THE EFFECTS OF FUNGICIDES ON PHOMOPSIS BOLL DANGLE INCIDENCE AND SEVERITY

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Abstract

Field tests were conducted in 1999 and 2000 to evaluate the effects of fungicides on Phomopsis boll dangle (PBD). Phomopsis boll dangle epidemics were monitored in Sure-Grow 501 and Phytogen 355 in 1999 and 2000, respectively. Foliar broadcast sprays of Quadris 2.08SC (12 fl oz/A) plus Bravo Weatherstik 6F (1.5 pt/A) or Benlate 50WP (1 lb/A) plus Bravo Weatherstik 6F (1.5 pt/A) were applied weekly beginning at or before boll initiation and continued until harvestable bolls were 20 to 24 days old. Beginning in late July and continuing until mid-August, PBD incidence (percent affected plants) and PBD severity (number of affected bolls per plant) were monitored weekly. PBD incidence and severity was not reduced by either fungicide combination compared to the non-treated cotton. In 1999, incidence ranged from 4.6% to 17.6% during the rating period. Severity ranged from 0.09 bolls per plant to 0.19 bolls per plant in 1999 and 0.5 bolls per plant to 0.81 bolls per plant in 2000. Lint yields from plots treated with fungicides did not differ from the non-treated. PBD was not a problem in the varieties evaluated under the environments experienced in 1999 and 2000. However, further research is necessary to determine if specific environmental conditions could cause PBD to negatively impact cotton yield.

Introduction

Phomopsis boll dangle (PBD), also known as phomopsis boll rot, atypical boll shed, cotton blossom-boll rot, and vascular cavitation, is a condition in which 2 to 4 day old bolls (thumbnail size) mummify and remain attached to the plant. Bolls are light to reddish-brown with an associated lesion that extends from the base of the boll along the peduncle. There has been concern among producers about the effects PBD has on cotton growth and development. In Arkansas, yield losses of one bale per acre have been attributed to PBD (Coker et al. 1998). While yield losses due to PBD have not been reported in Louisiana, the condition was reported in the state by 1963 and continues to be prevalent each year (Ivy 1963, McLean and Lawrence 1998). Evaluations from Louisiana State University official variety trials revealed the most severely affected varieties were the highest yielding (Dr. Patrick Colyer, LSU Agricultural Center, Red River Research Station, Bossier City, unpublished data). Some varieties most affected by Phomopsis boll dangle include Sure-Grow 501, Sure-Grow 248, Deltapine 90, Deltapine 90B, Deltapine 5415, Deltapine 5690, Deltapine 35B, Stoneville 474, and Phytogen PSC355 (Patrick Colyer, unpublished data). This variability in response of cotton to PBD suggests knowledge about the epidemiology is lacking and more research is necessary. Therefore, studies were initiated to address the following: 1) can PBD be managed with fungicides and 2) does PBD impact cotton growth and development. This paper presents the results of studies conducted in 1999 and 2000.

Materials and Methods

1999 Test

Cotton (*Gossypium hirsutum* L.) (cv. Sure-Grow 501) was planted (5 seed/ft) in a Gigger silt loam on 12 May at the LSU AgCenter Macon Ridge location of the Northeast Research Station located near Winnsboro, LA. Plots were 4 rows (40-inch centers) by 50 feet. The test area was managed according to Louisiana Cooperative Extension Service recommendations. Treatments were arranged as a randomized complete block with four replicates. Treatments evaluated included a non-treated, Quadris 2.08SC (12 fl oz/A) (Zeneca Agricultural Products, Wilmington, DE) plus Bravo Weatherstik 6F (1.5 pt/A) (Zeneca Agricultural Products, Wilmington, DE), and Benlate 50WP (1 lb/A) (DuPont E. I. DeNemours & Inc., Wilmington, DE) plus Bravo Weatherstik 6F (1.5 pt/A). Ten applications of fungicide were made beginning just prior to boll initiation (2 Jun) and continued weekly until 5 Aug. Foliar broadcast applications were applied with a CO_2 charged hand-held boom equipped with 80015 VS nozzles spaced 20 inches apart calibrated to deliver 10.5 GPA at 30 psi.

Data recorded included plant density, PBD incidence, PBD severity, and yield. Plant density, PBD incidence and severity were assessed on 5, 11, and 18 Aug. Plant density was determined from the two center rows of each plot. For each rating period, PBD incidence and PBD severity assessments were recorded from two ten-foot sections randomly selected from the center two rows. Incidence was assessed as the number of infected plants divided by the total plants. Severity was assessed by recording the location (node and fruiting branch position) of every boll affected within the 10 foot section of row. In addition to incidence and severity, plant densities and node above white flower (NAWF) measurements were recorded. Plots were mechanically harvested on 15 Sep. Data were subjected to GLM procedures and means were compared using Fisher's protected LSD (SAS Institute 1988).

2000 Test

Cotton (cv. Phytogen 355) was planted (6 seed/ft) in a Gigger silt loam on 12 May at the LSU Agricultural Center Macon Ridge location of the Northeast Research Station located near Winnsboro, LA. Plots were 4 rows (40-inch centers) by 30 feet. The test area was managed according to Louisiana Cooperative Extension Service recommendations. Treatments were arranged as a randomized complete block with five replicates. Treatments were evaluated in a manner similar to 1999. Five applications of fungicide were made beginning at boll initiation (26 Jun) and continued every seven days until 24 Jul. Foliar broadcast applications were applied with a CO_2 charged hand-held boom equipped with 8002 VS nozzles spaced 20 inches apart calibrated to deliver 15 GPA at 38 psi.

Data recorded included plant density, PBD severity, NAWF, and yield. Plant density and PBD was assessed on 24 Jul, 2 Aug, and 11 Aug. Data was recorded in the same manner as described in 1999. Plots were mechanically harvested on 19 Sep. Data were subjected to GLM procedures and means were compared using Fisher's protected LSD (SAS Institute 1988).

Results and Discussion

Plant densities did not differ among treatments during 1999 or 2000 (Table 1). Densities ranged from 2.4 to 3.3 plants per foot in 1999, and 5.1 to 5.7 plants per foot in 2000. These densities are within the acceptable range to optimize yields. Poor emergence and stand establishment did not jeopardize the performance of any treatment.

Overall pressure from PBD was low. During the two year period, PBD was higher in Phytogen 355 than in Sure-Grow 501 (Table 2 & 3). Even though PBD severity was five to seven times higher in Phytogen 355 compared to Sure-Grow 501, the number of affected bolls never exceeded one per plant. On 11 Aug 1999, PBD incidence was lowest (4.8%) in cotton sprayed with Quadris + Bravo Weatherstik and highest (17.6%) in the non-treated cotton (Figure 1). This treatment effect was also observed for PBD severity at first position sites, as well as total sites (Table 2 and Figure 3). This treatment effect was not observed at other ratings taken during 1999 or 2000. Quadris + Bravo Weatherstik was probably not entirely responsible for this reduction in PBD incidence and severity. Other treatment differences were not detected, at least in part, because of low PBD pressure and the high

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variability within treatments. Severity ranged from 0.09 bolls per plant to 0.19 bolls per plant in 1999 and 0.5 bolls per plant to 0.81 bolls per plant in 2000. The variation in incidence and severity indicates PBD is not uniformly distributed in a field, making it hard to accurately quantify.

The majority of the bolls affected by PBD were located at first position sites, followed by second position sites, and other sites (Figures 2-7). On all but one rating (11 Aug 99), 60% to 93% of the affected bolls were located at first position sites regardless of treatment. This is consistent with results from Colyer (unpublished data) and Padgett et al. (2000). They reported that 69% and 56% of affected bolls were located at first position sites in NuCotn 33B and DP 90RR, respectively. Boquet et al. (1993) reported that over 50% of bolls retained by cotton are located at first position sites. Therefore, the opportunity for first position sites to be affected by Phomopsis is greater than for other sites.

Fungicide treatments did not increase yield over the non-treated (Figure 8). Yields were low overall and ranged from 323 lb/A to 458 lb/A during 1999 and 2000. The low PBD incidence was not enough to impact yield. In many cases the severity of this condition is probably overestimated based on visual observations. In tests that monitored PBD epidemics in individual fields, Padgett et al. (2000) found PBD affected plants out-yielded non-affected plants of the same variety.

Phomopsis boll dangle cannot be managed with these fungicides based on the results from this work. In addition, this condition did not impact yield under the environment experience during these studies. The variability of PBD within fields makes it hard to accurately quantify. Quantifying epidemics using repeated measures techniques might help reduce this variability. To further determine if this condition impacts cotton growth and development, PBD epidemics need to be evaluated in other varieties and under different environmental conditions.

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Table 1. Plant densities of cotton treated with fungicides for the management of Phomopsis boll dangle.

		Plants / Foot	
Treatment	**Rate/A**	**1999**	**2000**
Non-treated	---	3.3	5.1
Quadris 2.08 SC +	12 fl oz		
Bravo Weatherstik 6F	1.5 pt	2.4	5.3
Benlate 50WP +	1 lb		
Bravo Weatherstik 6F	1.5 pt	2.5	5.7
LSD (P=0.05)	---	0.9	0.8

Table 2. Phomopsis severity in cotton treated with several fungicides for Phomopsis boll dangle, 1999.

		Affected bolls per plant[1]		
Treatment	**Rate/A**	**5 Aug**	**11 Aug**	**18 Aug**
Non-treated	---	0.09	0.25	0.10
Quadris 2.08SC +	12 fl oz			
Bravo Weatherstik 6F	1.5 pt	0.15	0.08	0.15
Benlate 50WP +	1 lb			
Bravo Weatherstik 6F	1.5 pt	0.12	0.19	0.15
LSD (P=0.05)	---	0.26	0.13	0.30

[1]An affected boll is a boll that is mummified and attached to the plant.

Table 3. Phomopsis severity in cotton treated with several fungicides for Phomopsis boll dangle, 2000.

		Affected bolls per plant[1]		
Treatment	**Rate/A**	**24 Jul**	**2 Aug**	**11 Aug**
Non-treated	---	0.50	0.69	0.59
Quadris 2.08SC +	12 fl oz			
Bravo Weatherstik 6F	1.5 pt	0.58	0.89	0.81
Benlate 50WP +	1 lb			
Bravo Weatherstik 6F	1.5 pt	0.53	0.77	0.78
LSD (P=0.05)	---	0.30	0.40	0.34

[1]An affected boll is a boll that is mummified and attached to the plant.

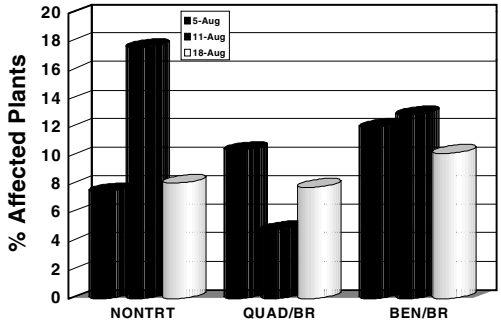

Figure 1. Percent plants affected by Phomopsis boll dangle in 10 foot of row, 1999.

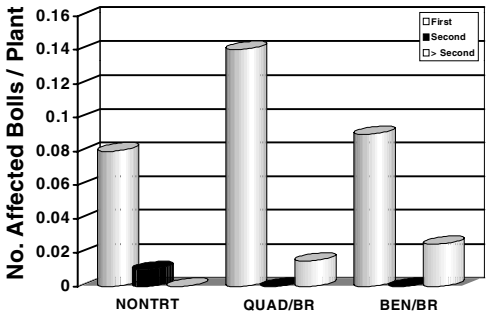

Figure 2. Number per plant of first, second, and grater than second position bolls affected by Phomopsis boll dangle, 5 Aug 99.

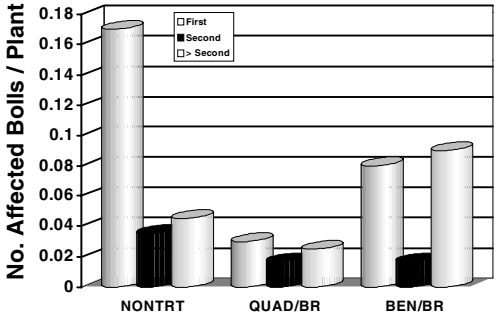

Figure 3. Number per plant of first, second, and greater than second position bolls affected by Phomopsis boll dangle, 11 Aug 99.

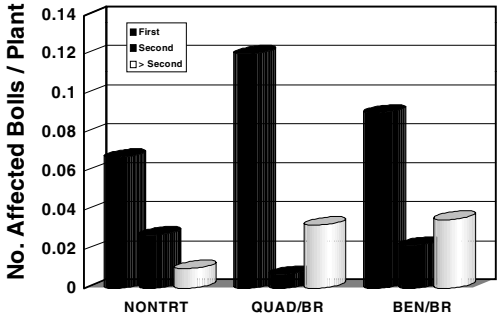

Figure 4. Number per plant of first, second, and greater than second position bolls affected by Phomopsis boll dangle, 18 Aug 99.

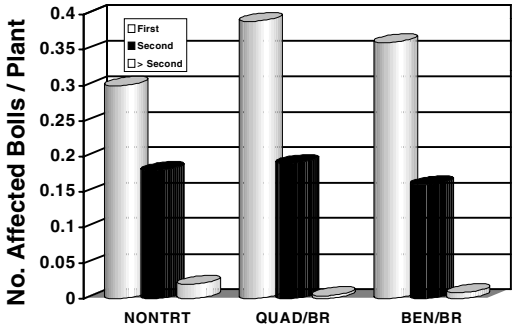

Figure 5. Number per plant of first, second, and greater than second position bolls affected by Phomopsis boll dangle, 24 Jul 00.

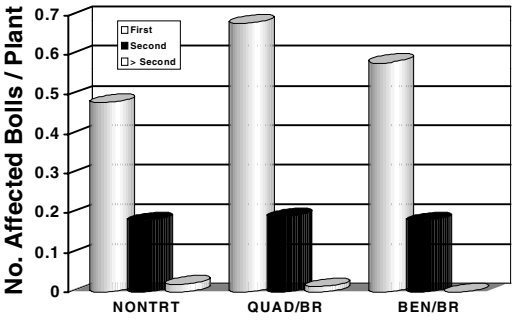

Figure 6. Number per plant of first, second, and greater than second position bolls affected by Phomopsis boll dangle, 2 Aug 00.

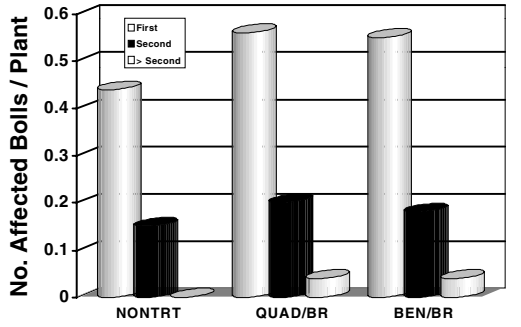

Figure 7. Number per plant of first, second, and greater than second position bolls affected by Phomopsis boll dangle, 11 Aug 00.

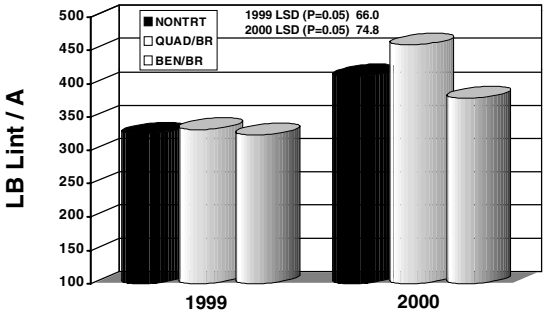

Figure 8. Lint yields of cotton treated with fungicides to manage Phomopsis boll dangle in 1999 and 2000.