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

DATE: September 9, 1981

SUBJECT: PP#9F2203: Metolachlor in Potatoes. Amendment of 7/14/81

FROM: Alfred Smith
Alfred Smith, Chemist
Residue Chemistry Branch
Hazard Evaluation Division (TS-769)

TO: Richard F. Mountfort, Product Manager #23
Fungicide-Herbicide Branch
Registration Division (TS-767)

and

Toxicology Branch
Hazard Evaluation Division (TS-769)

THRU: Charles L. Trichilo, Branch Chief
Residue Chemistry Branch
Hazard Evaluation Division (TS-769)

The amendment contains studies on the metabolism of metolachlor in potatoes. The studies are in response to our memo of 11/16/79 (A. Smith) in which such data were requested.

Conclusions

1. The nature of the residue in animals and plants is adequately understood. The parent compound metolachlor and its metabolites CGA-37913 and CGA-49751 are the significant components of the residues.

2. Adequate analytical methods are available for enforcement purposes.

3(a). Residues of metolachlor in or on potatoes may exceed the proposed tolerance. A tolerance of 0.2 ppm would be more appropriate.

3(b). Residues of metribuzin in potatoes are not likely to exceed the established tolerance (0.6 ppm) due to the tank-mix use.

4. Any residues which might occur in eggs, milk, or meat due to the feed use of potatoes would be adequately covered by the established tolerances [§180.6(a)(2)].

Recommendation

We recommend against the proposed 0.1 ppm tolerance.

TOX considerations permitting we can recommend for a tolerance of 0.2 ppm for combined residues of the herbicide metolachlor, 2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide, and its metabolites determined as 2-[(2-ethyl-6-methylphenyl)amino]-1-propanol and 4-(2-ethyl-6-methylphenyl)-2-hydroxy-5-methyl-3-morpholinone, each expressed as metolachlor, in or on potatoes, if the petitioner were to propose this level.

Nature of the Residue in Potatoes

Potatoes were grown in the greenhouse from potato quarters in soil that had been treated with radiolabelled C^{14}-(phenyl label)-metolachlor (CGA-24705), 2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide at 3.0 lb act/A. Samples of potatoes and potato foliage were collected at intervals of 8, 18, and 21 weeks after treatment and analyzed for residues of metolachlor.

Metolachlor is absorbed, translocated, and metabolized by the potato plant. Metolachlor and its metabolites (free and conjugated) are found in the vines, foliage, and the potato tuber. At 21 weeks, residues in the tuber were characterized and consisted of the metabolites CGA-37913 (2.0%), 2-[(2-ethyl-6-methylphenyl)amino]-1-propanol; CGA-49751(18.1%), 4-(2-ethyl-6-methylphenyl)-2-hydroxy-5-methyl-3-morpholinone; C-25702 (3.6%), 6-ethyl-2-methyl aniline. The residue also consisted of 5 unidentified components which represented, 0.01%, 1.4%, 9.0%, and 9.7% of total radioactivity. (The 5th component was not quantitated). (These identified and unidentified components resulted from acid hydrolysis of the tuber sample). Eight components are noted in the foliage and tuber of the potato by thin-layer chromatography. These components are also noted in plant residues of soybeans and corn which indicates a similar metabolic pattern.

Of the total radioactivity present in tubers and plants, 67-96% was extractable (82-96% extractable in the plants and 67% in the tuber). Of the extractable material, 53-85% was aqueous soluble and 10-16% was organo soluble. (The organo-soluble phase contains free metolachlor and its metabolites containing the intact phenyl moiety; the aqueous soluble phase contains the conjugated metabolites.) Greater than 90% of the radioactivity was accounted for.

The quantity of radioactivity in the potato plant increased with time. Radioactivity in plants increased from 1.05 ppm at 8 weeks to 1.75 ppm at 21 weeks. The tubers had total radioactivity equivalent to 0.13 ppm at 21 weeks. Of this quantity, less than 0.09 ppm could be attributable to free and conjugated residues of metolachlor and its metabolites.

In summary, the nature of the residue in potatoes, corn, and soybeans is similar. The significant components of the residues consist of the parent compound and its metabolites CGA-37913 and CGA-49751.

The samples were analyzed by extraction of the radioactivity, liquid-liquid partitioning, and further clean-up thru column chromatography. The cleaned-up extracts were examined for radioactivity by radiometric techniques. Characterization, quantitation, and identification of the residue components were carried out by thin layer chromatography (TLC), acid hydrolysis, and high performance liquid chromatography (HPLC).

The potato metabolism study resolves the questions raised concerning the nature of the residue in potatoes (memo of 11/16/79, A. Smith, Conclusions 1, 2, 3a). The analytical methods already submitted and reviewed are adequate for enforcement of the proposed potato tolerance of 0.1 ppm.

For residue levels in potatoes, we have discussed the residue data in our 11/16/79 review. Residues range from <0.08 - 0.12 ppm at a 48-60 day PHI and <0.08-0.09 ppm at 60-67 days. The label imposes a 70 day PHI. Our information indicates that new potatoes can be harvested as early as 60 days after planting. The 70 day PHI would not be practical in this case. The residue data at 60-70 days indicate that residues may approach or exceed the proposed 0.1 ppm tolerance at 60 days. We suggest that a higher tolerance of 0.2 ppm be proposed for potatoes.

Metolachlor Metabolism in Lettuce

Lettuce plants were grown to maturity in soil treated with radiolabelled C^{14}-(phenyl ring label)-metolachlor (at 3.0 lb act/A) in the greenhouse. Samples were taken at intervals of 4-7 weeks and analyzed for metolachlor residues. The analytical procedures are similar to those used in the potato study.

Metolachlor is absorbed, translocated, and extensively metabolized by lettuce. In mature lettuce total radioactivity was equivalent to 1.63 ppm metolachlor. Of this quantity, less than 15% could be free metolachlor and its metabolites (organo-souble residues). 78% of the total radioactivity is polar soluble residues. 84-100% of the radioactivity in the plant was extractable.

Characterization studies were performed on the residue in the mature lettuce (7 weeks). Acid hydrolysis of the residue revealed 4 components. 2 components were identified: the metabolites CGA-37913 and CGA-49751. Two components in minor quantities were not identified (4.3% and 6.9%). Overall, the metabolites CGA-37913 (29.8%) and CGA49751 (30.9%) represented 61% of the total plant radioactivity.

These data are similar to results obtained in metabolism studies with corn and soybeans. We can conclude that the nature of the residue in lettuce is similar to that in corn, soybeans, and potatoes.

Meat, Milk, and Eggs

Potatoes may be fed to livestock and can comprise up to 50% of the diet. On this basis, the maximum ingestion level would be 0.1 ppm based on our suggested 0.2 ppm level.

Permanent tolerances are established at 0.02 ppm in eggs, milk, meat, fat, and meat byproducts of livestock. The tolerances are supported by livestock feeding studies in which dairy cows and goats were fed at levels of 0-2 ppm. In view of the ingestion level indicated above, we conclude that any metolachlor residues which might occur in eggs, milk, or meat due to the feed use of potatoes would be adequately covered by the established tolerances [§180.6(a)(2)].

cc: Reading file
Circu
Reviewer
FDA
PP# No.
TOX
EEB
EFB
Randy Watts

TS-769:Reviewer:A.Smith:LDT:X77324:CM#2:RM:810:Date:9/9/81
RDI:Section Head:RJH:Date:8/28/81:RDS:Date:9/2/81