USE OF HOPPER-BOX TREATMENTS IN COMBINATION WITH REDUCED RATES OF IN-FURROW FUNGICIDES TO CONTROL COTTON SEEDLING DISEASES

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Abstract

In-furrow applied fungicides were evaluated at their lowest recommended rate and at reduced rates alone or in combination with hopper-box fungicides for the control of cotton seedling diseases. Plots were inoculated to increase disease pressure. In general, the lowest recommended rate and three-forths for granular in-furrow formulations and one-half for liquid formulation preformed comparably. Addition of a hopper-box treatment was additative and increased fungicide efficacy with granular formulations but not with liquid formations. In-furrow fungicides were the most efficious when disease pressure was high. The liquid formulations preformed slightly better than the granular formulations when the same amount of active ingredient was applied.

Introduction

Almost one-hundred percent of the cotton planted in Mississippi receives a fungicide seed treatment. Depending upon the year, an additional 60 percent of the seed is also treated with an additional hopper-box or in-furrow fungicide treatment. Of this 60 percent, hopper-box fungicides account for 40 to 60 percent and in-furrow fungicides account for 40 to 50 percent of the treatments applied. About 60 to 70 percent of the in-furrow fungicides are applied as a granule and the remainder are applied as a liquid. The percentage of in-furrow fungicides applied as a liquid has been increasing in recent years.

The benefits of the additional hopper-box or in-furrow treatments are not realized every year. If weather conditions are not favorable for seedling disease development, there is little difference in seedling disease development between cotton receiving a seed treatment only and cotton receiving a seed treatment with additional hopper-box or in-furrow treatments. In addition, the price of hopper-box and in-furrow treatments have increased in recent years. For these reasons producers have been looking for ways to reduce fungicide input costs by decreasing fungicide rates and still have an acceptable seedling stand.

Chemical companies have recommended hopper-box treatments in leu of in-furrow treatments and have reduced the minimum recommended rates for in-furrow fungicides in recent years. Therefore, it has become important to determine if the following can give acceptable control of seedling disease:

- hopper-box treatments alone
- reduced rates of in-furrow fungicides
- lower than recommended rates of in-furrow applied fungicides alone or in combination with hopper-box fungicides.

Materials and Methods

Triple treated seed of the cotton variety ‘Stoneville 453' was planted in a randomized complete block design (four replications) with a two level factorial arrangement of treatments. The first level was three hopper-box treatments: No hopper-box; DeltaCoat, 11.75 oz/CWT and Prevail, 16 oz/CWT. The second level was nine in-furrow applied fungicide regimes: No in-furrow fungicide; Terraclor Super X, 12.5G; Ridomil PC, 11G; and Start, 15G at their lowest recommended rate (8 lb/A, 7 lb/A and 6 lb/A, respectively); at three-fourths the recommended rate (6 lb/A, 5.25 lb/A, 3 lb/A, respectively); and Terraclor Super X, 12.5G and Ridomil PC at one-half recommended rates (4 lb/A and 3.5 lb/A).

Another trial was conducted using comparable rates of liquid in-furrow fungicides. No in-furrow fungicide; Terraclor Super X, 2.5EC; Terraclor, 2EC + Ridomil, 2EC; and Start, 60 WP at their lowest recommended rate (6 pt/A, 6pt + 4 oz/A, and 1 lb/A, respectively). The same fungicides at one-half their recommended rates (3 pt/A, 3 pt + 3 oz/A and .6 lb/A); and Terraclor Super X, 2.5EC and Terraclor, 2EC + Ridomil, 2EC at one-fourth there recommended rates (1.5 pt/A and 1.5 pt + 2 oz/A, respectively).

In both trials, plots were four, 40 inch rows, 40 feet long with a seeding rate of five seed per foot of row. Plots were inoculated in-furrow at planting with .5 oz of a 1:1 mixture of sterilized oats infested with *Rhizoctonia solani* and *Pythium* spp. Stand counts were made at two and four week after planting. Two rows were harvested with a commercial cotton picker adapted to harvest plots for yield data.

Hopper-box treatments were applied with a small rotary seed treater prior to planting. Granular treatments were applied at planting with cone planters. Liquid treatments were applied in 5 GPA through a single TX4 nozzle tip positioned to distribute one-half of the spray in the seed furrow and one-half of the spray on the covering soil.

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Results

Granular in-Furrow Fungicide Trial

Seedling survival reported is for the final stand count (4 weeks). In the plots receiving no hopper box treatment (Figures 1-3), plots treated with all rates of Terraclor Super X (TSX), Ridomil PC and Start, with the exception of the 4 lb/A Start rate in 1994, had significantly higher percent seedling survival over the plots receiving no in-furrow treatment. The percent seedling survival was similar between the full and three-fourths fungicide rate and was reduced when the one-half rate was used.

Addition of the hopper-box treatments DeltaCoat or Prevail (Figures 1-3) tended to reduce the stand differences between the three in-furrow rates. In the heavy disease pressure year of 1993, there was little difference between the plots receiving no hopper-box treatment and those receiving a hopper-box treatment. However, in 1994 and 1995 treatment with a hopper-box alone often significantly increased seedling stands.

It appears that hopper-box and granular in-furrow treatments are additive and that it may be possible to use reduced rates of in-furrow fungicides in combination with hopper-box treatments and obtain comparable stands to higher in-furrow fungicide rates. During years with severe disease pressure this may not be the case.

Yield results for the granular trials are given in Figures 4-6. In 1994, the plots receiving no hopper-box treatment (severe disease pressure) with all rates of TSX, Ridomil PC and Start had significantly higher seed cotton yields over the plots receiving no in-furrow treatment. Seed cotton yields tended to decrease, although not significantly, in the plots receiving the lower in-furrow fungicide rates. In 1994 and 1995 disease pressure was lower and while there was usually a numerical increase in seed cotton yields following in-furrow treatments, the yield increase was not always significant.

There were no significant seed cotton yield differences in 1993 when no in-furrow fungicides were applied between the three hopper-box treatments (None, DeltaCoat, and Prevail). Significant seed cotton yield differences between no hopper-box and hopper-box treatments in the plots receiving no in-furrow treatment were observed in 1994 and 1995 (lower disease pressure) in some treatments.

Liquid in-Furrow Fungicide Trial

Seedling survival reported are for the final stand count (4 weeks). The plots receiving no hopper box treatment, (Figures 7-9), treated with all rates of Terraclor Super X (TSX), Ridomil PC and Start in 1994 had significantly higher percent seedling survival over the plots receiving no in-furrow treatment. The percent seedling survival was similar between the three in-furrow fungicide rates evaluated.

Addition of the hopper-box treatments DeltaCoat or Prevail (Figures 7-9) had no consistent affect on percent seeding survival in the plots receiving in-furrow fungicides. In the plots receiving no in-furrow treatment, results were similar to the granular trial. In the heavy disease pressure year of 1993, there was little difference between the plots receiving no hopper-box treatment and those receiving a hopper-box treatment. However, in 1994 and 1995 the treatment with a hopper-box alone increased seedling stands, often significantly.

It appears that comparable rates of liquid in-furrow treatments increase seedling stands more than granular in-furrow treatments. In this trial, seedling stands were increased with some of the in-furrow fungicides about as much with a one-fourth fungicide rate as with a full fungicide rate.

Yield results for the liquid trials are given in Figures 10-12. For the trial in 1993 (severe disease pressure), in the plots receiving no hopper box treatment, plots treated with all rates of the liquid formulations of the in-furrow fungicides yielded significantly higher than the plots receiving no in-furrow treatment. Seed cotton yields tended not be significantly different across all the in-furrow fungicide rates in all three years of the study. There were significant seed cotton yield differences in 1993, but not in 1994 and 1995 when no in-furrow fungicides were applied between the three hopper-box treatments (None, DeltaCoat, and Prevail).

Discussion

In years such as 1993 when disease pressure is very high, the benefits of in-furrow applied fungicides are evident. Significantly higher stand counts and in many cases, significantly higher seed cotton yields, were observed. However, in years when disease pressure was not as high (1994, 1995) significant stand and seed cotton yield increases do not always occur following in-furrow fungicide applications.

In the granular trials, except under severe disease pressure (1993), we observed that the lower in-furrow fungicide rates, especially in combination with a hopper-box treatments, preformed as well as the higher recommended in-furrow fungicide rate. The lower fungicide rates and even the hopper-box treatments alone increased seedling stands when disease pressure was not extremely high (1994, 1995).

The liquid in-furrow applied fungicides tended to increase seedling stands at lower equivalent rates than their granular counterparts. For this reason, the addition of hopper-box treatments to the lower liquid in-furrow rates does not increase their efficacy as much as the addition of hopper-box treatments to lower granular rates. However, most farmers are currently equipped to apply granule fungicides

and the cost of new equipment and the need to haul water with liquid fungicides may outweigh the benefits of a liquid fungicide.

Essentially all of the cotton planted in Mississippi receives at least a protectant and systemic seed treatment. The addition of a hopper-box or an in-furrow applied fungicide should be viewed as added insurance. Producers should weight the costs of a particular hopper-box or in-furrow treatment against the potential benefits. Hopper-box treatments may be satisfactory in fields with a history of low seedling disease, when cotton is planted at the later end of the recommended growing season, or when the farmer is willing to risk the possibility of having to replant.

In-furrow treatments may be needed in fields with a history of severe seedling disease, when the cotton is planted early in the growing season or when it is imperative to establish a stand on the first try. Stand establishment with an initial planting is becoming more important as producers plant genetically engineered cotton seed which may be in short supply and is more expensive (i.e. farmers cannot adjust seeding rates higher to compensate for seedling disease etc.) than conventional cotton seed.

Additional benefits from hopper-box and in-furrow fungicide treatments such as increased earliness and a more healthy, vigorous, disease resistant cotton plant throughout the growing season should be considered. No one can predict weather conditions after planting and under some conditions, even the best of treatments will not insure a acceptable seedling stand. Therefore, the decision whether or not to use a hopper-box or in-furrow treatment should be made by weighing the above factors and determining which treatments are the best for a particular field.

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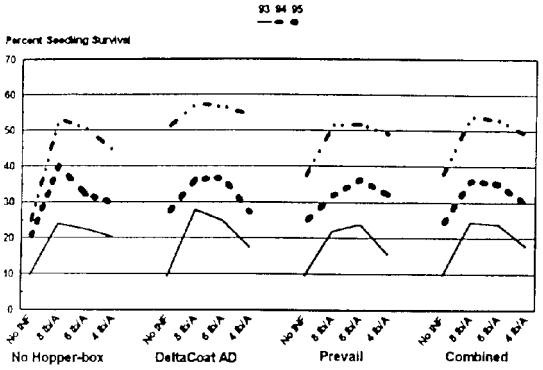

Figure 1: Terraclor Super X 12.5 G

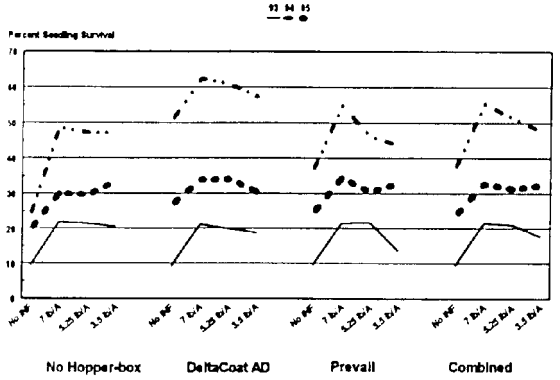

Figure 2: Ridomil PC 11 G

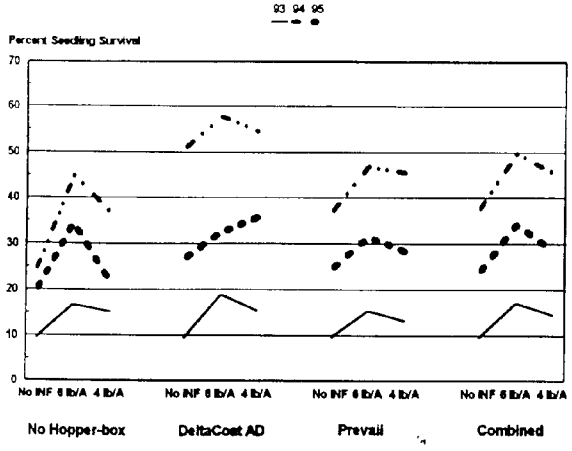

Figure 3: Start 15 G

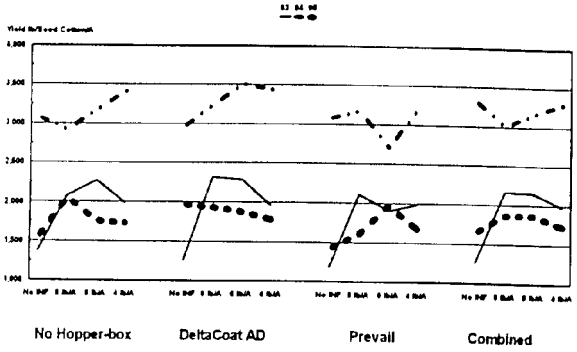

Figure 4: Terraclor Super X 12.5 G

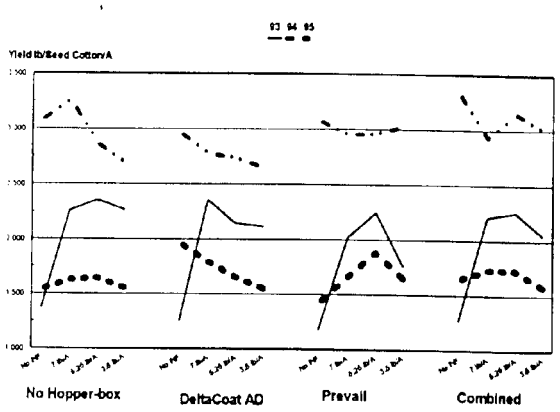

Figure 5: Ridomil PC 11 G

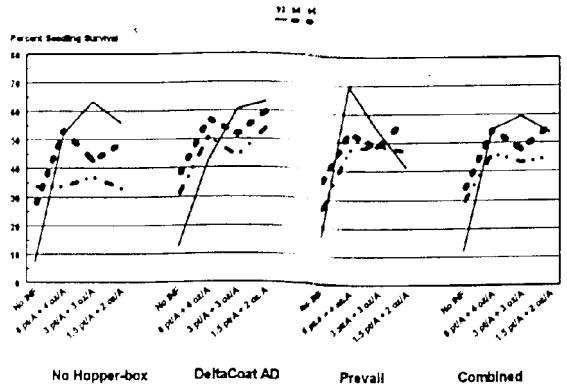

Figure 8: Terraclor 2.0 EC + Ridomil PC 2.0 EC

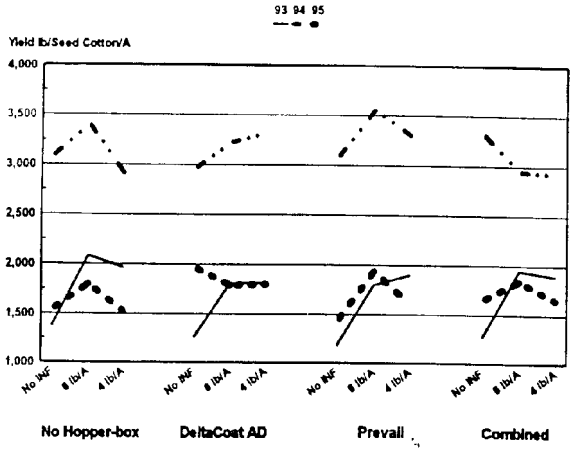

Figure 6: Start 15 G

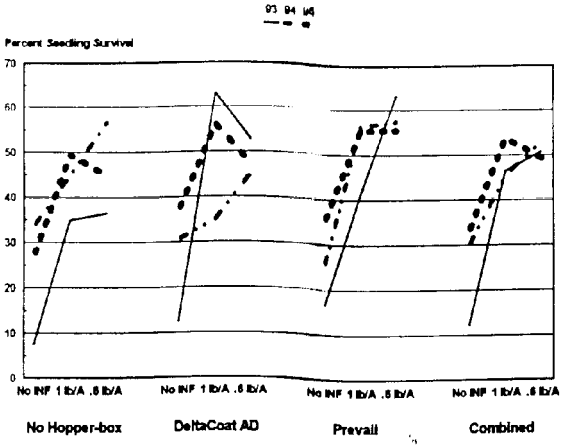

Figure 9: Start 60 WP

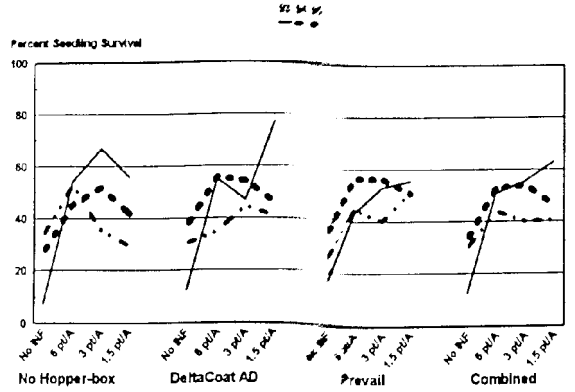

Figure 7: Terrctor Super X 2.5 EC

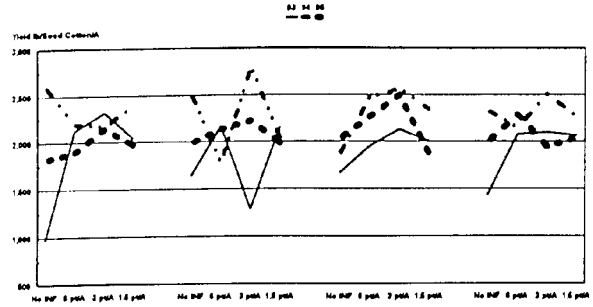

Figure 10: Terraclor Super X 2.5 EC

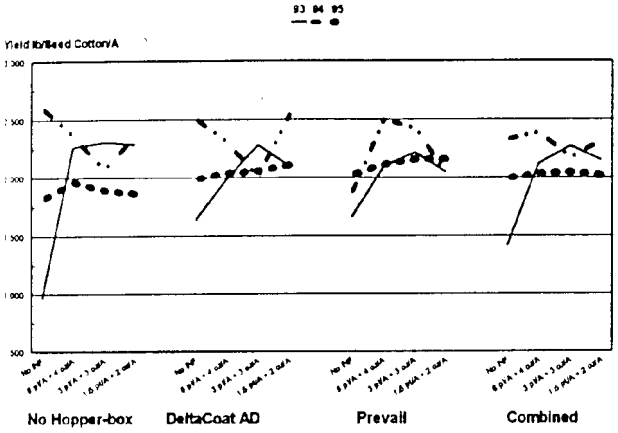

Figure 11: Terraclor 2.0 EC + Ridomil PC 2.0 EC

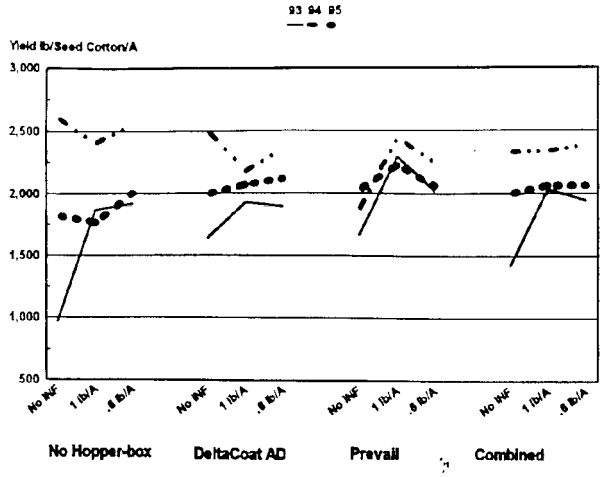

Figure 12: Start 60 WP