

Survey of Potatoes Grown in New York State for Aldicarb Residues

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Aldicarb [2-methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime] (Temik) is a broad-spectrum pesticide registered for use on a wide variety of agricultural crops. A single application, in the case of potatoes at the time of seed planting, protects the crop for the entire season against a variety of insects, mites, and nematodes.

Upon weathering, aldicarb is oxidized to aldicarb sulfoxide and aldicarb sulfone (Kuhr and Dorrough 1976). When field-grown potatoes were exposed to in-furrow treatment with aldicarb, the expected sulfoxidation products were found but no parent compound was extracted from any portion of the plants (Andrawes et al. 1971). The tolerance in the United States for residues of aldicarb and its metabolites in potatoes is 1 ppm (Code of Federal Regulations 1983).

As part of the Food and Drug Administration's (FDA) ongoing pesticide residue surveillance program, the FDA Buffalo District conducted a survey of potatoes grown in New York State in 1982 to determine carbamate insecticide use and residue content after harvest. The residue of particular interest was aldicarb. This insecticide is systemic, its metabolites are stable, and its application to potatoes is recommended for a variety of insect pests. Due to the contamination of groundwater with aldicarb on Long Island, the manufacturer requested from the Environmental Protection Agency (EPA) an amendment to its product label banning the use of aldicarb in Suffolk County, NY. This was granted (Zaki et al. 1982).

MATERIALS AND METHODS

Fifty samples, representing potatoes grown in four areas of New York State, were collected. Interviews with growers were obtained for nearly all samples. With the exception of potatoes grown on Long Island, all growers indicated that granular aldicarb had been applied at rates between 13 and 20 lb/acre at planting. No further applications of aldicarb were made.

Each sample, approximately 20 lb, was collected after harvest and represented one potato variety from each grower. The

samples were analyzed using the method of Krause (1980), which is capable of determining the N-methylcarbamate insecticides (aldicarb, bufencarb, carbaryl, carbofuran, methiocarb, methomyl, and oxamyl) as well as four related carbamate metabolites (aldicarb sulfone, aldicarb sulfoxide, 3-hydroxy carbofuran, and methiocarb sulfoxide). The method involves methanol extraction with high performance linear gradient separation of the residues, on-line derivatization, and post-column fluorometric detection.

Recovery data indicated complete extraction of all residues except for aldicarb sulfoxide, which is a very polar metabolite. Recoveries of the sulfoxide consistently averaged about 50%.

Five samples of potatoes, representing two varieties all grown on the same farm, contained significant residues of aldicarb sulfoxide and aldicarb sulfone and were analyzed using the pesticide petition method submitted to the EPA for an aldicarb tolerance on potatoes (Union Carbide Corp. 1973). In this method, aldicarb and its metabolites are extracted and simultaneously oxidized to aldicarb sulfone by adding peracetic acid to the acetone-chloroform extracting solvent. After Florisil column cleanup, the aldicarb sulfone is determined by gas chromatography, using either a nitrogen/phosphorus or flame photometric detector in the sulfur mode. The method is specific for aldicarb and its carbamate metabolites, and the recovery of their residues from potatoes is complete.

RESULTS AND DISCUSSION

Table 1 shows the results for the 50 potato samples analyzed using the Krause (1980) carbamate procedure. Twenty-three samples were positive for aldicarb sulfoxide and/or sulfone. Parent aldicarb was not detected as a residue. No other carbamate residues were found.

Table 1. Aldicarb Residues Found in Potatoes, Using Krause Procedure

New York State Location	Soil Type	No. of Samples	No. Positive for Aldicarb	Range (ppm)	
				Aldicarb Sulfoxide	Aldicarb Sulfone
Western	Loam and Gravelly Loam	5	4	0.04-0.26	0.04-0.07
North Central	Muck	21	5	Trace-0.14	Trace-0.14
North Eastern	Sandy	17	14	0.02-0.48	Trace-0.20
Long Island	Sandy	7	0	0	0

Aldicarb use on potatoes is not permitted on Long Island, and none was found in the 7 samples examined.

The highest residue levels were found in potatoes grown north of the Adirondack Mountains and south of the St. Lawrence River. This area has rocky-sandy type soil and had experienced very dry weather in the summer of 1982. This may have contributed to the slower aldicarb decomposition on these samples.

Since the Krause (1980) procedure gives only partial recovery of aldicarb sulfoxide, the sample containing 0.48 ppm was reanalyzed using the petition method (Union Carbide Corp. 1973). The petition method detected a total of 1.2 ppm aldicarb sulfone. An investigation of this grower revealed that he had raised two varieties of potatoes in 1982: Chippewas, which are harvested in late summer, and Katahdins, which are harvested in the fall. Subsequent samples of this farmer's crop showed that the Chippewa potatoes contained an average of 1.5 ppm aldicarb and the Katahdins an average of 0.80 ppm. The Chippewa potatoes were withheld from sale and will be used as seed potatoes for next year's crop.

The results from the potato samples collected in the north central part of New York indicate aldicarb decomposition with moisture. The farms in this area are located on wet muck type soil, and although aldicarb application rates were the same as in northeastern New York, the incidence and amount of residue found were much less. Bull et al. (1970) reported that aldicarb is easily leached through wet soil shortly after its application.

REFERENCES

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Received July 14, 1983; Accepted September 20, 1983.