JAN 22 1982

Date Out EFB: JAN 22 1982

To: Product Manager 23 Mountfort
TS-767

From Dr. Willa Garner
Chief, Review Section No. 1
Environmental Fate Branch

Attached please find the environmental fate review of:

Reg./File No.: 100-597

Chemical: Metolachlor

Type Product: Herbicide

Product Name: Dual 8E

Company Name: Ciba Geigy

Submission Purpose: Review exposure study and exposure estimates use on flak, sunflower, cotton, corn, seed pod, potatoes

ZBB Code: 3(c)(7)

ACTION CODE: 336

Date in: 11/17/81

EFB # 60-65

Date Completed: JAN 22 1982

TAIS (level II)	Days
67	5

Deferrals To:

____ Ecological Effects Branch

x Residue Chemistry Branch

x Toxicology Branch

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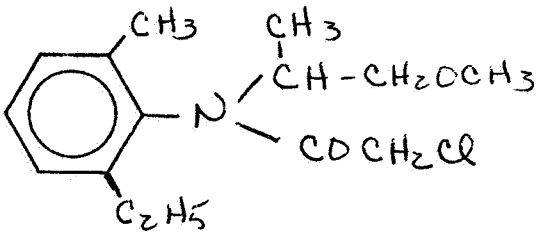
1.0 INTRODUCTION

Ciba-Geigy has submitted exposure estimates for mixer/loaders and applicators during use of the herbicide metolachlor. EFB has been requested to review these estimates.

2.0 Dual 8E: metolachlor



2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methyl-ethyl)acetamide

3.0 DISCUSSION

Potential mixer/loader and applicator exposures to metolachlor were calculated using exposure data for Supracide 2E used on alfalfa. It is assumed that an open mixing/loading system is used and that protective clothing protects. Exposure is primarily to head, neck, and hands.

In order to properly review the exposure assessment for Dual 8E, it was first necessary to review the worker exposure study for the surrogate, Supracide, which was was submitted along with the Dual exposure estimates.

EFB has only one major difficulty with the Supracide study: the sampling number is small. Only one mixer/loader study with open and closed systems was completed. Two applicator studies were done, each following a mixer/loader study. EFB believes that the statement "very little, if any, actual difference existed between the closed and open systems in this study" is premature. Replicates of each type mixer/loader study are first required. Notwithstanding this difficulty, the Supracide study can be considered to provide useful exposure data.

The data generated in the Supracide study for mixer/loader and applicator exposure can be used to calculate exposure estimates for metolachlor. Appendix II which contains the calculations submitted by Ciba-Geigy for estimating potential exposure is attached.

3.1 Comments on Metolachlor Exposure Assessment

EFB finds the general approach used to estimate exposure to be acceptable. However, EFB expands upon the assessment provide by the registrant. Ciba-Geigy calculates a weighted average for the exposure time to mixer/loaders and applicators. EFB believes that a range of potential exposures based on exposure times of farmers and custom applicators is useful since the farmer is expected to spend three hours mixing/loading where as a custom applicator may spend up to 45 hours mixing/loading. (See Table II.) The weighted average exposure time was determined to be 11.2 hours.

Simarlarly, the weighted average for applicator exposure time is 43.9 hours but a farmer may apply Dual for only 11.7 hours but a custom applicator may apply the pesticide for up to 176 hours. (See Table III.) Exposure estimates are then calculated to reflect the range of exposure times found for both mixer/loaders and applicators.

3.2 Calculations

These calculations do not assume a percent skin absorption. This factor is left to the risk assessor in Tox Branch to determine.

Mixer/Loader
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a. Hourly Exposure

0.046 mg/hr

b. Yearly Exposure

for the farmer:

0.046 mg/hr x 3 hr/yr = 0.14 mg/hr

for the custom applicator:

0.046 mg/hr x 45 hr/yr = 2.1 mg/yr

c. Lifetime Daily Exposure

for the farmer:

0.14 mg/yr x yr/365 day x 40 yr/70 yr = 0.00022 mg/day

for the custom applicator:

2.1 mg/yr x yr/365 day x 40 yr/70 yr = 0.0033 mg/day

d. Recalculated Ciba-Geigy time-weighted average mixer/loader Lifetime Daily Exposure omitting dermal absorption factor:

0.52 mg/yr x yr/365 day x 40 yr/70 yr = 0.00081 mg/day

Applicator

a. Hourly Exposure

0.87 mg/hr

b. Yearly Exposure

for the farmer:

0.87 mg/hr x 11.7 hr/yr = 10.2 mg/yr

for the custom applicator:

0.87 mg/hr x 176 hr/yr = 153 mg/yr

c. Lifetime Daily Exposure

for the farmer:

10.2 mg/yr x yr/365 day x 40 yr/70 yr = 0.016 mg/day

for the custom applicator:

153 mg/yr x yr/365 day x 40 yr/70 yr = 0.24 mg/day

d. Recalculated Ciba-Geigy time-weighted average applicator Lifetime Daily Exposure omitting dermal absorption factor:

38.1 mg/yr x yr/365 day x 40 yr/70 yr = 0.06 mg/day

3.3 Summarizing Exposure Estimates

Farm worker	Hourly Exposure	Yearly Exposure	Lifetime Daily Exposure
	mg/hr	mg/yr	mg/day
Farmer			
Mixer/Loader	0.046	0.14	0.00022
Applicator	0.870	10.2	0.016
Total	0.92	10.	0.016
Custom Applicator			
Mixer/Loader	0.046	2.1	0.0033
Applicator	0.870	153.	0.240
Total	0.92	155.	0.24
Adjusted Time-Weighted Average Exposure Times			
Mixer/Loader	0.046	0.515	0.00081
Applicator	0.870	38.1	0.060
Total	0.92	39.	0.061

3.4 Range of Exposure by Farmworker Function

Yearly Exposure

Mixer/Loader	0.14 - 2.1	mg/yr
Applicator	10. - 153.	mg/yr
Total	10. - 155.	mg/yr

Lifetime Daily Exposure

Mixer/Loader	0.00022 - 0.0033	mg/day
Applicator	0.016 - 0.24	mg/day
Total	0.016 - 0.24	mg/day

4.0 RECOMMENDATIONS

- o EFB defers to Tox Branch the estimates of exposure generated for a risk assessment to be compared with that generated in Appendix III by Ciba-Geigy.
- o EFB defers to Residue Chemistry Branch Appendix I which deals with dietary exposure.

Richard V. Moraski
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Environmental Fate Branch

APPENDIX II

POTENTIAL MIXER/LOADER AND APPLICATOR EXPOSURE TO DUAL® 8E DURING TREATMENT - PROJECTIONS FOR 1983

A. Mixer/Loader Exposure

1. Use Pattern Information for Dual

   a. Maximum Application Rate is 3 lbs. in 10 gallons water/acre.

   b. Application Frequency - 1 application/year.

   c. Average Size of treated field is 175 acres (see Table I and Table IV).

   d. Total Estimated Acres treated with Dual 1983 (all crops) 24.8 million.

   e. System for Loading - open.

   f. System for Application - ground boom sprayer - 300 gallon tank.

2. Assumptions

   a. Average treated area is 175 acres.

   b. Average sprayer has 300 gallon tank.

   c. One load treats 30 acres.

   d. Loading and mixing operation takes 30 minutes for one 30 acre treatment.

3. Mixer/Loader Exposure Time

   11.2 hours/ML*/Year - See Table II for calculations.

4. Mixer/Loader Exposure - Open System

   a. Base exposure to Dual 8E on exposure data for Supracide® 2E used on alfalfa (EIR-81011 - attached). Surrogate approach for open mixing/loading system and for a liquid formulation and wearing protective clothing.

*ML = Mixer/Loader

Appendix II (Continued)

b. Supracide 2E was applied at 1 lb. ai/acre/20 gallons of water. Since Supracide has 2 lbs. ai/gallon, 0.5 gallons of 2E was handled (loaded and mixed) for every acre treated.

c. The amount of Dual 8E handled per acre treated will be 0.375 gallons. Dual has 8 lbs. ai/gallon; 3 lbs. ai/acre or 3/8 = 0.375 gallons/acre.

d. Supracide 2E is 24% active ingredient. Dual 8E is 86.4% active ingredient.

e. A "handling correction factor" (HCF) for exposure to the active ingredient in the liquid concentrate Dual relative to Supracide can be calculated:

$$\text{HCF} = \frac{0.375 \text{ gal./A Dual}}{0.5 \text{ gal./A Supracide}} \times \frac{86.4\%}{24\%} = 2.7$$

f. The exposure to Supracide 2E using an open system was 0.017 mg/ML/hour (EIR-81011)

correcting for Dual (HCF)

0.017 mg/ML/hour x 2.7 = 0.046 mg/ML/hour

g. Thus, mixer/loader exposure to Dual is:

0.046 mg/L/hour x 11.2 hours/ML/year = 0.515 mg/ML/year.

h. Assume 40 year working span/70 year life expectancy = 40 yrs./70 yrs.

0.515 mg/ML/year ÷ 10% dermal absorption ÷ 365 days/year x 40 yrs./70 yrs.

= **0.000086 mg/day**

Appendix II (Continued)

B. Applicator Exposure - Dual

1. Assumptions

a. Average treated field size is 175 acres.

b. Application frequency - 1 application/year.

c. One load treats 30 acres and this takes 2 hours; thus, it takes

$\frac{175}{30} \times 2 = \underline{11.7}$ hours to treat 175 acres.

d. A custom applicator can treat 15 farms/year.

2. Applicator Exposure Time is 43.9 hours/App*/year (see Table III for calculations). 11.7 hrs farmer 176 hrs custom appl

3. Applicator Exposure

a. Base exposure to Dual 8E on exposure data for Supracide 2E on alfalfa (EIR-81011). Surrogate approach for liquid concentrate and ground application using a boom sprayer.

b. Supracide 2E was applied at 1 lb. ai/acre/20 gallons of water (0.05 lb. ai/gallon). Dual applied at 3 lbs./acre/10 gallons of water (0.3 lb. ai/gallon).

c. A "concentration correction factor" (CCF) for the difference in concentration of Dual and Supracide in the application spray can be calculated:

$$CCF = \frac{0.3 \text{ lb. ai/gallon spray Dual}}{0.05 \text{ lb. ai/gallon spray Supracide}}$$

$$CCF = 6.0$$

*App = Applicator

Appendix II (Continued)

d. The exposure to Supracide 2E during application to alfalfa was 144.5 µg/hour (EIR-81011)

correcting for Dual using the CCF

144.5 µg/App/hour x 6.0 = 867 µg/App/hour = 0.867 mg/App/hour

e. Thus, applicator exposure to Dual is:

0.867 mg/App/hour x 43.9 hours/App/year = 38.1 mg/App/year

f. Assume 40 year working span/70 year life expectancy = 40 yrs./ 70 yrs.

38.1 mg/App/year ÷ ~~10~~% dermal absorption ÷ 365 days/year x 40 yrs./70 yrs.

= 0.005965 mg/App/day

[illegible]

Table I: Projected Market Data for 1983

Crop	Total Acres (Million)
Corn	14.5
Beans	6.0
Sorghum	4.0
Sunflower	0.05
Pod Crops	0.06
Potatoes	0.06
Cotton	0.08
Sweet Corn & Popcorn	0.02
Peanuts	0.04
Total	24.81

Median size of farm will be 150-200 acres for 80% of all crops (corn and soybeans). See Table V.

$$\text{Average farm size} = \frac{150 + 200}{2} = 175 \text{ acres}$$

$$\text{Average number of applicators} = \frac{24.81 \times 10^6 \text{ Acres Treated}}{175 \text{ Acres}} = 141{,}771$$

Custom Applied - 19.6%
Self Applied - 80.4%

Table II: Dual Mixer/Loader Exposure Time

1. Applied once each year.

2. 80.4% of acreage is self applied.

3. 19.6% is custom applied.

If a farmer applies once each year and takes 0.5 hours to mix for 30 acres, the total amount of time mixing/loading would be $\frac{175}{30} \times 0.5 = 2.9 \approx 3$ hours.

3 hours/mixer ave. farm/year

A custom applicator can apply to about 15 farms/year (each farm 175 acres). Exposure to custom mixer/loaders for these 15 applications is 3X15 = 45 hours.

Total exposure to mixer/loaders is a weighted average:

(3 hours/ML/year x 80.4%) + (45 hours/ML/year x 19.6%)
= 2.4 + 8.8 = <u>11.2 hours</u>/mixer-loader/year.

Table III: Dual Applicator Exposure Time

1. Applied one each year.

2. 80.4% of acreage is self applied.

3. 19.6% of acreage is custom applied.

If a farmer applies once each year and it takes 4 minutes to cover 1 acre, the total time to apply Dual to 175 acres is 4 min. X 175 acres ÷ 60 min/hour = 11.7 hours.

A custom applicator can apply to about 15 farms/year (each farm 175 acres). Exposure to custom applicators for these 15 applications is 11.7X15 = 176 hours.

Total exposure to applicators is a weighted average:

(11.7 hours/App/year x 80.7%) + 176 hours/App/year x 19.6%) = 9.44 + 34.5 = 43.9 hours/App/year.

Table IV: Summary Dual 8E Exposure

Worker	Exposure (µg/day)
Mixer/Loader	0.1411
Applicator	10.4380
Total	10.5791