

APR - 1 1980

TO. Product Manager (23)
TS-767

Through. Dr. Gunter Zweig, Chief
Environmental Fate Branch

From: Review Section No. 1
Environmental Fate Branch

Gunter Zweig
RW Cook

Attached please find the environmental fate review of:

Reg./File No.: 100-583, -590, -597

Chemical: Metolachlor

Type Product: Herbicide

Product Name: Dual, Bicep

Company Name: Giba-Geigy

Submission Purpose: Amend registration to allow greater corn rotation
flexibility

EFB# 244

Action Code 22

ZBB Code: Sec 3

Date in: 8-9-79

Date completed: APR - 1 1980

Deferrals To:

☐ Ecological Effects Branch

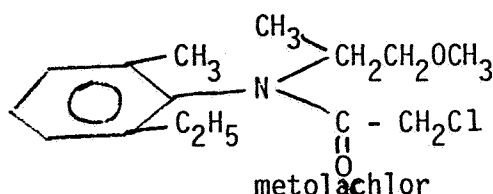
☐ Residue Chemistry Branch

☐ Toxicology Branch

Introduction

This is a review of three Ciba-Geigy submissions for registration amendments which would relax the rotational crop restrictions on cotton and leafy vegetables following the use of the herbicides Dual 6E (ai metolachlor 68%, Reg. No. 100-583) and Dual 8E (ai metolachlor 86%, Reg. No. 100-597) on corn and soybeans, and on cotton following the use of the herbicide Bicep (ais metolachlor 27%, atrazine 21%, Reg. No. 100-590) on corn.

chemical. 2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl) acetamide



past submissions. See metolachlor reviews dated January 6, 1978 and June 24, 1975.

Directions for Use

Apply aqueous dispersions by spraying or center pivot irrigation. Apply preplant (incorporated) or preemergence or early postemergence (surface broadcast). Use 1.5-3.0 lbs ai (metolachlor)/Acre depending on soil type. Do not use on sweetcorn or popcorn. Do not graze or feed forage to livestock. Keep out of any body of water.

Do not apply where runoff is likely or when weather conditions favor drift.

Current Rotational Crop Restrictions. Do not make a second broadcast application.

Dual 6E and Dual 8E

- 1) Corn, peanuts, or soybeans may be planted immediately in the event of crop failure.
- 2) Small grains may be planted 4 1/2 months following treatment.
- 3) Corn, soybeans, root crops, and small grains may be planted the spring following treatment.
- 4) All other crops may be planted 18 months after treatment.

Bicep

- 1) If corn is lost, corn may be replanted immediately.
- 2) Corn and soybeans may be planted the spring following treatment.
- 3) Small grains may be planted 15 months following treatment.
- 4) All other crops may be planted 18 months after treatment.

3. Discussion of Data

The registrant is attempting to fill a data gap - a leafy vegetable rotational crop study - and is seeking a relaxation of the current 18-month rotational crop restriction to the spring following application for leafy vegetables (Dual) and cotton (Dual, Bicep). The new data submitted consist of a labeled rotational crop study with lettuce. The data are divided into two parts corresponding to a fall and spring planting on the same small study plot. The registrant provides a rationale for relaxing the rotational crop restriction on cotton.

A 2 ft x 2 ft outdoor soybean plot was treated with the equivalent of 2 lbs. ai/Acre ring-labeled metolachlor. It is not specified whether the soil, a characterized sandy loam, was treated preplanting or pre- or postemergence of this primary crop. 14 weeks after herbicide application, the soil was mixed and lettuce was planted as a rotation crop. The lettuce was expected to mature in 8-10 weeks, but due to unfavorable weather conditions the crop had reached only 75% maturity (determined by relative head size) by 26 weeks. Control lettuce growth was affected similarly. Harvest was necessary at 26 weeks since bolting conditions began to develop. Immediately after harvest the plot was reseeded with lettuce. Adverse weather conditions again inhibited growth. After 13 weeks the lettuce was about 75% mature, and harvest was necessary at 15 weeks (85% mature) due to the onset of bolting conditions. Plant and soil samples were extracted and analyzed for radioactivity by previously-reviewed LSC methods.

The observed residue levels in soil were as follows:

time from application of 2 lb/A ¹⁴ C-Metolachlor (weeks)	<u>14</u>	<u>30</u>	<u>41</u>	<u>54</u>	<u>56</u>
0-3"	0.36*	0.32	0.34	0.18	0.22
3-6"	0.14	0.11	0.15	0.13	0.18
6-9"	0.03	0.07	0.07	0.07	0.11
% 0-3" "bound"	71	77	77	91	95

*ppm as metolachlor

The level of total soil residues (0-9") remained fairly constant over the length of the study, with minor leaching observed. A progressively smaller fraction of the soil residues were extractable as a function of time.

Lettuce residues are summarized as follows:

Week from Application	Fall Seeding <u>14</u>	Fall harvest ^① Spring seeding <u>41</u>	<u>54</u> ^②	Spring Harvest ^③ <u>56</u>
lettuce	—	0.025*	0.144	0.062

*ppm as metolachlor

- ① 75% mature
- ② 75% mature
- ③ 85% mature

The residue level found in the 26-week old fall planting lettuce (75% mature) was 0.025 ppm. The levels observed in the second crop (spring planting) were 0.144 ppm in the 13-week old (75% mature) sample and 0.062 ppm at final harvest (15 weeks old, 85% mature).

Only the 54-week plant sample was considered to contain a sufficiently high level of residues for further characterization, which consisted of partitioning the radioactivity into organic, polar, and non-extractable fractions (method not specified, but presumably is chloroform-methanol/water fractionation). The organic, polar, and nonextractable fractions contained 21, 73, and 12% of the activity, respectively. No further identification was attempted.

The rationale advanced for relaxing the restriction on cotton as a rotational crop is based on an extrapolation of the results from previously-submitted rotational crop studies. In both labeled and non-labeled studies of wheat, oats, and soybeans as rotation crops, mature grain contains either nondetectable or very small amounts of metolachlor residues. Higher levels are found in plant foliage. The registrant therefore predicts that the plant portion and seed hulls, but not cottonseed, will contain detectable levels of residues when cotton is grown as a rotation crop in the spring following the treatment of corn or soybeans with metolachlor.

Conclusions

It is not clear why the second crop of lettuce contained a higher residue level than the first crop--0.144 ppm compared to 0.025 at 75% maturity. The reduction in residue level from 0.144 to 0.062 ppm over the two week period (week 13-15) before harvest in the spring crop cannot be explained by simple growth dilution since there was only a slight increase in head size (85:75) over this period. It is therefore uncertain whether the reduction in residue level occurs as a function of time from planting or as a function of relative maturity. If the former is true, levels in normal mature lettuce (8-10 weeks under these conditions) could be higher than the residue level observed here.

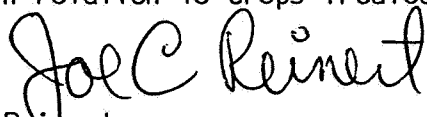
From previous work with other crops (corn has been studied in the most detail), it is expected that parent metolachlor and unconjugated metabolites (40172 and 37913 are the principal metabolites identified in corn--see appended chart for structures) will partition into the chloroform phase while glutathione conjugates of metolachlor and metabolites will partition into the aqueous methanol phase (conjugates of 41507 and 42446 have been identified in corn). Assuming a total residue level of 0.144 ppm, and since 73 and 21% of the activity is observed to partition into the polar and organic fractions respectively, the expected levels in lettuce will be 0.104 ppm for the various conjugates and 0.04 ppm for metolachlor and unconjugated metabolites.

It is noted that no attempt was made to identify the degradation products in lettuce (or to compare the metabolite pattern with the more extensively studied corn system as was done with soybeans) and that the study was carried out on a very small plot at less than the maximum label rate of 3 lb/A.

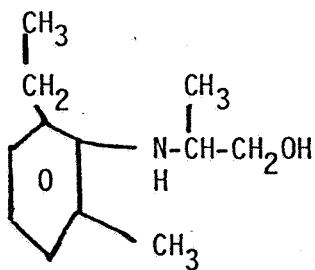
Recommendations

1. EFB defers to TB for their comments relative to the anticipated levels of metolachlor and its metabolites in rotational lettuce following the use of Dual.
2. EFB concurs with relaxing the rotational crop restriction for cotton following the use of Dual or Bicep since residues are not observed in rotational soybeans, a similar crop.

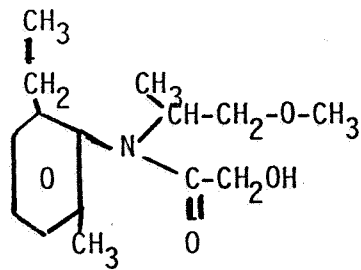
Note to RCB: Based on the studies of rotational soybeans, residues levels of up to 0.06 ppm can be expected in the foliage of cotton grown in rotation to crops treated with 2 lb a.i./A metolachlor.



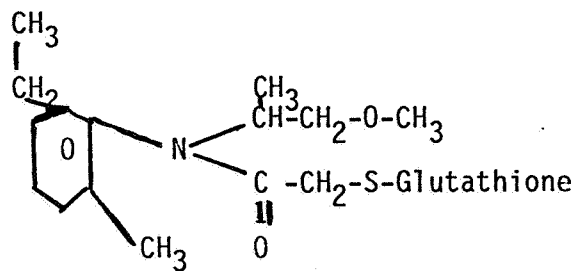
Joe C. Reinert
Review Section #1
EFB



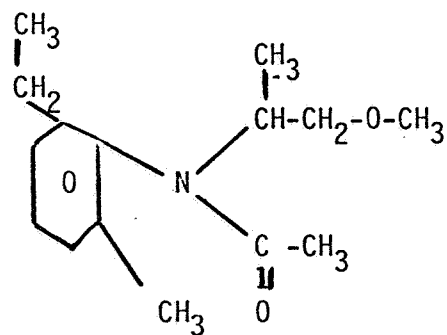
CGA-37913



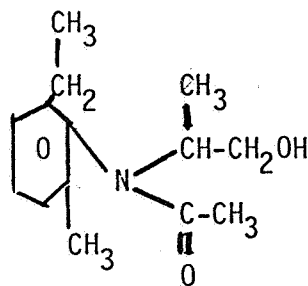
CGA-40172



CGA-41638
(glutathione conjugate of
metolachlor)



CGA-41507



CGA-42446