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TITLE: Evaluation of Pesticide and Herbicide use in Farming Operations

KEYWORDS: Herbicides, 2,4D (prometon), Roundup (glyphosate), Temik@15G (aldicarb)

QUESTION: How should a CP evaluate property that was used for farming anytime during the 1960s through the 1990s for the uses of pesticides and herbicides?

ANSWER: The primary herbicides used in the 1960's and 1970's would likely include 2,4D (prometon). From the mid 1970's to the present, the predominant herbicide used has been Roundup (glyphosate) due to its lower application quantity per acre, hence its lower cost. Toxicity and application data for these materials are listed in Table 1. IRIS data were taken from the US EPA on-line data base on April 16, 1997. The values for the Region IX Preliminary Risk Goals (PRGs) were taken from the August 6, 1996 document. Degradation times are from the Herbicide Handbook, 4th edition, 1979.

With regard to the use of pesticides, Temik@15G (aldicarb), would be effective for insects such as leaf hoppers, Mexican beetles, and thrip. This material is labeled by the manufacturer for application on soybeans. The economics of aldicarb application preclude large scale use of this material because it is expensive and that the pests described above may not present a significant crop problem in every county in Ohio.

Table 1. Herbicide Data

Herbicide	Normal Application Rate	RfD mg/kg/day¹	Preliminary Remediation Goals²	Degradation time³
prometon	10-30 lb./acre	0.015	980 mg/kg	Several years
glyphosate	1-1.5 lb./acre	0.01	6,500 mg/kg	t _{1/2} <60 days

¹ From IRIS database, as of April 16, 1997

² From Region IX Preliminary Remediation Goals Data, August 1, 1996

³ Herbicide Handbook, Fourth Edition, Weed Science Society of America, (1979)

EXAMPLE:

In a typical acre, the tilled soils (8 inches) have a weight of 1100 tons. At an application rate of 1 pound per acre, the estimated concentration of herbicide in soil is about 0.5 ppm. Calculations were prepared for a site in Delaware County, Ohio to estimate the residual pesticide quantities, the calculations in assumed the following:

- A 5 year half-life of degradation for prometon. The Herbicide Handbook indicates disappearance in several years, so this assumption is very conservative.
- Application each year at the maximum rate per acre.
- A tillage depth of 8 inches.
- Use of prometon from 1960 to 1974, followed by use of glyphosate from 1975 through 1995, and no application since 1995. The data show that residual concentrations (expressed as mass fraction in the appendix) are substantially less than those which US EPA indicates as preliminary remediation goals (PRGs) in the August, 1996 Region IX table.

The following formula was used for the calculations:

$$R_k = [(A/W)(e^{-0.693(i/t)})] [e^{-0.693 (n/t)}]$$

Where:

A = application rate: lb/acre

R_k = residual pesticide concentration

n = number of years of pesticide application

i = 1

w = avg. weight of soil/acre at a depth of 8 inches

= (1100 tons x 2000 lbs/ton)

$e^{-0.693(i/t)}$ = decay constant for half life,(i/t)

$e^{-0.693 (n/t)}$ = decay constant for half life x n

SUMMARY:

2,4D (prometon) was the primary herbicide used in Ohio during the 1960's and 1970's. From the mid 1970's to present, Roundup (glyphosate) has been the predominant herbicide. Temik@15G (aldicarb), is effective for leaf hoppers, Mexican beetles, and thrip, and is labeled by the manufacturer for application on soybeans. The CP and/or volunteer should assess (if possible) the previous uses of the agricultural land to help determine which herbicides and pesticides may have been used on the property. Contacting the county USDA Farm Service Agency office is recommended to obtain information

with regard to the types of soils, crops planted, and the types of pesticides and herbicides that were most likely to be used in the county where the VAP property is located.

OHIO EPA
CONTACT:

For any questions concerning this issue, please contact the VAP central office at (614) 644-2924.