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Field Persistence Studies with Triallate and Trifluralin Both Singly and in Combination with Chloramben

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The soil incorporated herbicides triallate [S-(2,3,3-trichloroallyl)diisopropylthiocarbamate] and trifluralin (α, α, α,-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine) are used extensively in western Canada for the control of wild oats and other weeds in a variety of crops. For the control of wild mustard and stinkweed in sunflowers, soil incorporated treatments of chloramben (3-amino-2,5-dichlorobenzoic acid) in combination with trifluralin are recommended (ANON 1981) and currently, similiar tank-mix applications of triallate and chloramben are being used as soil incorporated treatments for the control of weeds in pulse and oilseed crops.

Field persistence studies have shown that both triallate and trifluralin are carried over in Saskatchewan soils to the following crop year (SMITH 1971, 1972; SMITH AND HAYDEN 1976). The effects of additional herbicides on the breakdown of a particular herbicide are important, and a recent review (HURLE and WALKER 1980) has summarized evidence to show that the soil persistence of a number of herbicides may be changed when used in combination with other chemicals.

The work to be described was undertaken using a small plot technique to study the persistence of triallate and trifluralin, both singly and in combination with chloramben, to ascertain whether the chloramben has any effect on the loss of triallate and trifluralin from field soils at two Saskatchewan locations.

MATERIALS AND METHODS

Soils. The physical characteristics and composition of the heavy clay and sandy loam field soils have already been reported (SMITH 1978).

Persistence studies. Commercial formulations of the various chemicals were diluted with methanol, and individual solutions prepared containing chloramben (4 mg/mL), triallate (3 mg/mL) and trifluralin (1.5 mg/mL).

At the two Saskatchewan sites, 3 replicate plots were treated with each of the following herbicidal treatments: triallate (1.5 kg/ha), triallate + chloramben (1.5 kg/ha + 2.0 kg/ha), trifluralin (0.75 kg/ha) and trifluralin + chloramben (0.75 kg/ha + 2.0

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Table 1

Residues of triallate and trifluralin recovered from the top 5 cm of soil at two locations after 22 weeks following single and combination treatments with chloramben

Treatment	Rate (kg/ha)	% of triallate and trifluralin*					
		Heavy clay			Sandy loam		
		1979	1980	1981	1979	1980	1981
Triallate	1.5	34 ± 8	64 ± 8	15 ± 9	28 ± 4	32 ± 3	12 ± 1
Triallate + chloramben	1.5 + 2.0	46 ± 4	58 ± 7	16 ± 3	32 ± 1	35 ± 0	12 ± 2
Trifluralin	0.75	40 ± 4	53 ± 3	16 ± 1	33 ± 3	39 ± 4	13 ± 2
Trifluralin + chloramben	0.75 + 2.0	47 ± 5	45 ± 6	15 ± 3	25 ± 2	40 ± 2	13 ± 2

* Mean and standard deviation from the analysis of 3 plots.

Less than 2% of applied herbicides at depths greater than 5 cm.

kg/ha). All herbicides were applied as methanolic solutions (2 mL) to small field plots (20 X 20 cm, 400 cm^2) and incorporated to a soil depth of 5 cm using a small fork. Treatments were made during the second week of May 1979, 1980 and 1981. The plots were left fallow and hand weeded as necessary. All plots from each experiment were sampled during the second week of October, 22 weeks following application, by carefully removing the soil from the 0 to 5 cm and 5 to 10 cm levels of the various treatments. The soil samples were air-dried at laboratory temperature, weighed, ground and thoroughly mixed in a soil mixer for 20 minutes. Full details for the setting up and sampling of these small plots have been reported elsewhere (SMITH 1971, 1972).

Soil samples (20 g) were extracted and analyzed gas chromatographically for triallate and trifluralin using the procedure previously reported (SMITH 1979).

RESULTS AND DISCUSSION

Losses of triallate and trifluralin from the top 5 cm of treated soils, both in the presence and absence of chloramben are summarized in Table 1. No residues were found at depths below 5 cm. Although losses over the 22 week sampling period varied each year, no doubt reflecting edaphic and soil moisture conditions, it was apparent (Table 1) that losses of neither triallate nor trifluralin were significantly affected by the addition of chloramben.

It has generally been assumed that the increased persistence of herbicides in the presence of other pesticides is due to the inhibition of the herbicide degrading organisms in the soil by the additives (KAUFMAN 1966, KAUFMAN et al. 1970, KAUFMAN 1977). Thus, it must be concluded from the present studies that chloramben has no significant effect on the soil microorganisms that may degrade triallate and trifluralin in Saskatchewan soils, or, that the soil persistence of the two herbicides is being affected by being applied in combination with chloramben.

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