BIOLOGY AND CONTROL OF YELLOW NUTSEDGE IN COTTON

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RESEARCH PROBLEM

Yellow nutsedge (*Cyperus esculentus*) is a problem weed in cotton (*Gossypium hirsutum*) that escapes most weed control programs. Postemergence herbicide applications are required for season-long control. The physiological characteristics of yellow nutsedge inhibit the absorption and translocation of herbicides so application timing is critical. This research tests the hypothesis that the direction of carbohydrate flow in yellow nutsedge influences susceptibility to many herbicides and that carbohydrate flow fluctuates with plant growth stages. The primary goals of this research are (1) to identify optimal herbicide application timing and herbicide combinations for yellow nutsedge control in cotton; and (2) determine if control is influenced by a correlation between herbicide application timing and carbohydrate flow toward tubers.

BACKGROUND INFORMATION

Yellow nutsedge has been listed among the most troublesome weeds in the world. Found in all 50 states, it has been responsible for significant crop losses (Holm et al., 1977; Wills, 1985). In 2000, there were 5,121,478 ha of cotton grown in the US with 18% infested with the *Cyperus* species. This level of infestation reduced cotton yield by 8.3% (Byrd, 2001). In the 2000 growing season, 384,465 ha of cotton were grown in Arkansas with 5.2% infested with the *Cyperus* species. This weed caused a 6% yield loss in the state (Byrd, 2001).

Stoeller and Woolley (1983) reported that yellow nutsedge utilizes a complex underground network of rhizomes, basal bulbs, and tubers to produce vegetative and reproductive growth. Individual yellow nutsedge tubers have been reported to sprout up to three times. Tuber viability must be diminished to ensure against resprouting (Stoeller and Wax, 1973). Application timings that coincide with basipetal translocation have increased herbicide efficacy in other species (Wilson et al., 2001; Ficke and Sosebee,

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1981). Wills (1971) reported carbohydrate concentration in various parts of purple nutsedge (*C. rotundus*) was affected by maturity. Little has been reported on carbohydrate levels and translocation during the life cycle of yellow nutsedge.

RESEARCH DESCRIPTION

Two studies were conducted to evaluate the control of yellow nutsedge in glyphosate-tolerant cotton in Rohwer, Arkansas. Cotton cultivar DP451BRR was planted 5 June 2001 in 0.96-m rows on a Hebert silt loam soil. The plots contained a natural population of yellow nutsedge. The study design was a complete randomized block, replicated four times. The first study evaluated metolachlor alone preplant (PP) and preemergence (PRE) at 1.12 kg ai/ha and postemergence in combination with or followed by glyphosate at 1.12 kg ai/ha or trifloxysulfuron at multiple application rates and timings. The second study evaluated norflurazon at 1.12 kg ai/ha preplant incorporated (PPI) followed by 1.12 kg ai/ha PP. Norflurazon was observed followed by glyphosate at 1.12 kg ai/ha or trifloxysulfuron at multiple application rates and timings.

In the fall of 2001 a greenhouse study was conducted to test a possible correlation between carbohydrate content and growth stage of yellow nutsedge. Two-leaf through nine-leaf plants were harvested and the study was replicated ten times. At harvest the plants were separated into rhizomes, tuber, shoot, old leaves, and young leaves. The samples were then weighed, bagged, and frozen. All samples will be analyzed for carbohydrate content using high performance liquid chromatography (HPLC).

These studies will be repeated in 2002. The efficacy of three herbicides (metolachlor, trifloxysulfuron, and glyphosate) will also be investigated in a greenhouse study conducted in Monticello, AR, in the spring of 2002. Treatments will occur at each leaf stage to determine the correlation between plant growth stage and herbicide efficacy based upon carbohydrate content.

RESULTS

Metolachlor PP offered 71% control of yellow nutsedge at 35 days after treatment (DAT; data not shown). Increased control was achieved with early-postemergence (EP) treatments influenced by herbicide and rates. Trifloxysulfuron applied alone, in combination with metolachlor, or following metolachlor provided greater than 80% control at 21 DAT. Sequential postemergence applications provided greater than 85% control. Trifloxysulfuron at 13.0 g ai/ha EP fb 19.0 g ai/ha mid-postemergence (MP) provided greater than 85% control at 35 DAT. MSMA at 1.12 kg ai/ha MP and metolachlor at 1.12 kg ai/ha in combination with trifloxysulfuron at 13.0 g ai/ha EP fb trifloxysulfuron at 19.0 g ai/ha MP provided 89% control at 35 DAT. Season-long control was achieved with sequential applications of trifloxysulfuron at 13.0 g ai/ha EP fb 32.0 g ai/ha late-postemergence (LP). This resulted in 94% control at 21 DAT. The addition of metolachlor

EP did not improve control over the sequential applications of trifloxysulfuron alone. Norflurazon evaluated at 2.24 kg ai/ha applied PPI or at 1.12 kg ai/ha in a split PPI/PRE application offered 82% control at 35 DAT. An EP application of glyphosate alone provided 73% control at 21 DAT. An EP tank-mix of trifloxysulfuron at 13.0 g ai/ha and glyphosate improved control to 81%. However, when these treatments followed a PPI application of norflurazon the level of control exceeded 90%. Norflurazon PPI fb trifloxysulfuron EP fb trifloxysulfuron at 19.0 g ai/ha MP offered 95% control. Sequential applications of glyphosate EP and MP provided 92% control at 35 DAT. Norflurazon PPI fb glyphosate or trifloxysulfuron EP fb trifloxysulfuron at 32.0 g ai/ha LP provided 94% control at 21 DAT. The same control was achieved with trifloxysulfuron at 13.0 or 19.0 g ai/ha EP fb trifloxysulfuron at 32.0 g ai/ha LP. Trifloxysulfuron in combination with glyphosate EP fb trifloxysulfuron at 13.0 g ai/ha LP resulted in 72% control.

PRACTICAL APPLICATION

These studies were conducted to evaluate the efficacy of herbicides with different modes of action at various application rates and timings on yellow nutsedge. Although glyphosate provides excellent control of pigweed (*Amaranthus*) and small-seeded annuals, morningglory (*Ipomoea*) and *Cyperus* species continue to be problematic weeds. Trifloxysulfuron promises greater than 80% control when applied EP, MP, or LP following an EP treatment. Similar control may be achieved with glyphosate following a PPI or PP treatment.

The data from these studies will be used to develop protocols for future tests and may also allow producers to treat yellow nutsedge in the most effective rates and timings.

LITERATURE CITED

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