Interaction of Cotton Varieties and *Rhizoctonia solani:* Effects on Resultant Plant Populations, 2005

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Abstract

Eight varieties were evaluated under field conditions for resultant plant populations after field infection with Rhizoctonia solani. Highest plant populations were noted in Delta and PineLand 454BR, followed by three other Delta and PineLand (DPL) varieties. Stoneville and Phytogen cotton varieties had reduced plant stands compared to DPL varieties at approximately 30 days after planting. DPL 454BR, which had the highest plant population, also had earlier growth and establishment than other varieties which is thought to have helped plant survival. Although all seed was treated with multiple fungicides, seed of DPL varieties was treated with several fungicide active ingredients (thiram, tridimenol) not present on seed from other varieties. Comparative increased stand on DPL varieties may be in part due to plant genetics as well as fungicide. Stand loss was noted in all varieties however. Data indicate that in-furrow application of fungicides or applications to small cotton plants may be necessary for heavier soils under cool and moist early season growing conditions in the low desert.

Introduction

Incidence and the severity of diseases on seedling cotton in the low desert are often negligible due to typically warm, dry conditions that do not favor disease development, and because cotton seed is typically treated with multiple fungicides. Growers and PCAs therefore often somewhat unconcerned about soil diseases on cotton seedlings in this environment. The cool, wet conditions of spring 2005 slowed cotton seedling emergence and subsequent growth, and favored development of seedling diseases, especially in heavier soils. *Rhizoctonia solani* is known as 'sore shin', named for the large sunken lesion on the hypocotyl (=shins) at the soil surface (Davis, 2005, Rothrock, 2001). Although the fungus is capable of growth over a wide temperature range (64-91°F), the plant is more susceptible to the disease at low soil temperatures (Rothrock, 2001). This experiment examined and compared the response of several widely grown cotton varieties with commercial seed treatments planted in soils with conditions conducive to *Rhizoctonia solani* infection.

Methods and Materials

Seed was obtained from several commercial seed companies, which included Delta and PineLand (DPL), Phytogen (PHY), and Stoneville (STV). Varieties included DPL 449BR, DPL 454BR, DPL 455BR, DPL 555BR, PHY 510R, PHY 710R, STV 5599BR and STV 6636BR. Plots were 8 rows wide by field length (1,200 ft long) and were replicated four times in a randomized complete block design. Cotton was planted to moisture April 5-6, 2005, with a John Deere VacuPlanter, resulting in an even seed distribution. The field was irrigated approximately six days after planting, providing adequate moisture for growth. Multiple soil types were present in this field, and consisted primarily of silty clay loams (Cibola, Gilman, Rositas) and had a streak of Imperial silty clay across most plots.

All seed had been treated with multiple fungicides prior to being bagged for commercial planting. All DPL cotton seed varieties had been treated with a combination of four fungicides: Apron® (active ingredient = mefenoxam), Baytan® (tridimenol), Thiram (tetramethylthiuram disulfide) and Allegiance® (metalaxyl). Both Stoneville varieties had been treated with Apron® XL (mefenoxam), Maxim® (fludioxonil), Quadris (azoxystrobin) and Rally (myclobutanil). Both Phytogen cotton seed varieties had been treated wth Maxim® (fludioxonil), Apron® XL, myclobutanil and Nusan 30EC (TCMTB; 2-(thiocyanomethylthio) benzothiazole).

Cotton seedlings were noted dying in early May due to *Rhizoctonia solani* infection. Numbers of live plants were counted and recorded from 30 feet in each of the center four plot rowss, and again on June 21 when 30 foot of row was used from each of the center six rows of each plot. PHY 510R was removed prior to June 21, so data were not collected on June 21 for this variety. Data were statistically analyzed using Fisher's least significant difference (Statgraphics for Windows, Manugistics, Inc.).

Results

Varieties differed in their emergence and early seedling growth, as well as their response to *Rhizoctonia solani*. DPL 454BR emerged quickly and rows of this variety were discernable across the field before any other variety. This variety also had significantly more plants/acre (25,373) than any other variety evaluated (Table 1), including all other DPL varieties on May 5. DPL 455BR, DPL 449BR and DPL 555BR were very similar in plant populations on May 5 (18,400$\pm$270), and had significantly more plants/acre than remaining varieties with the exception of PHY 510R, which had numerically fewer plants/acre (15,709 plants/acre) than DPL varieties. The two STV varieties in this trial were also fairly similar in mean numbers of plants/acre on May 5 (12,200$\pm$550). PHY 710R had the fewest mean number of plants/acre (10,264).

Plant populations of most varieties continued to decrease due to *Rhizoctonia solani* presence between May 5 and June 21 with the exception of DPL 454BR which remained at almost the same plant population (24,411) as the May 5 sample date (25,373). All other varieties had about 33% less plants on the latter sample date when compared with May 5, with the exception of PHY 710R in which only a slight population decline was documented. DPL varieties continued to average more plants/acre than did Phytogen 710R (9,329) or STV varieties (8,200$\pm$800). DPL 449BR had numerically more plants/acre than did DPL 455BR or DPL 555BR on June 21 (Table 1).

Fungicide combinations on seed (which varied among seed sources) may have also contributed to differences in disease incidence and severity and resulting differences in seedling mortality in addition to genetic differences. Baytan and Thiram, two fungicides which have activity against *R. solani* (Colyer and Vernon, 2003; Davis 2005; Seebold and Kemerait, 2002)), were only noted as being present on DPL cotton seed. Fungicides present on PHY and STV varieties are also used for control of *R. solani* however, such as Maxim®, Quadris, Rally and Nusan (Colyer and Vernon, 2003; Davis 2005; Seebold and Kemerait, 2002).

Seedling vigor at low temperatures is also an important factor, as the variety with the greatest seedling vigor (DPL 454BR) also had the highest plant population, thought due to the faster growth of seedling plants of this variety allowing the plants to partially outgrow disease infection (Rothrock, 2001).

Seed applied fungicides provide a degree of immediate protection, however this may be lost when the seed coats are pulled out of the soil with the cotyledons. Under the type of conditions associated with this experiment there may have been a benefit of an in-furrow application of fungicides (Phipps and Rideout, 2005).

Literature cited

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Table 1. Mean plant populations per acre of eight cotton varieties on May 5 and June 21, 2005.

Variety	Live Plants/acre	
	May 5	June 21
DPL 454BR	25,373a	24,412a
DPL 455BR	18,649 b	10,727 bc
DPL 449BR	18,431 b	12,088 b
DPL 555BR	18,132 b	11,308 bc
PHY 510R	15,709 bc	-------
STV 6636BR	12,714 cd	8,948 bc
STV 5599BR	11,652 cd	7,387 c
PHY 710R	10,264 d	9,329 bc

Means in columns followed by the same letter are not statistically different at the p≤0.05 level (Fisher's LSD test).