COTTON RESPONSE TO TRIFLOXYSULFURON IN ARKANSAS

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RESEARCH PROBLEM

Trifloxysulfuron-sodium, marketed under the brand name Envoke, is mainly used for broadleaf and sedge weed control in cotton. Trifloxysulfuron-sodium causes the leaves of susceptible plants to turn yellow, red, or purple subsequent to application followed by necrosis and death of the growing point. In some instances crop injury may occur. The purpose of this paper is to examine the data collected over the past five years concerning cotton injury due to trifloxysulfuron-sodium in Arkansas, to evaluate the environmental conditions affecting trifloxysulfuron-sodium injury, and to determine the best recommendations for trifloxysulfuron-sodium use on cotton.

BACKGROUND INFORMATION

Trifloxysulfuron (Envoke) is a sulfonylurea herbicide labeled for post-emergence over-the-top or post-directed application in conventional or transgenic (Roundup Ready® or BXN™) cotton. It controls several economically important weeds in cotton, including morningglory (Ipomoea) species, non-ALS-resistant pigweed (Amaranthus) species, hemp sesbania (Sesbania exaltata), sicklepod (Senna obtusifolia), and purple and yellow nutsedge (Cyperus species) at very low use rates. Cotton injury from over-the-top applications can be of concern to cotton producers, although the symptoms normally dissipate quickly and do not affect yield (Porterfield, 2002). However, more information is needed to determine conditions under which injury may occur.

RESEARCH DESCRIPTION

Two greenhouse studies were conducted in Monticello, AR in 2001. All treatments were sprayed at the 3- to 4- leaf growth stage. Treatments included untreated controls and trifloxysulfuron-sodium (Envoke) sprayed at 0.0063, 0.0094, and/or 0.0142 lb ai/ac Both studies were arranged in a randomized complete block

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design with six replications. The purpose of the first study was to examine injury due to varying environmental conditions—growth chamber versus greenhouse. All plants were grown to the 3- to 4-leaf stage at 85°F in the greenhouse. Four days prior to spraying half of the pots were moved to 50°F growth chamber. Two rates of 0.0094 and 0.0142 lb ai/ac were sprayed at the 3- to 4-leaf growth stage. Subsequent to spraying, half of the greenhouse pots and half of the growth chamber pots were kept at 50°F in the growth chamber for 4 days. The remaining pots were moved back to 85°F greenhouse. Following the 4 days in growth chamber, all plants were grown at 85°F until harvested. Plants were harvested at 20 days after treatment, and dry weights were recorded. The purpose of the second greenhouse study was to examine injury due to greenhouse or growth chamber temperatures in soil at field capacity and flooded conditions. The two temperatures were 50°F and 85°F, and soils were either kept saturated or at field capacity. All plants were treated at the 3-to 4-leaf stage with two rates of trifloxsulfuron-sodium. Plants were harvested at 15 days after treatment, and dry weights were recorded.

FIELD RESEARCH

Thirty-nine field experiments were conducted over the past five years across three locations: Marianna, Fayetteville, and Rohwer. Thirteen experiments evaluated crop response following preemergence applications, 19 early post-emergence (cotyledon to 4 leaf) applications, 15 mid-post (5-6 leaf) applications, and 11 late post-emergence (7 leaf and above) applications. Field studies were conducted on a randomized complete block with four replications a 12.66 ft (4 rows) wide by 30 ft long. Herbicides were applied with a hand-boom at 12 GPA spray volume. Treatments included untreated checks and trifloxsulfuron-sodium (Envoke) sprayed at 0.0024, 0.0047, 0.0063, 0.0071, 0.0094, 0.0118 and/or 0.0142 lb ai/a. LSD statistics were analyzed using SAS program with an alpha=0.05.

RESULTS AND DISCUSSION

The first greenhouse study examined crop response due to trifloxsulfuron-sodium applications and effects of cool versus warm temperatures four days prior to and four days subsequent to application. Cooler temperatures resulted in increased crop injury 5 days after treatment. By 19 DAT, no difference in crop injury existed for any temperature regime (Fig. 1). There was also no difference in dry weights when compared to the control. The second greenhouse/growth chamber study examined injury due to two temperature regimes (cool vs. warm) superimposed upon two moisture regimes (field capacity vs. flooded). At fourteen days after treatment, plants grown under the cooler temperatures had significantly more injury than those grown in warmer temperatures. Saturated field capacity and soil moisture regimes did not appear to have an effect on injury. There were no differences in dry weights when compared to the control.
FIELD RESULTS

Most crop injury occurred following preemergence or early post-emergence applications. In all studies, cotton injury dissipated by 50 days following application. The most severe crop injury observed at each stage is as follows: preemergence 48% (Fig. 2), early post-emergence 70% (Fig. 3), mid-post 30%, and late post-emergence 25%. Yields were not affected by any trifloxysulfuron-sodium injury at any application timing. Although injury ratings were high, no yield differences were seen at any rate at any application timing (Fig. 4). The least amount of injury was seen when trifloxysulfuron-sodium was applied at the mid-post to late-post application timings. Cotton plants generally recovered from injury within three weeks following over-the-top applications.

PRACTICAL APPLICATION

Greenhouse/growth chamber studies were somewhat inconclusive but indicated that cool temperatures may be more detrimental than wet soils. If crop response cannot be predicted, this herbicide may have limited acceptance as a post-emergence over-the-top herbicide.

LITERATURE CITED

Fig. 1. Percent cotton injury from Envoke (0.0142 lb ai/A) at various days after treatment, as affected by temperature.

Fig. 2. Percent cotton injury from Envoke pre-applications of five rates at various times after treatment, Rohwer, Ark., in 2000.
Fig. 3. Percent cotton injury from early post applications of Envoke at various rates; Marianna, Ark., in 2001.

Fig. 4. Seedcotton yields; Marianna, Ark., in 2001.