2-21-96

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MEMORANDUM

Subject: **PP# 5F4545/FAP# 6H5737 - QUIZALOFOP-P ETHYL ESTER (ASSURE® II) ON THE FOLIAGE OF LEGUME VEGETABLES (EXCEPT SOYBEANS) CROP GROUP, CANOLA AND CANOLA PROCESSED COMMODITIES.**
Review of Magnitude of the Residue Data and Residue Analytical Method.
(MRID #s 436957-01 and 436957-02)[CBTS #s 16392, 16393, and 16394]{DP Barcode D220476, D220478, and D220478}

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INTRODUCTION

E.I. duPont de Nemours and Company, Agricultural Products, proposes tolerances for the combined residues of the herbicide quizalofop-p ethyl ester, trade named Assure® II (ethyl(R)-2-[4-((6-chloroquinoxalin-2-yl)oxy)phenoxy] propionate), and the racemic quizalofop ethyl ester, trade named Assure® (ethyl-2-[4-((6-chloroquinoxalin-2-yl)oxy)phenoxy] propionate) and the acid metabolite (ethyl 2-[4-((6-chloroquinoxalin-2-yl)oxy)phenoxy] propanoic acid), all expressed as quizalofop ethyl ester in or on the following raw agricultural commodities (racs): the forage of legume vegetables (except soybean) crop group at 3 ppm and canola at 2 ppm. A feed additive tolerance (FAT) is proposed for canola meal at 3 ppm and a food additive tolerance is proposed for canola oil at 0.1 ppm.

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EXECUTIVE SUMMARY OF RESIDUE CHEMISTRY DEFICIENCIES

- CONDITIONALLY COMPLETE THE TMV
- ADDITIONAL FIELD TRIAL RESIDUE DATA FOR FOLIAGE OF LEGUME VEGETABLES
- REVISE CANOLA AND FOLIAGE OF LEGUME VEGETABLES TOLERANCES

RECOMMENDATION

CBTS cannot recommend at this time for the requested permanent tolerances for the combined residues of the herbicide quizalofop ethyl ester and the acid, all expressed as quizalofop ethyl ester in or on canola seed 2 ppm, the forage of legume vegetables (except soybean) crop group at 3 ppm, and FAT for canola meal at 3 ppm and canola oil at 0.1 ppm for the reasons cited above in our Executive Summary and further described in the conclusions 6b; 8b, e, and f; and 9.

Provided a revised Section F is submitted to address conclusions 8b and f, and 9; CBTS could recommend for tolerances with expiration dates for total quizalofop ethyl to allow DuPont time to plan and conduct additional foliage of legume vegetable field trials, analyze the samples, and present a final report to the Agency. While the granting of registrations and the issuing of tolerances is the prerogative of the Registration Division, CBTS suggests that total quizalofop ethyl tolerances be set as we suggested in our conclusions above.

A DRES analysis may now be initiated using the CBTS suggested revised total quizalofop ethyl ester tolerances on canola seed at 1 ppm and canola meal at 1.5 ppm. There is no anticipated concentration of quizalofop ethyl in canola oil. A DRES analysis may be initiated for the foliage of the legume vegetables (except soybeans) crop group at 3 ppm.

CONCLUSIONS

Note: ***All residue chemistry data for the foliage of legume vegetables (except soybeans) crop group were submitted in PP# 3F4268 and reviewed by F. Griffith in the March 30, 1995, memorandum (qv).***

1. CBTS Conclusion on Product Chemistry/Chemical Identity

CBTS concludes that after reviewing the CSF for the TGAI the impurities present in the TGAI quizalofop-p ethyl ester are not expected to present a residue problem in the subject crops when formulated into Assure® II and used as directed.

2. CBTS Conclusion on Directions for Use/Labeling

The petitioner has proposed an adequate set of directions for use of quizalofop-p methyl ester, formulated as Assure® II, in con-

junction with an approved oil concentrate, or a non-ionic surfactant on canola and crambie.

3. CBTS Conclusion on the **Nature of the Residue - Plants**

CBTS reiterates that the nature of the quizalofop-p ethyl ester residue in **cottonseed**, potatoes, soybeans, tomatoes and sugarbeets is adequately understood. The residues of concern are quizalofop-p ethyl ester and its acid metabolite, quizalofop-p, and the S enantiomers of both the ester and the acid, all expressed as quizalofop-p ethyl ester. We are translating these data to canola.

4. CBTS Conclusion on the **Nature of the Residue - Livestock**

The nature of the quizalofop ethyl ester residue in livestock is adequately understood. The residues of concern are quizalofop ethyl, quizalofop methyl, and quizalofop, all expressed as quizalofop ethyl.

5. CBTS Conclusion on **Confined Accumulation Studies on Rotational Crops**

The petitioner has characterized and identified over 50% of the residue in each of the rotational crops from the labeled quizalofop ethyl soil treatment and has confirmed the metabolic pathways. The nature of the residue in rotational crops is adequately understood and is the same as identified above for tomatoes, cottonseed, soybeans, and sugar beets. The residues of concern are quizalofop ethyl and its acid metabolite.

6. CBTS Conclusions on the **Residue Analytical Method**

a. The petitioner has presented adequately validated residue analytical methods, LAN-1 and LAN-3, to gather the magnitude of the quizalofop-p, its acid metabolite; and phenols 1, 2, and 4 residue data on canola and canola processed commodities.

b. The revised residue analytical method for quizalofop-p and its acid metabolite as presented in PP# 3F4268 has been submitted for a Tolerance Method Validation (TMV) in EPA laboratories. The Analytical Chemistry Branch (ACB) noted several deficiencies in the method. The petitioner needs to respond to ACB's concerns with a revised method before we can get the TMV back on track. CBTS reiterates that the results of the successful TMV is not a prerequisite for a tolerance on canola and canola processing commodities as there is already an enforcement method in PAM-II.

7. CBTS Conclusion on **Storage Stability**

The petitioner has provided frozen storage stability data for quizalofop acid, phenols 2, 3, and 4 in cottonseeds and cotton processed commodities, snap bean pods and "straw," peas and pea forage, sugarbeet roots, and **canola** which show residues are stable for up to 3 years. The data are sufficient to support the magnitude

of the residue crop field trial data submitted in this petition where samples were stored under like conditions and for a shorter time.

8. CBTS Conclusions on Magnitude of the Residue - Crop Field Trials

a. The petitioner has generated more than the required total number of quizalofop on canola trials as specified in our June 1994 guidance. Although fewer trials were conducted in Region XI than suggested in that guidance document the petitioner generated all of the canola field trial data in 1989, prior to the new requirements. We can recommend for a quizalofop ethyl ester tolerance on canola without any additional crop field trial residue data.

b. CBTS concludes that quizalofop and its metabolites, all expressed as quizalofop-p ethyl ester, are not expected to exceed the proposed 2 ppm tolerance on canola when Assure® II plus the surfactant are used as directed. However, this tolerance is higher than necessary (see conclusion 8f below).

c. CBTS reiterates that there has been insufficient time since the imposition of the data requirement for specific geographical representation on bean field trials to generate the necessary residue data. We continue to recommend for tolerances with an expiration date for total quizalofop residues on the foliage of legume vegetables crop group to allow the company time to complete the trials, analyze the samples, and present a final report (see PP# 3F4268 memo by F. Griffith dated 14 Feb 96). While the granting of a registration and a tolerance is the prerogative of the Registration Division, CBTS suggests quizalofop-p tolerances with a 3 year expiration date are acceptable considering we are too far into the 1996 growing season for the company to adequately plan for these additional field trials. This should allow sufficient time to complete the trials even with crop failure, analyze the samples, and present a final report.

d. The petitioner needs to present the following additional quizalofop-p ethyl ester magnitude of the residue crop field trial data for succulent beans and forage: 1 trial from Region I, 1 trial from Region II, and 1 trial from Region III.

e. CBTS reiterates that the petitioner has presented an adequate amount of varietal and geographically representative pea and bean crop field trial residue data to show that residues of quizalofop and quizalofop-p ethyl ester are not expected to exceed the proposed foliage of legume vegetables (except soybeans) crop group tolerance of 3 ppm when Assure® II plus the surfactant are used as directed. This conclusion is drawn for a time limited tolerance only.

f. Since CBTS recommends for tolerances no higher then necessary, the petitioner will need to submit a revised section F proposing total quizalofop ethyl tolerances for canola at 1 ppm

for 40 CFR §180.441(a) and for the foliage of legume vegetables subgroup foliage of legume vegetables (except soybeans) at 0.5 ppm for 40 CFR §180.441 (c).

9. **CBTS Conclusion on Magnitude of the Residue - Processed Food/ Feed**

The petitioner has conducted an adequate canola processing study using canola bearing detectable residues following a single 6X exaggerated application with a 45 day PHI. Total quizalofop residues were shown to concentrate only in canola meal. Residues declined in canola oil. In a revised Section F the petitioner will need to propose a total quizalofop Section 701 Maximum Residue Limit (MRL) on canola meal at 1.5 ppm. The petitioner needs to delete the proposed total quizalofop ethyl tolerances for canola oil in the revised section F.

10. **CBTS Conclusions on Magnitude of the Residue - Meat/Milk/ Poultry/Eggs**

a. The results of the quizalofop ethyl ester bovine feeding study show that finite residues will actually occur in milk and livestock tissues from the feeding of quizalofop ethyl ester treated racs or their processed feed items when Assure® II is used as directed. The established quizalofop and quizalofop ethyl ester tolerances in milk, and in fat, meat, and meat by-products of cattle, goats, hogs, horses, and sheep are adequate and need not be increased from these additional uses.

b. The results of the quizalofop ethyl ester poultry feeding study show that while it is not possible to establish with certainty whether finite residues will actually occur in eggs and tissues from the feeding of quizalofop ethyl ester treated racs or their processed feed items when Assure® II is used as directed, there is a reasonable expectation for such residues to occur. The established quizalofop and quizalofop ethyl ester tolerances in eggs, and in fat, meat, and meat by-products of poultry are adequate and need not be changed from these additional uses.

11. **CBTS Conclusion on Harmonization of Tolerances**

Since there are no Mexican or Codex MRLs/tolerances, compatibility is not a problem at this time. Compatibility cannot be achieved with the Canadian negligible residue type limit at 0.1 ppm as the USA use pattern had findings of real residues above 0.1 ppm.

DETAILED CONSIDERATIONS

BACKGROUND

Tolerances of the combined residues of the racemic mixture of quizalofop ethyl and its acid metabolite quizalofop, all expressed as quizalofop ethyl have been established on soybeans at 0.05 ppm (see 40 CFR §180.441[a]). A food additive tolerance (FAT) has been

established for the combined residues of the racemic mixture of quizalofop ethyl on soybean flour at 0.5 ppm (see 40 CFR §185.5250) and feed additive tolerances have been established for combined residues of the racemic mixture on soybean hulls at 0.2 ppm, on soybean meal at 0.5 ppm, and on soybean soapstock at 1 ppm (see 40 CFR §186.5250). CBTS has also recommended for the established tolerance of combined residues of the R enantiomer quizalofop-p ethyl ester and its acid metabolite, quizalofop-p, and the S enantiomers of both the ester and the acid, all expressed as quizalofop-p ethyl ester on cottonseed and pineapples at 0.1 ppm (see 40 CFR §180. 441[c]).

In addition, CBTS has recommended for two Emergency Exemptions (Section 18) for use of quizalofop-p ethyl ester on mint (see memoranda by M. Peters dated February 25, 1993, for 93WA0008 and 93MT0004). Quizalofop-p ethyl ester and its metabolite residues are not expected to exceed 5 ppm on mint hay and 0.05 ppm in mint oil.

In a related co-pending petition residue chemistry data have been presented for the foliage of legume vegetables to support a crop group tolerance at 0.7 ppm. PP# 3F4268 is currently in reject status with deficiencies on the method needing to complete a successful Agency TMV, a revised tolerance, and additional crop field trial residue data (see memo dated March 30, 1995 and February 14, 1996).

PRODUCT CHEMISTRY/CHEMICAL IDENTITY

The product chemistry data for the R enantiomer were submitted as an amended registration to PP# 3F3252/6H5479.

CBTS concludes that after reviewing the results of the preliminary analysis of the TGAI (contains 98% active ingredient) as presented on the Confidential Statement of Formula (CSF) the impurities present in the TGAI quizalofop-p ethyl ester are not expected to present a residue problem in canola and crambie when formulated into Assure® II and used as directed.

DIRECTIONS FOR USE/LABELING

Quizalofop-p ethyl ester is proposed for use as a selective post emergence herbicide to provide control of annual grasses; eg, foxtails, barnyardgrass, etc., and perennial grasses; eg, quackgrass.

The formulation to be used on the crops is Assure® II Herbicide (EPA Reg. No. 352-541) containing quizalofop-p ethyl ester at 10.3%, or 0.88 lb a.i. per gallon. In ground applications, apply with standard fan or hollow cone nozzles, not with flood type nozzles. Apply in a minimum of 10 to 20 gallons water per acre, and use either an EPA approved crop oil concentrate at a rate of 4 qts per 100 gallons (1%), or a non-ionic surfactant at a rate of 1 qt per 100 gallon (0.25%). For aerial application, apply in a minimum of 5 gallons water per acre.

To control annual and perennial grasses in canola and crambie apply 7 to 12 ozs of Assure® II (1.2 ozs ai quizalofop-p ethyl ester

per 3/4 pt) per acre per application once or twice per crop growing season when the grasses are actively growing, usually when they are around 4 inches high. The maximum application in a crop growing season to canola is 18 ozs Assure® II (2 ozs ai) with a 60 day PHI.

The petitioner cautions that the cereal grains are "highly sensitive" to Assure II, thus care should be taken to avoid application when drift is likely. Assure II should not be applied through any irrigation system.

The petitioner has proposed an adequate set of directions for use of quizalofop-p methyl ester, formulated as Assure® II, in conjunction with an approved oil concentrate or a non-ionic surfactant on canola and crambie.

NATURE OF THE RESIDUE - PLANTS

The registrant has provided plant metabolism studies for soybeans, cotton, tomatoes, potatoes, and sugarbeets. These studies have been previously reviewed in PP# 3F4268.

In summary, quizalofop-p ethyl ester is metabolized by cleavage at three sites as follows:

1) Primary pathway is hydrolysis of the ethyl ester to form the quizalofop-p acid, then

2) Cleavage of the enol ether linkage in the acid, between the phenyl and quinoxalinyl rings, to form phenols, and

3) Cleavage of the ether linkage between the isopropanic group and the phenyl ring to form a phenol.

The plant metabolism data show that quizalofop-p ethyl ester does not translocate, but is rapidly hydrolyzed to the corresponding acid, then the phenols conjugate with the plant sugars. Metabolism studies in soybeans using the racemic mixture quizalofop ethyl ester and the resolved D+ isomer show nearly identical pathways.

CBTS reiterates that the nature of the quizalofop-p ethyl ester residue in cottonseed, potatoes, tomatoes, soybeans, and sugarbeets is adequately understood. The residues of concern are quizalofop-p ethyl ester and its acid metabolite, quizalofop-p, and the S enantiomers of both the ester and the acid, all expressed as quizalofop-p ethyl ester. CBTS is translating these data to canola.

NATURE OF THE RESIDUE - LIVESTOCK

^{14}C-phenyl and ^{14}C-quinoxaline quizalofop ethyl ester caprine and poultry metabolism studies have been submitted and reviewed.

In summary, the primary pathway in ruminants is hydrolysis of the ethyl ester to form the quizalofop-p acid, then methyl esterification to form the quizalofop methyl ester. Since neither phenol 1 or phenol 2 were detected, cleavage of the enol ether linkage in the

acid between the phenyl and quinoxalinyl rings and cleavage of the ether linkage between the isopropanic group and the phenyl ring are not ruminant metabolic pathways.

In poultry, the primary metabolic pathway is also the hydrolysis of the ethyl ester to form the quizalofop-p acid, then the methyl esterification to form the quizalofop methyl ester becomes a minor pathway. Poultry apparently recognize the free acid metabolite as a fatty acid and utilize it in fatty acid chain elongation to form the quizalofop-pentanoic acid metabolite through a series of reactions involving acetyl Co-A, NAD/NADPH, and catalyzed by beta-hydroxyaryl dehydrogenase and enoyl reductase. Since neither phenol 1 or phenol 2 were detected, cleavage of the enol ether linkage in the acid between the phenyl and quinoxalinyl rings and cleavage of the ether linkage between the isopropanic group and the phenyl ring are not poultry metabolic pathways.

The nature of the quizalofop ethyl ester residue in livestock is adequately understood. The residues of concern are quizalofop ethyl, quizalofop methyl, and quizalofop, all expressed as quizalofop ethyl.

CONFINED ACCUMULATION STUDIES ON ROTATIONAL CROPS

In summary, [Phenyl-^{14}C] and [quinoxaline-^{14}C] quizalofop ethyl treated soils were aged 30 and 62 days before planting with the rotational crops red beets, lettuce, wheat, peanuts, and cotton. The petitioner has characterized and identified over 50% of the residue in each of the rotational crops from the phenyl and quinoxaline labeled quizalofop ethyl soil treatment and has confirmed the hydrolysis of the ethyl ester, and the cleavage of the enol and ether linkages metabolic pathways. These data support a 120 day plant back interval.

The nature of the residue in rotational crops is adequately understood and is the same as identified above for tomatoes, cottonseed, soybeans, and sugar beets. The residues of concern are quizalofop ethyl and its acid metabolite.

RESIDUE ANALYTICAL METHOD

The petitioner presented the magnitude of the residue data which were generated by Enviro-Test Laboratories, 9936-67 Avenue, Edmonton, Alberta T6E OP5. The method used for quizalofop ethyl ester and its acid metabolite was referred to as LAN-1. The method was previously reviewed by F. Griffith in his March 30, 1995, memorandum in PP# 3F4268 (qv).

In summary, samples were extracted twice with ACN/1% HOAc, centrifuged and combined. The ACN was removed by rotary evaporation and the aqueous extract was adjusted to pH 5 before cellulase and beta-glucosidase were added. The sample was incubated for 2 hours, then the pH was adjusted to 8 and the sample was hydrolyzed an additional 2 hours after addition of esterase. The sample was cooled, pH adjusted to 3, then partitioned twice with ACN/CH_2Cl_2. The extracts were combined, concentrated by rotary evaporation,

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transferred into ACN, then partitioned twice with hexane (discard the hexane). KH_2PO_4 buffer was added; the sample was mixed, centrifuged, and filtered. The sample was cleaned up on a prep or cleanup HPLC column reliance cartridge with a "heart cut" collected which contained quizalofop and reanalyzed by HPLC using a Supelco C_{18} column with the mobile phase of 22% ACN/K_2HPO_4 at 1.5 ml/min flow rate and detection by UV at 254 nm. Quantitation was by peak height. Acceptable linearity curves were presented.

The limit of quantitation (LOQ) is 0.05 ppm with a set of 12 samples being analyzed in 3 working days.

To validate the method control samples of canola seeds were fortified with quizalofop at 0.047/0.049, 0.19/0.2, and 0.47/0.49 ppm. Overall quizalofop recoveries ranged from 71 to 113%, averaging 86 ± 15%, n = 6.

Concurrent quizalofop and quizalofop-p recoveries from control canola seeds spiked at 0.047 to 0.47 ppm ranged from 70 to 95%, averaging 82 ± 9%, n = 7. These fortified samples were analyzed along with the treated canola samples.

Method and concurrent validation data for quizalofop and its acid metabolite from the foliage of legume vegetables were previously submitted and reviewed (ibid).

The petitioner presented additional magnitude of the residue data which were also generated by Enviro-Test Laboratories. The method used for quizalofop ethyl ester phenol 2 and phenol 4 metabolites was referred to as LAN-3. The method was previously reviewed by F. Griffith in his March 30, 1995, memorandum in PP#3F4268 (qv).

In summary, samples were extracted twice with aqueous ACN, centrifuged, filtered, acidified with 10% HCl, and partitioned with CH_2Cl_2 to remove the unconjugated phenols. The aqueous layer was adjusted to pH 5, then incubated with beta-glucosidase and cellulase. After incubation, the aqueous layer was adjusted to pH 2 and partitioned again with CH_2Cl_2. The CH_2Cl_2 extracts were combined and rotary evaporated to just dryness. ACN was used to dissolve the sample before it was partitioned three times with hexane (discard hexane). The sample was blown dry at room temperature under a gentle stream of N_2. The sample was derivatized with diazomethane, then cleaned-up through a deactivated florisil column. The methyl esters of phenol 2 and phenol 4 were eluted off the column with acetone/hexane. Determination was by capillary GC-MSD using a HP 5890 GC containing a J & W DB 1701, 25 m X 0.25 mm column connected to a HP 5971 MSD. Ions 165 or 124 were used for identification and quantitation of phenol 2 and ions 210 or 123 were used for identification and quantification of phenol 4.

The LOQ is 0.05 ppm for both phenols and a set of 12 samples can be analyzed within 2 days.

Control samples of canola seeds were fortified with quizalofop phenol 2 and 4 at levels around 0.046, 0.23, and 0.46 ppm. Overall

quizalofop phenol 2 recoveries ranged from 100 to 124%, averaging 114 ± 9% and quizalofop phenol 4 recoveries ranged from 75 to 83% averaging 79 ± 4%, n = 6.

Concurrent quizalofop phenol 2 and phenol 4 recoveries from canola seeds spiked at 0.046 to 0.46 ppm ranged from 67 to 122%.

The petitioner has generated adequate method validation and concurrent method validation data to show that methods LAN-1 and LAN-3 are suitable to gather the magnitude of the quizalofop-p ethyl ester and its metabolites residue crop field trial data.

The revised residue analytical method for quizalofop-p and its acid metabolite as presented in PP# 3F4268; ie, LAN-1, has been submitted for a Tolerance Method Validation (TMV) in EPA laboratories. The Analytical Chemistry Branch (ACB) noted several deficiencies in the method (see memoranda by H. Hundley dated 21 July 95). The petitioner needs to respond to ACB's concerns with a revised method before we can get the TMV back on track. CBTS reiterates that the results of the successful TMV is not a prerequisite for a tolerance on canola and canola processing commodities.

STORAGE STABILITY

Storage stability data have been previously submitted for soybeans and cottonseed (high oil content commodities) which show that quizalofop ethyl ester, the free acid, and phenols 1, 2, and 4 metabolites are stable in frozen storage for at least 5 1/2 months.

The petitioner submitted additional frozen storage stability data for quizalofop ethyl ester, its acid and phenol metabolites in cottonseed, beans, peas, sugarbeets, and canola which have been reviewed by F. Griffith in his memoranda dated March 30, 1995, and February, 1996 (qv).

These frozen storage stability data for quizalofop acid, phenols 2, 3, and 4 in cottonseeds and cotton processed commodities, snap bean pods and "straw," peas and pea forage, sugarbeet roots, and **canola** show that residues are stable for up to 3 years. The data are sufficient to support the magnitude of the residue crop field trial data submitted in this petition where samples were stored under like conditions and for a shorter time.

MAGNITUDE OF THE RESIDUE - CROP FIELD TRIALS

CANOLA (MRID # 436957-01)

The petitioner presented quizalofop residue data on canola in a study titled "Magnitude of Residues of Assure® II Herbicide When Applied to Canola" by T. Mester dated June 9, 1993, and coded Dupont Report Number AMR 1389-89.

The petitioner presented total quizalofop-p magnitude of the residue data on canola seeds from 9 crop field trials in 5 states: Washington, North Dakota, Minnesota, Illinois, and Tennessee all for

the 1989 crop year on 3 varieties. When the number of crop field trials presented are reviewed against the data requirements for number of trials as described in the "EPA Guidance on Number and Location of Domestic Crop Field Trials for Establishment of Pesticide Residue Tolerances", June 1994, the petitioner appears to need 2 additional canola field trials from Region XI. CBTS notes that the petitioner has generated more than the required total number of canola field trials specified in the June 1994 document. Although fewer trials were conducted in Region XI than suggested in that guidance document the petitioner generated all of the field trial - data prior to the new requirements. We can recommend for a quizalofop ethyl ester tolerance on canola without any additional crop field trial residue data.

Each trial had a control plot and 2 test plots. One canola test plot received 1 broadcast ground spray at 1.5 oz ai (approx. 1X)/acre along with the surfactant. The application was post-emergence, when the canola was flowering, or at least 4 inches high. The other canola plot received 1 broadcast ground spray at a rate of 3 oz ai (2X)/acre with the surfactant. Both the 1X and 2X applications were done at the same time. One of the Minnesota trials did not produce seed after the Assure® II application due to a lack of rain and an early frost. The test sites in Tennessee received the racemic Assure® application and the test site in the other four states received Assure® II containing the D+ isomer. Neither of these situations affect the validity of the data presented.

2.5 pounds of mature canola seeds were harvested at 38 to 74 days PHI. Samples were promptly frozen and remained frozen until preparation and analysis. Samples were analyzed by the residue analytical methods reviewed above which have adequate validation and concurrent recovery data for quizalofop ethyl ester and the phenol metabolites.

Residues of quizalofop and phenols 2 and 4 were not detected to the LOQ of 0.05 ppm in any of the control canola seeds.

From the 1X application, detectable quizalofop residues ranged from < 0.05 ppm (3 trials) to 0.7 ppm, averaging 0.22 ± 0.22 ppm, n = 12. **The highest average field trial (HAFT) for the 1X application is 0.65 ppm.** From the 2X application, quizalofop residues ranged < 0.05 ppm (2 trials) to 1.5 ppm, averaging 0.45 ± 0.44 ppm.

No phenol 2 or phenol 4 residues were detected in any of the canola seed samples from the 1X and 2X applications at any of PHIs.

CBTS concludes that quizalofop and its metabolites, all expressed as quizalofop-p ethyl ester, are not expected to exceed the proposed 2 ppm tolerance on canola seed when Assure® II is used as directed. However, since CBTS recommends for tolerances no higher than necessary, the petitioner will need to submit a revised Section F proposing a 1 ppm total quizalofop ethyl tolerance on canola seed in 40 CFR §180.441(a).

SUCCULENT AND DRIED PEAS

In PP# 3F4268, the petitioner presented quizalofop residue data on edible and dried peas and pea forage and "straw." These data have been reviewed by F. Griffith in his March 30, 1995, memorandum (qv).

CBTS reiterates that the petitioner has presented an adequate number of geographically representative quizalofop-p pea crop field trials.

Residues of quizalofop and phenols 2 and 4 were not detected to the LD of 0.02 ppm in any of the control succulent peas, forage, dried peas, and "straw."

Quizalofop residues were detected from the 1X application at 30 days PHI in pea forage, ranging from 0.061 to 0.28 ppm averaging 0.112 ± 0.071 ppm and from the 2X application ranging from 0.067 to 0.47 ppm averaging 0.16 ± 0.12 ppm. No phenol 2 or phenol 4 residues were detected in the succulent peas, forage, dried peas, and "straw" samples from the 1X and 2X applications at either 30 day or 60 day PHI.

On pea "straw," quizalofop residues ranged from 0.053 ppm to 0.22 ppm and averaged 0.082 ± 0.044 ppm from the proposed use application and from 0.059 to 0.32 ppm and averaged 0.126 ± 0.078 ppm from the 2X application.

The petitioner has presented an adequate amount of varietal and geographically representative pea crop field trial residue data to show that residues of quizalofop and quizalofop-p ethyl ester are not expected to exceed the proposed foliage of legume vegetables (except soybeans) crop group tolerance of 3 ppm when Assure® II plus the surfactant are used as directed. This conclusion is drawn for a time limited tolerance.

SUCCULENT AND DRIED BEANS

The petitioner presented quizalofop residue data on succulent (snap) and dried beans and bean forage and "straw" in PP#3F4268 which have been reviewed by F. Griffith in his March 30, 1995, memorandum.

CBTS reiterates that the petitioner needs to present the following additional quizalofop-p ethyl ester magnitude of the residue crop field trial data for succulent beans and forage: 1 trial from Region I, 1 trial from Region II, and 1 trial from Region III.

Residues of quizalofop and phenols 2 and 4 were not detected to the LD of 0.02 ppm in any of the control succulent beans, forage, dried beans, and "straw."

Two bean forage samples at the 30-day PHI from the 1.25X application showed detectable quizalofop residues less then the LOQ of 0.05 ppm. From the 1.25X application at 15-day PHI, 3 bean forage samples were positive for quizalofop with residues ranging from 0.02 to 0.22 ppm and averaged 0.13 ± 0.07 ppm. Quizalofop residues were detected from the two 1.25X applications at 15 days after the second application in bean forage ranged from < 0.05 to 0.10 ppm, averaging

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0.07 ± 0.02 ppm. From the 2.5X application at 15-day PHI residues in bean forage ranged from 0.02 to 0.63 ppm, averaging 0.19 ± 0.2 ppm.

No phenol 2 or phenol 4 residues at or above the LOQ of 0.05 ppm were detected in the succulent beans, bean forage, and dried beans samples from any of the four quizalofop treatments at various PHIs.

On bean "straw," quizalofop residues following the 2.5X application with a 45 day PHI ranged from 0.02 to 0.19 ppm, averaging 0.1 ± 0.05 ppm and from the 30 day PHI following the 2.5X application, residues ranged from 0.02 to 0.67 ppm averaging 0.28 ± 0.23 ppm. Applying two applications at a rate of 1.5 ozs ai/application, then harvest after 70 days, quizalofop residues ranged from 0.02 ppm to 0.11 ppm, averaging 0.06 ± 0.02 ppm. Quizalofop residues on bean "straw" following the 5X application ranged from 0.051 to 2.5 ppm, averaging 0.48 ± 0.83 ppm.

CBTS concludes that quizalofop and its metabolites, all expressed as quizalofop-p ethyl ester, are not expected to exceed the proposed foliage of legume vegetables (except soybeans) crop subgroup tolerance of 3 ppm when Assure® II plus the surfactant are used as directed. This conclusion is drawn for a time limited tolerance. However, since CBTS recommends for tolerances no higher than necessary, the petitioner will need to submit a revised Section F proposing a time limited tolerance for the foliage of legume vegetables subgroup foliage of legume vegetables (except soybeans) at 0.5 ppm for 40 CFR §180.441 (c).

MAGNITUDE OF THE RESIDUE - PROCESSED FOOD/FEED (MRID # 436957-02)

The petitioner submitted the results of a quizalofop canola processing study in a document titled "Magnitude of Residues of Assure® II Herbicide in Canola and Its Processed Fractions" by T. Mester dated June 30, 1993, and coded DuPont study number AMR 1435-89.

The canola processing study was conducted using canola grown in 1990 in Illinois, treated once at a rate of 9 ozs ai/acre (6X for an individual application) as a broadcast foliar spray with the surfactant at a rate of 0.25% (v/v) 45 days before harvest. Mature canola seeds (rac) had residues of quizalofop 0.45 ppm and phenol 2 at 1.7 ppm. The treated canola seeds were processed by the Food and Protein Research and Development Center at Texas A & M University using a small scale commercial process into light impurities, small screenings, large screenings, crude and **refined oil**, presscake and extracted presscake or **meal**, and soapstock. Quizalofop was detected in the extracted presscake or meal at 1.04 ppm (2.3 X conc. factor) and in the refined oil at 0.05 ppm (0.11 X conc. factor). While quizalofop residue data were presented for all of the canola processed fractions, only canola meal and oil are significant commercial processed commodities. The petitioner has conducted an adequate canola processing study using canola bearing detectable residues following a single 6X exaggerated application with a 45-day PHI. Total quizalofop residues were shown to concentrate only in the canola meal. No

food additive tolerance (FAT) is required for quizalofop in refined canola oil.

In determining the need for a Section 701 Maximum Residue Limit (MRL), or Section 409 feed additive tolerance (FAT) we note there was only one canola processing study and that the concentration factor for canola meal 2.3X. The HAFT from the crop field trials is 0.65 ppm. The residue level in the processed meal is obtained by multiplying the HAFT of 0.65 ppm from the 1X application X the concentration factor of 2.3 = 1.5 ppm. Canola meal is **NOT** a ready-to-eat (RTE) feedstuff. When mixed into feed concentrates and/or supplements, the dilution factor is 4. Canola meal does not exceed 15% of any total livestock diets, or 25% of concentrates or supplements . Thus, when canola meal is presented to livestock, CBTS expects the maximum residue level to be 0.375 ppm (1.5 ppm/4 = 0.375 ppm). Since the residues in the "RTE form" of canola meal do not exceed the canola seed 408 tolerance of 1 ppm, then the petitioner needs to submit a revised Section F proposing a canola meal quizalofop Section 701 MRL at 1.5 ppm.

MAGNITUDE OF THE RESIDUE - MEAT/MILK/POULTRY/EGGS

RUMINANTS

A ruminant feeding study has been submitted and reviewed in PP #s 5F3252 and 1F3951. In summary, 3 group of 3 lactating dairy cows (plus a control group) were fed 0.1, 0.5, and 5.0 ppm quizalofop ethyl ester encapsulated for 28 consecutive days. Milk was collected daily and a sub-sample was divided into skim milk and cream. 2 cows were sacrificed after 28 days with samples of fat, skeletal muscle, liver, and kidney being collected and analyzed. The remaining cow in each test group was fed a regular diet without encapsulated quizalofop ethyl ester for 7 additional days before sacrifice. Whole milk, skim milk, and cream from the control, and the 0.1 and 0.5 ppm dose groups showed no quizalofop to <0.02 ppm (0.05 ppm in cream). From the 5 ppm dose, quizalofop residues ranged from 0.01 to 0.02 ppm in whole milk, and when these samples were separated into cream and skim milk, the quizalofop partitioned into the cream with residues plateauing at 0.26 to 0.31 ppm. No quizalofop to < 0.02 ppm was detected in skeletal muscle, and to < 0.05 ppm was detected in any liver or fat sample from any of the 3 doses. Quizalofop was detected in one kidney sample at 0.05 ppm from the 5 ppm dose.

Bovine feed items in this petition include canola meal at 15% in beef and dairy cattle diets which will contribute up to 0.23 ppm potential dietary burden. Bean forage can be in dairy cattle diets up to 60% and up to 30% in beef cattle diets for potential dietary burdens of 0.6 and 1.2 ppm respectively. Bean hay/straw can be fed to beef and dairy cattle; however the petitioner has proposed a feeding restriction. Pea vines/forage can be included in beef cattle diets up to 35% and up to 50% of dairy cattle diets for potential dietary burdens of 0.98 and 1.4 ppm, respectively. Pea hay [88% DM] can be up to 25% in beef cattle diets and up to 60% of dairy cattle diets.

From the feed items in this petition and co-pending petition, 3F4268, all of the feed items in cattle diets can be treated with quizalofop ethyl ester. A theoretical beef cattle diet consisting of canola meal, bean and pea forage, pea hay, and sugarbeet tops which none-the-less maximizes the potential quizalofop exposure of 2.1 ppm. A theoretical dairy cattle diet consisting of pea and bean forage would none-the-less maximize the potential quizalofop exposure at 2.4 ppm. Substitutions of other feed items and varying their percentages in the diets would give a lower dietary quizalofop burden.

The results of the quizalofop ethyl ester bovine feeding study show that finite residues will actually occur in milk and tissues from the feeding of quizalofop ethyl ester treated racs or their processed feed items when Assure® II is used as directed. The established quizalofop and quizalofop ethyl ester tolerance in milk, and in fat, meat, and meat by-products of cattle, goats, hogs, horse, and sheep are adequate and need not be increased from these additional uses.

POULTRY

A poultry feeding study has been submitted and reviewed (ibid). In summary, 3 groups of 20 hens (plus one control group) were dosed encapsulated at 0.1, 0.5, and 5 ppm of quizalofop ethyl ester daily for 28 consecutive days. Eggs were collected daily and after 28 days 3/4 of the hens in each test group were sacrificed and samples of fat, liver, kidney, breast and thigh muscles were collected and analyzed. Tissues from each test group were pooled prior to analysis. The remaining 5 hens were fed a regular poultry diet without quizalofop ethyl ester for an additional 7 days before sacrifice. No quizalofop residues were detected in the liver to <0.05 ppm, and in breast and thigh muscles to <0.02 ppm for any dose administered. From the 5 ppm dose, one kidney sample showed 0.09 ppm quizalofop, 2 fat samples were 0.05 and 0.06 ppm quizalofop, and one egg sample was 0.02 ppm quizalofop.

Poultry feed item in this petition is canola meal at 15% of the diet with a potential poultry dietary burden from the feed item at 0.1 ppm based on the CBTS suggested tolerance.

The results of the quizalofop ethyl ester poultry feeding study show that while it is not possible to establish with certainty whether finite residues will actually occur in eggs and tissues from the feeding of quizalofop ethyl ester treated racs or their processed feed items when Assure® II is used as directed, there is a reasonable expectation for such residues to occur. The established tolerance of quizalofop and quizalofop ethyl ester in eggs, and in fat, meat, and meat by-products of poultry are adequate and need not be changed from these additional uses.

HARMONIZATION OF TOLERANCES

An INTERNATIONAL RESIDUE LIMIT STATUS SHEET (IRL) is attached to this review. Since there are no Mexican or Codex MRLs/tolerances, compatibility is not a problem at this time. Compatibility cannot be

achieved with the Canadian negligible residue type limit at 0.1 ppm as the USA use pattern had findings of real residues above 0.1 ppm.

cc:R.F.,Circu,Reviewer(FDG),PP#5F4545.
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RDI:TPT-1:2/13/96:BrSrSci:RALoranger:2/20/96:ActBrCh:EZager:2/20/96.