CONTROL OF NIGHTSHADE WITH STAPLE AND ITS EFFECT ON VARIOUS ROTATIONAL CROPS IN CALIFORNIA

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Abstract

Excellent black nightshade (*Solanum nigrum L.*), control is achieved with Staple, pyrithiobac sodium, when applied over the top of cotton in the one leaf stage with nightshade in the cotyledon to three leaf stage. Nightshade control ranged from 93 to 100 percent 50 days after application. There were no differences between broadcast and band applications. Cotton injury symptoms were evident with all treatments seven days after application, but nonexistent 50 days after treatment.

Staple adversely effected growth, development and yield of all rotational crops tested (barley, wheat, alfalfa, onions, sugar beets, tomatoes and corn). In general, reductions increased with increasing Staple rates and were greatest with broadcast treatments when compared to band treatments. Barley was more sensitive than wheat. Tomatoes and corn were more tolerant than most crops with onions and sugar beets being the most sensitive. There was no effect to cotton growth and development. When the same crops were planted two years after the initial Staple application, there were no adverse effects on growth, development and yield of all crops studied except onions and sugar beets.

Introduction

The most persistent and difficult weeds to control in cotton have evolved due to herbicide tolerance and rotation of cotton with tomatoes which is in the same family as nightshade (*Solanceae*). Mechanical harvesting of tomatoes infested with nightshade greatly enhances the distribution of nightshade. The early removal of black nightshade one to three weeks after cotton emergence, when combined with timely cultivation until layby, has been shown to be critical for the protection of cotton yields. Without a three-week black nightshade free period yield loss was greater than 50 percent.

The majority of the cotton acreage in the San Joaquin Valley of California is treated with a dinitroaniline herbicide as a preplant incorporated treatment. Annual weeds, including barnyardgrass (*Echinochola crus galli L.*) and many broadleaf weeds such as pigweed (*Amaranthus spp*), are effectively controlled, but weeds in the Solanaceae family are resistant. Nightshade, both black (*Solanum nigrum L.*) and hairy (*S. Sarrachoides*) are the most prevalent species infesting thousands of acres of cotton and other crops. Also occurring, but to a lesser extent are ground cherries (*Physalis lanceifolia*), tolguacha (*Datura meteloides*), and Chinese thronapple (*Datura ferox*). Annual morningglory (*Ipomea spp.*), also resistant to dinitroaniline herbicides, is a persistent weedy pest of cotton.

Present herbicide control options for nightshade have not been effective, resulting in hand hoeing costs of $150 to 200 per acre in severely infested fields. Staple can be an economical and viable alternative to present control options.

Materials and Methods

An Acala Maxxa cotton field infested with black nightshade was divided into plots and replicated three times in a randomized complete block design. Staple was applied over the top of cotton in the cotyledon to one true leaf stage at 1.0, 1.5 and 3.0 oz ai/A with nightshade being in the cotyledon to three leaf stage. A second sequential application was applied at .75 and 1.5 oz ai/A on three treatments when cotton was six inches tall with nightshade ranging from four to ten leaves. Broadcast and 12 inch band applications were evaluated. All treatments were applied with a power driven sprayer at 30 PSI applying 20 gallons of spray solution per acre. The broadcast treatments were made with 11003 flat fan Tee Jet nozzles and band treatments applied with TJ60-4003 EVS Tee Jet nozzles.

After cotton harvest, seedbed preparation for rotational crops included: shredding the cotton stalks, disced three times (once with the rows and twice at an angle), beds were listed perpendicular to the previous cotton beds then mulched and shaped previous to planting. Barley, wheat, alfalfa and sugar beets were planted 12/21/93, 230 days after the initial Staple application. Onions were planted on 1/5/94, 245 DAT; tomatoes 3/9/94, 308 DAT; corn 5/12/94, 372 DAT (double cropped behind wheat) and cotton 5/26/94, 393 DAT. Rotational crops were again planted the second year after the Staple application as follows: barley, wheat, onions and alfalfa, 12/1/94; sugar beets 12/6/94 and tomatoes 4/4/95.

Results and Discussions

Evaluations of black nightshade control 14 days after treatment (DAT) indicated 46 to 63 percent control. At 21 DAT control increased to 80 to 83 percent at the 3.0 oz and 1.5 + 1.5 oz rates. At 28 DA1stT and 7 DA2ndT control was excellent with all rates resulting in 95 to 100 percent control. At 50 DA1stT 100 percent control was achieved

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1524-1525 (1996)
National Cotton Council, Memphis TN

with the sequential applications with single rates providing excellent control at 93 to 98 percent. There were no differences between broadcast and band applications.

Cotton injury symptoms were evident with all treatments at 7 DAT, but non existent 50 DAT. Cotton plant growth data indicated no significant difference in plant height and height to node ratio. Cotton yield data indicated no reduction in seed cotton with any Staple treatment when compared to the hand weeded control.

Staple adversely effected the growth, development and yield of all rotational crops planted back the first year after the Staple application to cotton. In general growth, development and yield reductions increased with increasing Staple rates and were greatest with broadcast treatments. Early crop injury evaluations showed all crops to be exhibiting reduced growth. Germination and emergence were also reduced. Wheat was the most tolerant crop with onions and sugar beets being the most susceptible. Harvest data indicated the greatest yield reduction occurred at the higher rates and broadcast treatments with all crops. All rates of Staple and both application methods reduced yields of the first two alfalfa cuttings. There was no effect of Staple on third cutting alfalfa yields.

When the same crops were planted back two years after the initial Staple application, there were no adverse effects on germination, emergence, growth, development and yield of all crops studied except onions and sugar beets. Yields of both were significantly reduced at most rates when compared to the control.

Conclusions

1. Staple provided excellent control of black nightshade at single and sequential applications.

2. Staple provided excellent control of black nightshade at 1.0, 1.5 and 3.0 oz ai/A.

3. There were no differences in control between broadcast and 12" band applications.

4. Staple adversely effected growth, development and yield of all rotational crops, except cotton, the first year after application. Reductions increased with increasing Staple rates and was greatest with broadcast applications.

5. Staple had no effect to growth, development and yield of all rotational crops planted back the second year, except onions and sugar beets. Yields of both were significantly reduced when compared to the control.