Fungicide Evaluations on Beans in Southeastern Arizona, 1994-1995

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Abstract

Fungicidal evaluations were performed on pinto beans in two sites in 1994 and one site in 1995 to determine their effect on bean rust, white mold or common bacterial blight. The results were mixed between sites and years, but in 1994 the untreated control yielded less than all of the treatments except one and the Fluazinam 500F 1 lb rate was the highest yielding treatment. In 1995, no disease symptoms were observed in the field.

Introduction

The greatest disease threat to pinto beans in the southeastern, high deserts of Arizona is Rust (*Uromyces appendiculatus* (Pers.) Unger var. *appendiculatus*). This study was undertaken to check the efficacy of several fungicides on the pathological organisms that were present during the particular conditions exhibited during the year.

Materials and Methods

These trials were replicated small plot studies located within 125 acre pivots on the Haas Farm in the Bonita area and the Terry Farm in the Kansas Settlement area in southeastern Arizona. The experimental treatments were applied over the top of all the normal cultural practices of the farm cooperators except that the cooperators were asked to try to prevent the application of the field fungicide treatments in the plot areas. Crop histories are provided for the test plot areas.

Crop History on Haas farm 1994:
Soil type: Pima loam/Tubac sandy clay loam complex
Previous crop: Barley (double crop)
Planting date: July 6, 1994 Rate: 75 lbs/acre
Herbicide: Treflan and Eptam preplant
Fertilizer: 165 lbs/ac 18-46-0 at planting, 65 lbs/ac N applied via fertigation
Insecticide: One application for army worms
Fungicide: Three applications of copper based fungicides were applied for rust to the entire pivot, additional applications of the experimental treatments were applied twice (11 Aug and 24 Aug 1994) excepting treatment #3 (ASC 66825 10G 0.5 lbs ai/ac) which was applied once, on the 15th of August

Plots were observed on all three application times and again on the 9th and 20th of September. No disease symptoms were seen on any of the plots, including the control plots.

Irrigation: Center pivot
Harvest date: October 20, 1994 (106 days, 1940 HU(86/55°F)

Crop History is not available for Terry farm in 1994, but crop development and timing of applications and *observations was the same as the Haas farm. An exception being that rust was observed in this site.*

Crop History on Haas farm 1995:
Soil type: Sonoita sandy loam
Previous crop: Corn
Planting date: July 22, 1995
Herbicide: Treflan chemigated on initial irrigation.
Fertilizer: 190 lbs/ac of 11-52-0 + 9 gal 10-34-0 + Zn at planting
25 lbs/ac of N chemigated during the season
Insecticide: None
Fungicide: No fungicides were applied to the entire pivot, the experimental treatments listed in Table 3 were applied on September 14th and 29th.

Observations were made on the days of application and also on October 19th. On that date, all plants were senescing but some plots were more green than others "Percent Green" observations were made to see if they correlated to treatments applied.

Irrigation: Center pivot
Harvest date: November 9, 1995 (110 days, 2207 HU(86/55°F)

The bean plots were cut together with the rest of the bean field and then a subsample was taken from each plot where plants were counted, weighed, threshed with a Vogle-type small plot thresher and bean weights and aerial biomass determined.

Results and Discussions

Rust development is favored by 70-85°F (21-29°C) temperatures and moist conditions which present free water on the leaf surface for more than 10 hours (1). To see if those conditions were met during the growing seasons, the temperature, relative humidity and rainfall data are presented in Figures 1 and 2. The weather records of May and June are presented because this time of the year is critical for volunteer beans to be infected and cause an increase of inoculum for the later crops. With few exceptions, there were extended hours during each day that the temperature would have been conducive for the development of rust spores in the bean plants. The limiting factor was free water on the leaf surface. All of the test fields were irrigated with pivots which places free water on the leaves every time the pivot makes a circle. With low relative humidity, however, the free water evaporates within a couple of hours after the sprinkler has passed. Observing the "RHmin" lines for both years, there were only a couple of occasions from May to the middle of July when the minimum relative humidity was above 10%. This means that little inoculum would have been produced by volunteer plants in both years. Comparing the mid-July through October period, 1994 had more moisture than 1995 and would have had a greater chance of rust infection. This information is born out in the field observations.

Table 1 shows bean yields by fungicide treatments on the Haas farm in 1994. No disease symptoms were seen on any of the plots, including the control plots. Never-the-less, statistical yield differences were seen by treatment. The only explanation offered is that perhaps levels of infection, lower than are observable by eye, can cause yield losses. Table 2 gives the results from the Terry farm where rust was observed and quantified. The same treatments were at the top and bottom of the trial even though there were no statistically significant differences in yields. Variability was quite high in quantifying the disease symptoms and there was no significant correlation between symptoms and yield. Table 3 contains data from the Haas farm trial in 1995. No rust was observed in any of the plots and no significant differences were seen in any of the parameters measured.

References

1. Schwartz, H. et.al. 1990. Colorado dry bean production and IPM bulletin. Bulletin 548A, Colorado State University Cooperative Extension and Agricultural Experiment Station.

Table 1. Bean yields by fungicide treatment on the Haas farm in Bonita, AZ in 1994.

Treatment	Bean yields (pounds/acre)
Fluazinam 500F 1.0 lb ai/ac	4355 a
Fluazinam 500F 0.5 lbs ai/ac	4069 ab
ASC 66825 10G 0.5 lbs ai/ac	3743 abc
Bravo Ultrex 825SDG 1.0 lb ai/ac	3725 abc
Rovral 50WP 0.5 lb ai/ac	3659 bc
Control	3524 bc
Bravo Ultrex 825SDG 1.0 lb + Fluazinam 500F 0.33 lbs ai/ac	3267 c
Average	3763.1
LSD(05)	591.1
CV(%)	10.57

Table 2. Bean yields by fungicide treatment on the Terry farm in Willcox, AZ in 1994.

Treatment	Biomass/ac (pounds/ac)	Bean yields (pounds/acre)	% Infected Leaves	% Lesion Coverage
Fluazinam 500F 1.0 lb ai/ac	7005 a	2839 a	37.8 abc	0.3 b
Rovral 50WP 0.5 lb ai/ac	6025 a	2820 a	59.0 a	0.6 ab
Bravo Ultrex 825SDG 1.0 lb ai/ac	6499 a	2818 a	32.0 bc	0.2 b
Fluazinam 500F 0.5 lbs ai/ac	5845 a	2754 a	41.3 abc	0.4 ab
ASC 66825 10G 0.5 lbs ai/ac	6207 a	2691 a	57.0 a	0.8 a
Bravo Ultrex 825SDG 1.0 lb + Fluazinam 500F 0.33 lbs ai/ac	5990 a	2575 a	25.8 c	0.4 ab
Control	5519 a	2454 a	53.3 ab	0.6 ab
Average	6155.6	2707.3	43.7	0.48
LSD(05)	1457.6	484.7	21.3	0.38
CV(%)	15.9	12.1	32.7	53.8

Table 3. Bean yields by fungicide treatment on the Haas farm in Bonita, AZ in 1995.

Treatment	Biomass (pounds/ac)	Yield (pounds/acre)	Percent Green
Bravo 500F 1.5 lbs ai/ac	6371 a	2587 a	13.8 a
Control	6153 a	2689 a	21.3 a
Rovral 50WP 0.5 lb ai/ac	5472 a	2479 a	25.0 a
Fluazinam 500F 0.5 lbs ai/ac	5472 a	2397 a	8.8 a
Fluazinam 500F 0.25 lb ai/ac	5064 a	1996 a	10.0 a
Bravo 500F + Zn 1.5 lb ai/ac	4846 a	2158 a	23.8 a
Fluazinam 500F 1.0 lb ai/ac	4601 a	1859 a	20.0 a
Average	5425.6	2309.2	17.5
LSD(05)	1433.4	821.2	22.6
CV(%)	17.8	23.9	86.8

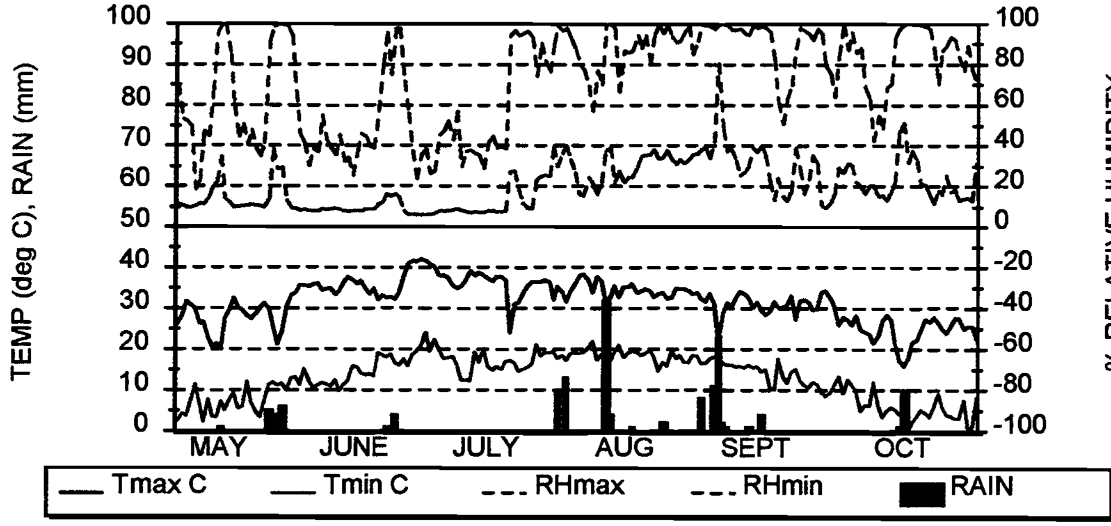

Figure 1. Weather data from the AZMET station in Bonita, 1994.

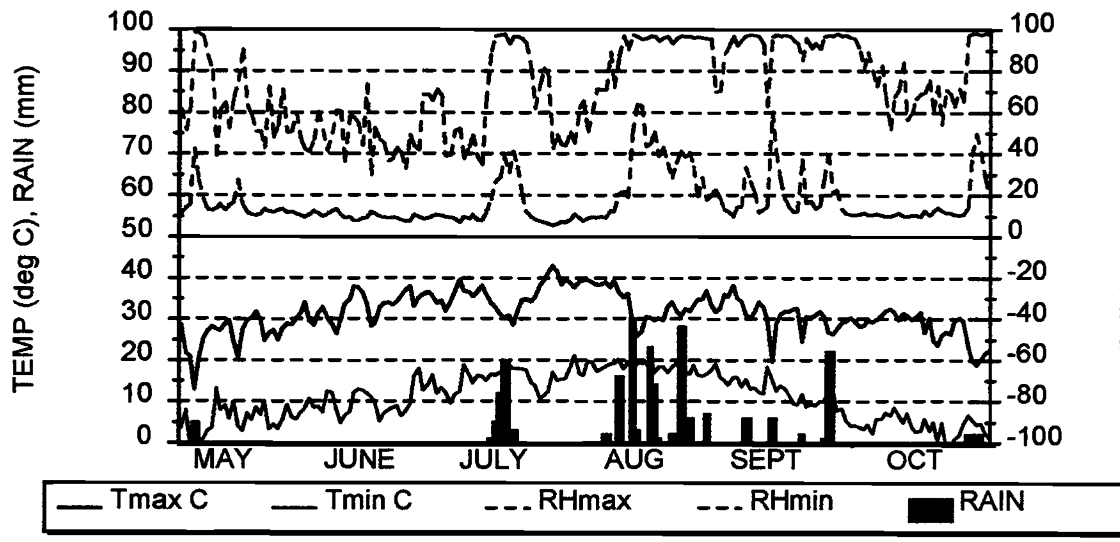

Figure 2. Weather data from the AZMET station in Bonita, 1995.