REPORT ON MONITORING FOR ALACHLOR IN WELL WATER:

I. SAMPLING IN THE SACRAMENTO VALLEY

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INTRODUCTION

Alachlor, trade name Lasso^{R}, was registered with the U.S. Environmental Protection Agency (EPA) by Monsanto in 1969 for use as a preplant, preemergence and early post-emergence herbicide. It is either broadcast or incorporated into the soil. In California alachlor is used to control annual grasses and some broadleaf weeds primarily in corn and dry beans, with some use in milo and sunflowers. The maximum allowable application rate is 3 lbs. active ingredient per acre in corn and 2-1/2 lbs. per acre in dry beans (Monsanto, 1985).

Alachlor residues were reported in ground water in Nebraska in 1978 (Spalding et al., 1980). In addition, alachlor has been found in surface waters in Ohio, Iowa, and Maryland (Cohen et al., 1984). Laboratory animal feeding studies of 5 months' to 2 years' duration have shown that alachlor produces tumors in rats and mice at levels of 42 and 26 mg/kg/day respectively, and investigations of applicator exposure to alachlor indicate that more stringent protective measures may be needed (EPA, 1984).

In November 1984 the EPA issued a Registration Standard on alachlor and in January 1985 alachlor was placed into special review. As a result of the EPA action and the possible danger to public health, the California Department of Food and Agriculture (CDFA) began reevaluation of alachlor in early 1985.

In order to determine whether or not residues of alachlor were present in ground water in California, well water samples were collected in 1985 in Yolo and Solano counties and analyzed for alachlor. These counties were chosen for sampling because corn was produced on over 40,000 acres in each county in 1982. In addition, the highest reported use of alachlor in 1983 occurred in Yolo and Solano counties (Simmons, 1985).

MATERIALS & METHODS

Sampling locations were selected based on their proximity to areas in which alachlor had been applied in 1983 and 1984 and on the availability of wells suitable for sampling. Wells were located from well logs or through County Agricultural Commissioners' offices, and permission to sample was obtained from well owners. Prior to sampling, each well was pumped for a minimum of 10 and a maximum of 30 minutes in order to flush out standing water. Whenever possible the sample was taken from a Schrader valve or other sampling port located between the well and the storage tank. If no sampling port existed the sample was taken from a faucet close to the storage tank. Teflon or stainless steel tubing was used to direct water into the sample bottles. Bottles were sealed with aluminum foil, capped, and stored on wet ice for transport to the laboratory. Each sample was accompanied by a chain of custody, which was signed by each person handling the sample through all stages from bottle preparation to final analysis. Samples were stored in a refrigerator at $4^{o}C$ until they could be analyzed.

The Yolo County well samples were collected in July 1985 as part of EHAP's survey of migrant worker camp and rural school wells in the county (Sava, 1985a). In September 1985 samples from 6 wells located in sections with reported alachlor use were chosen to be analyzed for alachlor and metolachlor residues by California Analytical Laboratories (CAL) in West Sacramento. Samples were analyzed for presence of metolachlor (Dual^{R}, Ciba-Geigy) because it is chemically similar to alachlor and its use is superceding alachlor use in some areas.

Water samples were collected from eight wells in Solano County on September 25 and 26, 1985. All were domestic wells with cement seals. Perforations in well casings occurred at different depths in each of the wells (Table 1). All samples were sent to CAL and analyzed for alachlor and metolachlor using EPA Method 608 (liquid-liquid extraction and analysis by gas chromatograph).

RESULTS AND DISCUSSION

Neither alachlor nor metolachlor was detected in any of the 14 well water samples from Yolo and Solano Counties (Table 1). Except for one well located near the Sacramento River levee, all wells sampled were located in areas of medium to heavy textured soils containing relatively high percentages (>50%) of silt and clay. All of these soils are deep (>5 feet) alluvial soils with dark surface horizons, indicating presence of organic matter. The permeability of these soils is moderate to slow, with high water holding capacity (Soil Conservation Service, 1972 and 1977) (Table 2).

A survey of Yolo County wells conducted by the Environmental Hazards Assessment Program (EHAP) of CDFA in June 1985 resulted in the discovery of alachlor at a level of 3 ppb in one well (Sava, 1985). The well was in poor repair and there was evidence of leakage of water from the ground surface into the well head. Since that time a new pump and pressure switch have been installed, the cracked cement pad replaced, and other plumbing problems repaired. The well was resampled on September 25, 1986, and presence of alachlor at 1.5 ppb was confirmed. Another sample should be taken in 1986 to determine whether the contamination problem has been solved. This well was not included in the present study because it did not fulfill the requirement that wells be sealed against surface contamination.

The Central Platte Valley in Nebraska, a region of irrigated agriculture where alachlor has been found in ground water, consists of 5 to 7 meters of sandy soil overlying a thick unconfined aquifer (Wehtje et al., 1981). In contrast, most of the corn-growing areas in Yolo and Solano Counties are high in clay and organic matter near the soil surface. Previous studies of pesticide mobility and degradation (Wilkerson et al., 1985; Caro, 1976) have indicated that organic matter, clay content and soil moisture content each play a role in determining potential for pesticide leaching. Given the characteristics of Yolo and Solano County soils, it is not surprising that alachlor residues were absent from well water samples. In the future, wells located in regions of coarse soils will be sampled and analyzed for alachlor and metolachlor. Corn and bean producing areas of this type occur in Merced and Fresno Counties.

TABLE 1. SUMMARY OF WELL SAMPLE DATA

County	Sample #	Well Location	Casing Perforations	Soil Type	Alachlor Concentration	Metolachlor Concentration
1. Yolo	48	T. 10N., R.1W., Sec. 27	-	Capay silty clay	ND[1]	ND[1]
2. "	109	T. 10N., R.2E., Sec. 11	-	Langenour or Tyndal very fine sandy loam	"	"
3. "	123	T. 7N., R.3E., Sec. 6	-	Brentwood silty clay loam	"	"
4. "	144	T. 6N., R.4E., Sec. 30	-	Sycamore complex (sil, sicl)	"	"
5. "	151	T. 10N., R2E., Sec. 33	-	Yolo silt loam	"	"
6. "	174	T. 11N., R2E., Sec. 21	-	Yolo silt loam	"	"
7. Solano	131	T. 6N., R.1W., Sec. 24	40'-50' 80'-100'	Yolo or Brentwood loam	"	"
8. "	133	T. 6N., R.1E., Sec. 14	254'-268'	Capay silty clay or clay	"	"
9. "	135	T. 7N., R.1E., Sec. 22	207'-219'	Yolo silty clay	"	"
10. "	137	T. 8N., R.2E., Sec. 34	231'-243'	Yolo silty clay loam	"	"
11. "	139	T. 7N., R.1E., Sec. 34	27'-39'	Capay silty clay loam	"	"
12. "	141	T. 7N., R.2E., Sec. 20	120'-140' 221'-241'	Yolo loam	"	"
13. "	143	T. 7N., R.1E., Sec. 11	150'-170' 180'-200'	Capay silty clay loam	"	"
14. "	146	T. 7N., R.2E., Sec. 19	100'-140' 200'-220'	Brentwood clay loam or Capay clay	"	"

1. ND=None Detected at MDL of 0.1 ppb.

TABLE 2. SOILS OF YOLO AND SOLANO COUNTIES

Soil Type	Surface Texture	Subsurface Texture	Soil Depth	Permeability	Available Water Holding Capacity
Brentwood clay loam	cl	cl	>5'	Moderately slow	High
Brentwood silty clay loam	sicl	sicl	>5'	Moderately slow	High
Capay clay	c	cl+	>5'	Slow	High
Capay silty clay loam	sicl	sicl	>5'	Slow	High
Langenour very fine sandy loam	vfsl	vfsl, fsl, sl (stratified)	>5'	Moderately rapid	Moderate
Sycamore complex	30% sil -	70% sicl	>5'	Moderately slow to slow	Medium to high
Tyndall very fine sandy loam	vfsl	vfsl, fsl, sl (stratified)	>5'	Moderately rapid	High
Yolo loam	l	l	>5'	Moderate	High
Yolo silt loam	sil	sicl, sil	>5'	Moderate to moderately slow	High
Yolo silty clay loam	sicl	cl-, l	>5'	Moderately slow	High

c = Clay
cl = Clay loam
sic = Silty clay
sicl = Silty clay loam
cl+ = Heavy clay loam
cl- = Light clay loam

l = Loam
sil = Silt loam
sl = Sandy loam
fsl = Fine sandy loan
vfsl = Very fine sandy loam

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