EFFECTS OF PLANT POPULATION AND FUNGICIDE TREATMENT ON SEEDLING DISEASES OF COTTON

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Introduction

Seedling diseases of cotton, primarily caused by *Rhizoctonia solani* AG-4 and *Pythium* spp., are widespread in Georgia; however, economic loss related to seedling disease is sporadic in Georgia. In general, environmental conditions are less favorable for the development of seedling disease when cotton is planted in the Coastal Plain, the location of the bulk of cotton production in the state. Damaging levels of seedling disease tend to be localized are often associated with poor production practices such as poor or non-existent rotations, improper herbicide use, planting low-vigor seed, planting when conditions favor seedling disease, or employing a less-than-optimal seeding rate. Typically, a rate of 3-4 seed per foot of row is employed by growers in Georgia to ensure optimal stands and yield. Research has shown that under ideal conditions, plant populations of 1-2 per foot are necessary to achieve optimal yield, and that yields from populations of 1-2 plants per foot do not differ from those of 3-4 plants per foot. In general, individual plants in low-density plantings yield higher than plants in high-density plantings, accounting for the lack of difference in yield between low and high plant populations. However, the risk of economic loss to seedling disease is greater with lower plant populations because the likelihood of uneven stands and reductions in population below 1 plant per foot. In situations where a less-than-optimal seeding rate is employed, in-furrow fungicides could provide a measure of insurance to guarantee optimal plant populations and yield, and their cost would be offset by the savings in seed cost and technology fees. The purpose of this study was to compare a standard cotton seed treatment with treated seed and an in-furrow fungicide for stand establishment in low-density plantings (1-2 seed per foot) and to determine if the use of an in-furrow fungicide and low seeding rate would result in yields equivalent to those of high density plantings (4 seed per foot) without in-furrow fungicides.

Materials And Methods

Experiments were conducted in 2003 at the Lang Farm in Tifton, GA and the Southwest Georgia Research and Education Center located in Plains, GA in fields that had been planted previously to peanut. Cotton ('DP458 BRR') was planted on 22 and 23 April (Tifton and Plains, respectively) using an Almaco cone-type seeder, and aldicarb (Temik 15G) was applied simultaneously at a rate of 3.5 lb/A for thrips management. The experimental design was a split-split-plot with 4 replications. Plot size was 12 rows (36-in. centers) × 40 ft with 10-ft alleys separating each block. Whole plots were seeding rate (1, 2, or 4 per foot) and sub-plots were seed treatment type (none, standard seed treatment, or standard seed treatment plus an in-furrow fungicide). Sub-sub plots were inoculation type (none or a mixture of *R. solani* and *P. irregulare*-infested millet applied at a rate of 3.8 grams per 10 feet of row). The standard seed treatment was a combination of triadimefon, thiram, and mefenoxam (Baytan-Thiram RTU + Allegiance FL), and Terraclor Super-X 290EC (52.8 fl oz/A) was used as the in-furrow fungicide. Terraclor Super-X (TSX) was applied in-furrow with a single, planter-mounted nozzle centered over the row and set to deliver 11 gallons per acre at 50 psi. Plant counts were taken at 14 days after planting (DAP) and 28 DAP. At 28 DAP, stand uniformity was evaluated. The experiments were harvested in early October and yield of seed cotton was determined.

Results

At both locations, emergence of cotton and final stand (no. of plants per 80 row-feet) increased as the seeding rate increased, while the skip index decreased (Fig. 1). Inoculation with *R. solani* and *P. irregulare* reduced emergence and stand at the Lang Farm, but not at Plains (data not shown). At both locations, the standard seed treatment (ST) alone and with in-furrow TSX increased emergence and stand and decreased the skip index; however, ST + TSX significantly increased emergence and stand over ST only at the Lang Farm. For both locations, means were averaged across inoculation type (no significant interactions between whole plots, sub-plots, or were detected). Data are presented as means across whole plot effects (seeding rate) and sub-plot (seed treatment type). Regardless of location, yields of seed cotton were higher at 4 seed per row-foot than at 1 or 2 seed per ft (Fig. 2). Yields were improved by ST and ST + TSX at the Lang Farm, while at Plains, no differences in yield were observed between any of the fungicide treatments. At 1 seed per foot, yields for ST + TSX did not differ from those of ST alone at 2 seed per foot (Fig. 3). Yields for 4 seed per foot, with or without ST, were greater than those for 2 seed per foot regardless of fungicide treatment. At 2 seed per foot, the addition of TSX to ST did not increase yields over those of for 4 seed per foot plus ST.

DISCUSSION

Despite improvements in emergence, stand, and stand uniformity, the application of in-furrow-applied TSX did not result in increased yields. It appears that even at a seeding rate of 1 seed per foot, the addition of TSX to the standard ST does not provide the same benefits, in terms of yield, as the standard ST alone when the seeding rate is 4 seed per foot. The savings on seed cost and technology fee would likely not offset the expense of the in-furrow fungicide. However, benefits might be observed where conditions would favor the development of disease. Further research will be conducted to evaluate this hypothesis.

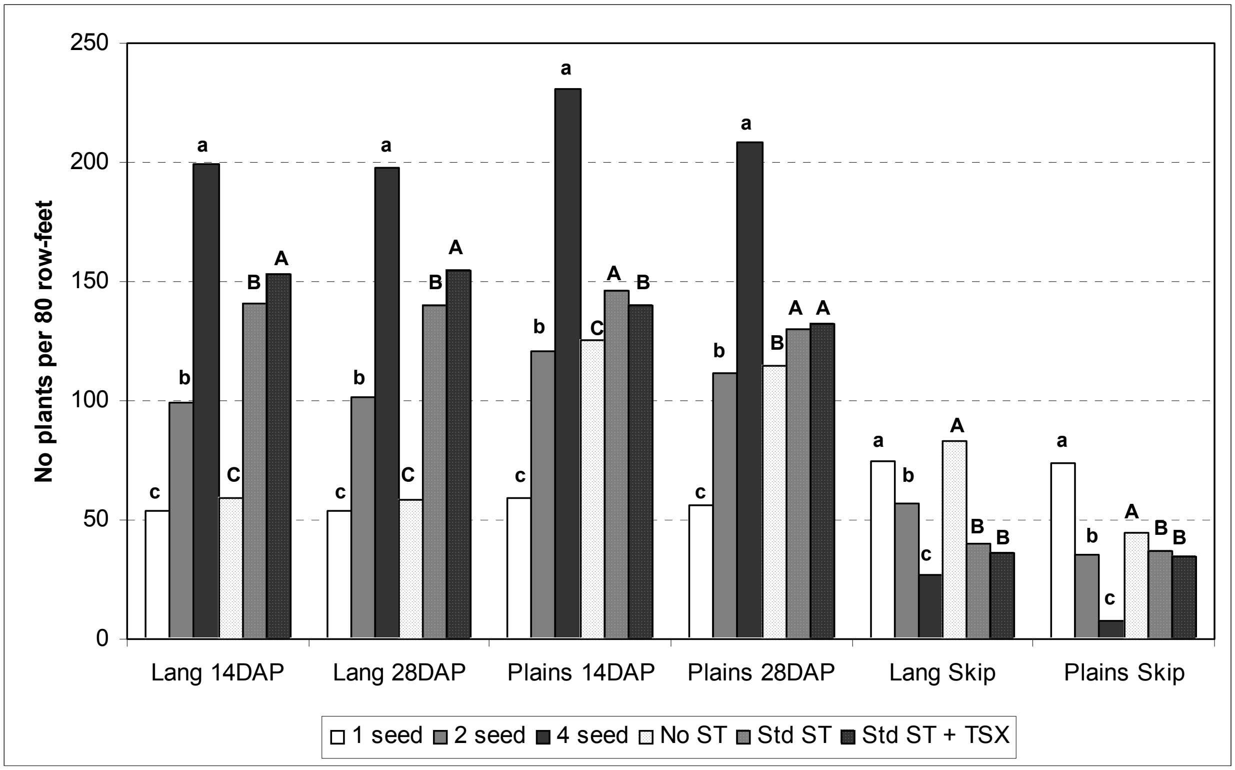

Figure 1. Effect of seeding rate and seed treatment on seedling disease and stand uniformity at two locations in the Coastal Plain of GA, 2003. Emergence counts were taken at 14 days after planting (DAP), stand counts at 28 DAP, and skip indices (skip) at 28 DAP. Skip indices indicate the cumulative number of gaps in stand greater than 12 in. and less than 18 in. Means followed by the same letter of the same case do not differ significantly as determined by Fisher's protected least significant test ($P \leq 0.05$).

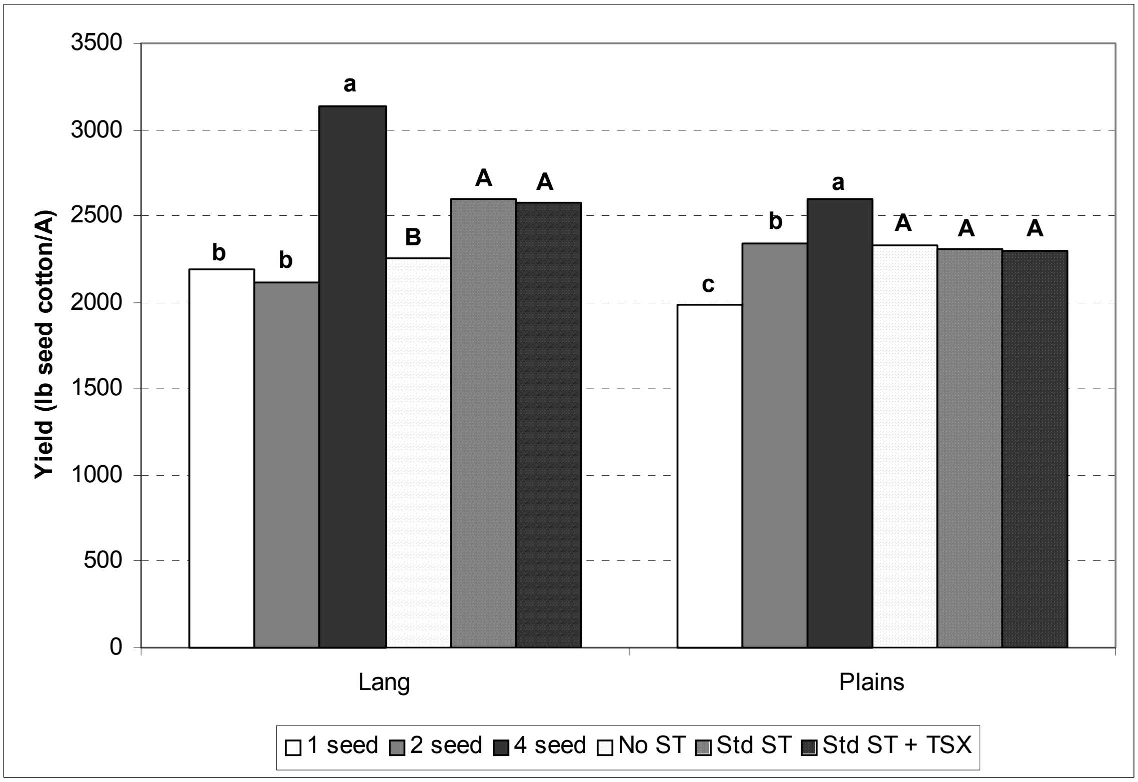

Figure 2. Effect of seeding rate and seed treatment on yield of seed cotton (lb/A) at two locations in the Coastal Plain of GA, 2003. Means followed by the same letter of the same case do not differ significantly as determined by Fisher's protected least significant test (P≤0.05).

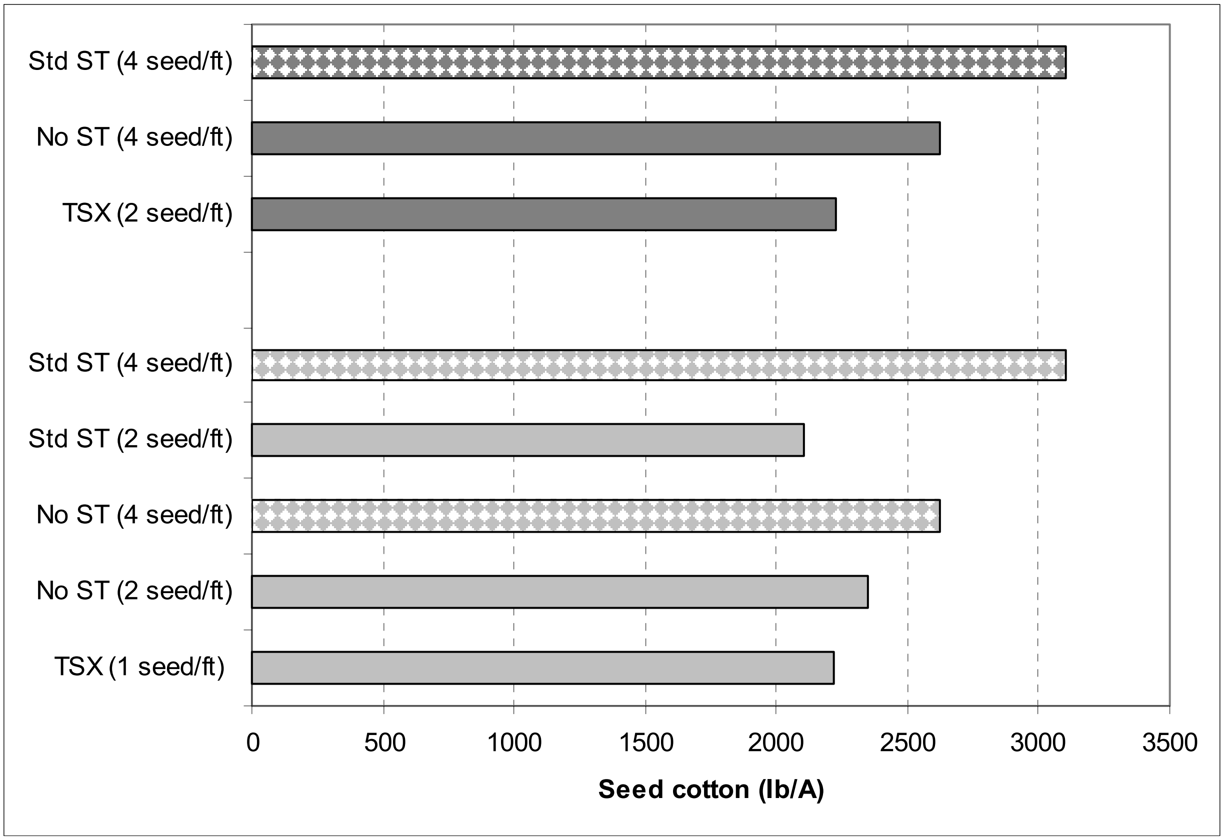

Figure 3. Selected comparisons between seeding rate and seed treatment and effects on yield of seed cotton (lb/A) at two locations in the Coastal Plain of GA, 2003. Bars of the same color and pattern do not differ significantly as determined by comparison of least squares means ($P \leq 0.05$).