.19			
0.023	4.44	1.02			
0.087	2.66	3.68			
0.094	2.85	3.44			
0.049	1.59	2.29			
0.029	1.48	2.26			
0.035	1.53	1.32			
0.037	1.64	2.04			

Table II – 2. Field Trial Values					
Sugar Beet Roots (ppm)	**Sugar Beet Tops** (ppm)	**Alfalfa Forage** (ppm)	**Alfalfa Forage** Cont'd. (ppm)	**Alfalfa Hay** (ppm)	**Alfalfa Hay** Cont'd. (ppm)
<0.003	<0.003	1.340	1.835	4.374	5.954
0.009	<0.003	0.930	1.988	4.854	5.926
0.004	<0.003	2.588	2.438	5.033	5.994
0.004	<0.003	2.119	2.260	5.696	5.429
<0.003	<0.003	1.492	2.324	5.890	16.494
0.003	<0.003	1.327	2.456	5.235	14.055
0.009	<0.003	2.752	4.412	4.506	4.220
0.025	<0.003	1.839	4.605	3.893	4.001
0.009	<0.003	1.509	1.194	4.373	4.238
0.009	<0.003	1.574	1.202	4.178	4.651
0.010	<0.003	1.095	2.465	2.507	1.993
0.088	<0.003	1.077	2.096	2.588	2.425
0.005	<0.003	0.647	0.917	1.802	3.321
<0.003	<0.003	0.614	1.251	2.114	3.485
<0.003	<0.003	1.060	1.858	2.522	4.182
0.006	<0.003	1.487	1.856	2.513	3.778
0.013	<0.003	0.710	1.468	5.513	3.657
0.003	<0.003	0.609	1.256	5.120	4.081
<0.003	<0.003	4.650	1.588	4.277	3.797
<0.003	<0.003	5.434	2.114	3.502	3.910
<0.003	<0.003	0.389	1.498	13.034	3.740
<0.003	<0.003	0.011	1.551	11.321	4.101
0.004	<0.003	5.882	1.296	3.362	5.412
<0.003	<0.003	5.412	1.270	3.922	4.933
		1.206	1.266	4.714	3.711
		1.052	1.263	4.566	3.557
		1.732	1.074	3.289	6.958
		1.684	1.187	3.645	6.943
		1.151	2.492	6.688	10.543
		1.211	2.529	6.612	10.660
		2.569	3.714	3.637	4.166
		2.129	3.396	3.161	3.915
		1.098	1.468	4.111	4.715
		1.114	1.491	4.006	4.644
		1.648	1.254	2.351	3.760
		1.220	1.658	2.664	3.786
		0.903	1.732	2.068	5.216
		1.233	1.483	2.162	5.117
		0.682	2.002	5.605	4.502
		0.543	1.913	5.676	4.551
		1.743	2.257	4.768	3.556
		1.884	2.519	4.772	3.569
		1.722	1.351	3.590	2.871
		1.559	1.421	3.991	3.177
		1.225	1.054	4.402	5.166
		1.292	1.329	3.646	6.110
		1.429	2.816	3.954	
		1.539	1.992	3.800	