Herbicide Carryover May Limit Winter Cover Cropping Potential in Arkansas

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INTRODUCTION

Herbicides are used extensively to control weeds in warm-season row crop production in Arkansas. Some herbicides in certain situations may persist through the summer and injure fall-seeded cover crops and winter annual weeds. Recent concerns about soil conservation have led to legislation requiring that cover crops be considered for use on erodible land. Cover crops may also benefit warm-season crops by improving soil organic matter and tilth and by providing nitrogen.

MATERIALS AND METHODS

Field studies were established on three soils at two Arkansas locations in 1976 with the following objectives: 1) to compare various levels of long-term, continuous herbicide use on herbicide carryover and injury to fall-seeded cover crops and 2) to assess soil and climatic factors influencing herbicide carryover. This report summarizes data collected by B.R. Corbin (Corbin, 1988), T.S. Green (Green, 1978) and C.B. Rogers (Rogers, 1983) and data collected by the authors since 1988.

Studies were conducted with soybeans and cotton. Herbicide treatments were modified in 1986 to include new persistent herbicides that were receiving extensive use. The current treatments for cotton are 1) no herbicide check, 2) a "minimal herbicide program" consisting of norflurazon, applied preplant incorporated (ppi), followed by (fb) methazole + MSMA directed at the V-2 and V-4 stage of cotton and 3) an "intensive herbicide program" consisting of trifluralin, ppi, fb fluometuron, preemergence (pre), fb fluometuron + MSMA directed at the V-2 and V-4 stage of cotton, fb linuron directed at cotton layby. Soybean treatments were a factorial arrangement of three ppi treatments and four pre/postemergence (poe) treatments. The ppi treatments were no herbicide, clomazone and trifluralin. The pre/poe treatments were 1) no pre- or postemergence herbicides, 2) imazaquin pre, fb imazaquin poe at the V-2 stage of soybeans, **3)** chlorimuron + metribuzin (Canopy™), pre, **fb** chlorimuron at the V-2 stage of soybeans and 4) metribuzin + imazaquin, pre. Cotton and soybean herbicides were applied at label-recommended rates, adjusted for soil texture and organic matter when appropriate. The experiments were conduced on three soils: a Dundee silt loam (11% sand (S), 74% silt (Si), 15% clay (C) and 1.3% organic matter (OM)) located at Clarkedale, Arkansas; a Loring silt loam (2% S, 80% Si, 18% C and 1.6% OM) at Marianna, Arkansas; and a Sharkey silty clay (4% S, 48% Si, 47% C and 2.3% OM) located at Clarkedale, Arkansas.

After cotton and soybean harvest, a portion of each plot was disked and planted with winter cover crops. Wheat and vetch have been evaluated since 1976. Clover and rye were evaluated from 1976 to 1978 and in the 1990-91 growing season. Austrian winter peas were also evaluated in the 1990-91 growing season.

Soil samples were collected in selected years and analyzed for the quantities of herbicide residues that had accumulated.

RESULTS AND DISCUSSION

Interactions occurred among years, soils and herbicide treatments although some consistent trends were observed.

Soil Effects

Carryover injury was highest on the Sharkey silty clay while the Loring silt loam and the Dundee silt loam, on average, behaved similarly. On Sharkey silty clay, norflurazon in the "minimal cotton program" resulted in complete kill of wheat, vetch and winter annual weeds. The fluometuron in the "intensive cotton program" and clomazone, ppi treatments from soybeans usually resulted in moderate to severe injury of wheat, vetch and winter annuals on the Sharkey. In the spring of 1991, both fluometuron and norflurazon completely killed wheat, vetch and winter annuals. On the Dundee and Loring silt loams, carryover injury to wheat,

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vetch and winter annuals was usually less than 30% and often not observed.

Herbicide Effects

The herbicides norflurazon and clomazone cause the most carryover problems. Norflurazon causes significant injury on all three soils. Clomazone usually causes significant injury although in certain years injury may be slight on the silt loam soils. Fluometuron also carries over on the Sharkey clay and causes significant stand reductions of cover crops. Some injury is observed from carryover of the soybean pre/poe treatments of imazaquin, chlorimuron and metribuzin. However, this injury interacts greatly with years and soils. The injury is greatest on the small-seeded, winter annual weeds. Larger-seeded cover crops usually tolerate residues of the pre- and postemergence soybean herbicides.

Cover Crop Tolerance

Work in 1976 to 1978 determined that the susceptibility ranking of cover crops was crimson clover (most susceptible) > hairy vetch > wheat > rye (least susceptible). In the 1990-91 season, Austrian winter peas appeared somewhat tolerant to herbicide residues. Foliar symptoms were evident in certain plots; however, plants were surviving. Because of poor seedbed conditions, Austrian peas were not established on the Sharkey soil, where carryover was greatest.

Residue Levels

Soil samples taken from the Sharkey clay in the spring, before herbicides were applied, typically contained residual concentrations equivalent to the normally recommended use rate of fluometuron and norflurazon. These residue levels would be expected to be very detrimental to cover crops and winter annual weeds.

CONCLUSIONS

When norflurazon, clomazone or fluometuron is used on clay-textured soils, severe cover crop injury is likely. When norflurazon, clomazone or fluometuron is used on silt-textured soils, wver crops may or may not be injured, depending upon specific soil properties and weather trends. Imazaquin and chlorimuron can, in certain instances, injure cover crops and reduce the cover from winter annual weeds, although cover crops usually tolerate the injury. Repeated use of the same herbicides in monoculture cotton and soybeans worsens carryover problems. Where persistent herbicides are used, cover crops should be used cautiously, and growers should recognize that there is a risk of injury. High-value cover crops should not be planted into high-risk situations.

LITERATURE CITED

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