1997 Seed Treatment Evaluations

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Abstract

Cottonseed was treated with several fungicide treatments in an effort to protect the seed and seedling from disease. Seed germination and vigor was evaluated in three Arizona locations; Maricopa, Marana, and Safford. Stand counts were taken on two separate dates after emergence at all three locations and percent emergence (PEM) was calculated. Significant differences in percent emergence due to treatment were observed in the both sample dates at Marana and Safford. Maricopa showed very little significant differences due treatment.

Introduction

One of the most important factors involved in producing a high yielding crop of cotton is being able to establish a uniform and vigorous stand early in the season. There are many factors that may affect the accomplishment of this goal. Weather is one of the most influential factors in seedling development. Cool temperatures can slow down the germination and growth of a cotton seedling resulting in poor seedling vigor and 'skippy' stands. Another factor is that of seedling diseases and soil-borne fungi that can slow down growth and development of a seedling, and in a worst case scenario, lead to the death of the seedling. In an effort to curb the effects of seedling diseases on emergence and vigor, cottonseeds treated with a variety of fungicides, and at different rates, were evaluated from the standpoint of seedling emergence and viability. This project is an extension of similar work conducted in Arizona in recent years (Silvertooth and Malcuit,1990; Silvertooth and Malcuit, 1991; Silvertooth and Malcuit, 1992; Silvertooth and Malcuit, 1993; Norton and Silvertooth, 1994; Norton and Silvertooth, 1995; Norton and Silvertooth, 1996, Norton and Silvertooth, 1997).

Materials and Methods

Separate experiments were conducted at the University of Arizona agricultural experiment stations located at Maricopa, Marana, and Safford, AZ. Plots were planted on 13 March at Maricopa, 28 March at Marana, and 8 April at Safford. Heat units accumulated since 1 January were 312, 469, and 441 heat units accumulated since 1 January (86/55° F thresholds) for Maricopa, Marana, and Safford respectively. Experiments were arranged in a randomized complete block design with each of the 8 treatments (Table 1) being replicated four times. Plots consisted of four, 40" rows that extended 40' in length. Exactly 200 seeds were planted in each of the four rows for every experimental unit. Percent emergence (PEM) was calculated for two sampling dates at each location based upon number of emerged, viable seedlings as a percentage of 200 seeds planted. Percent emergence values obtained were subjected to analysis of variance according to guidelines put forth in Gomez and Gomez (1984) and the SAS institute (1988). Due to missing values, the data set obtained was unbalanced. The general linear models (GLM) statement was used for analysis of variance along with a pairwise comparison t-test using least square means data for a given two treatment comparison. The resultant observed significance level from the t-test was used to determine if the differences between any two given treatments was significant. Differences were declared significant at the α=0.05 level.

Results and Discussion

Maricopa

Results obtained at the Maricopa location are consistent with previous years of studies conducted. Analysis of variance on the overall data revealed no significant differences among treatments. Table 2 lists the treatments and in descending order of PEM for both sample dates. Similar trends were observed between the two sample dates (8 April and 25 April). Significant differences among treatments were found only between treatment 8 (control) and the treatment with the highest PEM, treatment 6 (Table 1). All other differences among treatments were not statistically significant. Soil temperature data for the study is found in figure 1. Mean soil temperatures at a depth of 2.5 in. were at or above 65 °C for approximately 20 days post planting. This resulted in near optimum conditions for seedling emergence. A sharp decrease in soil temperatures did occur after this 20 day period but seedlings were well established and were not adversely affected by the brief decrease in soil temperatures.

Marana

Results at the Marana Agricultural center were once gain consistent with past year's studies. Planting conditions were conducive to producing significant results. Figure 2 indicates that the mean soil temperatures for approximately the first 20 days after planting were at or below 65 °C with a sharp decrease below 60 °C at approximately 6 days after planting. Treatment listings for PEM are found in Table 3. Significant results were found among several treatment comparisons for the second sample date (30 May). Treatment 8 (control) was significantly lower than all other treatments. Treatments 3 and 6 were significantly higher than two of the other treatments including; 1 and 2. All other treatments were not significantly different.

Safford

Mean soil temperatures at the Safford Agricultural Center near the date of planting were well below the optimum of 65 °C (Figure 3). Two days prior to planting temperatures dropped below 60 °C to approximately 55 °C. Mean soil temperatures remained below optimum for approximately the first 15 days post planting. Table 4 outlines results of PEM for each of the 8 treatments. All treatments were significantly higher than the control (treatment 8). Treatment 4, which had the highest PEM, was significantly higher than treatments 1, 2, and 7 as well. Treatments 3 and 5 were also significantly higher than 1, 2, and 7 but not statistically different than treatment 4.

Summary

At all locations, the benefit of planting chemically treated seeds is clearly demonstrated. Different treatment combinations also performed differently across the three locations. Treatment 6 performed well at both Maricopa and Marana but not so well at Safford while treatment 4 performed well at Safford but not at Maricopa and Marana. Another important consideration from these studies is that the overall PEM never exceeded 60%. It is common to use an estimate of 80% emergence when making decisions on seeding rates at planting. The evidence presented in this study indicates a more conservative estimate may be appropriate.

Acknowledgment

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Table 1. Treatment compositions for seed treatment experiments conducted at Maricopa and Marana, 1997.

Treatment #	Treatment	Rate fluid ounces/cwt.
1	Maxim	0.080
	Nu-Flow M	1.750
	Apron XL	0.425
2	Maxim	0.080
	Apron XL	0.425
	Dividend	1.000
3	Nu--Flow M	1.750
	Apron XL	0.425
	Maxim	0.080
	Nusan	2.000
4	Nusan	4.000
	Apron XL	0.425
	Nu-Flow M	1.750
5	Nuflow ND	7.500
6	WECO 969	3.380
	Nu-Flow M	1.750
	Apron XL	0.425
7	Maxim	0.160
	Nu-Flow M	1.750
	Apron XL	0.425
8	Untreated	

Table 2. Percent emergence data for seed treatment study at Maricopa, 1997.

Date		
8 April	**Treatment**	**Percent Emergence**
	6	52.72
	2	52.34
	7	51.84
	3	51.09
	4	50.59
	5	49.34
	1	49.22
	8	41.81
	C.V (%)§	28.44
25 April		
	6	49.91
	7	49.00
	4	48.06
	2	47.53
	3	46.75
	5	46.56
	1	45.06
	8	39.75
	C.V. (%)§	29.14

Significant Treatment Comparisons ($\alpha = 0.05$) for only sample date 25 April.

Comparison	OSL†
6 vs. 8	0.0364

§Coefficient of Variation

† Observed Significance Level

Table 3. Percent emergence data for seed treatment study at Marana, 1997.

Date		
23 April	**Treatment**	**Percent Emergence**
	6	40.03
	3	39.59
	5	38.16
	4	37.91
	1	35.72
	7	35.41
	2	34.25
	8	25.78
	C.V (%)§	23.03
30 May		
	3	39.25
	6	39.00
	5	36.67
	4	35.66
	7	34.78
	1	33.59
	2	33.25
	8	25.41
	C.V. (%)§	22.43

Significant Treatment Comparisons ($\alpha = 0.05$) for only sample date 30 May.

Comparison	OSL†
1 vs. 3	0.0420
1 vs. 8	0.0036
2 vs. 3	0.0312
2 vs. 6	0.0399
2 vs. 8	0.0052
3 vs. 8	0.0001
4 vs. 8	0.0003
5 vs. 8	0.0001
6 vs. 8	0.0001
7 vs. 8	0.0009

§Coefficient of Variation
†Observed Significance Level

Table 4. Percent emergence data for seed treatment study at Safford, 1997.

Date	Treatment	Percent Emergence
24 April		
	4	54.81
	3	54.37
	5	53.83
	6	51.87
	7	49.93
	1	47.90
	2	45.41
	8	38.53
	C.V (%)§	19.80
19 May		
	4	57.16
	3	56.20
	5	56.13
	6	55.20
	1	50.73
	7	49.60
	2	49.00
	8	39.90
	C.V. (%)§	14.27

Significant Treatment Comparisons ($\alpha = 0.05$) for only sample date 19 May.

Comparison	OSL†
1 vs. 3	0.0452
1 vs. 4	0.0479
1 vs. 5	0.0479
1 vs. 8	0.0001
2 vs. 3	0.0088
2 vs. 4	0.0027
2 vs.5	0.0094
2 vs. 6	0.0235
2 vs. 8	0.0010
3 vs. 7	0.0160
3 vs. 8	0.0001
4 vs. 7	0.0054
4 vs. 8	0.0001
5 vs. 7	0.0171
5 vs. 8	0.0001
6 vs. 7	0.0403
6 vs. 8	0.0001
7 vs. 8	0.0005

§Coefficient of Variation
†Observed Significance Level

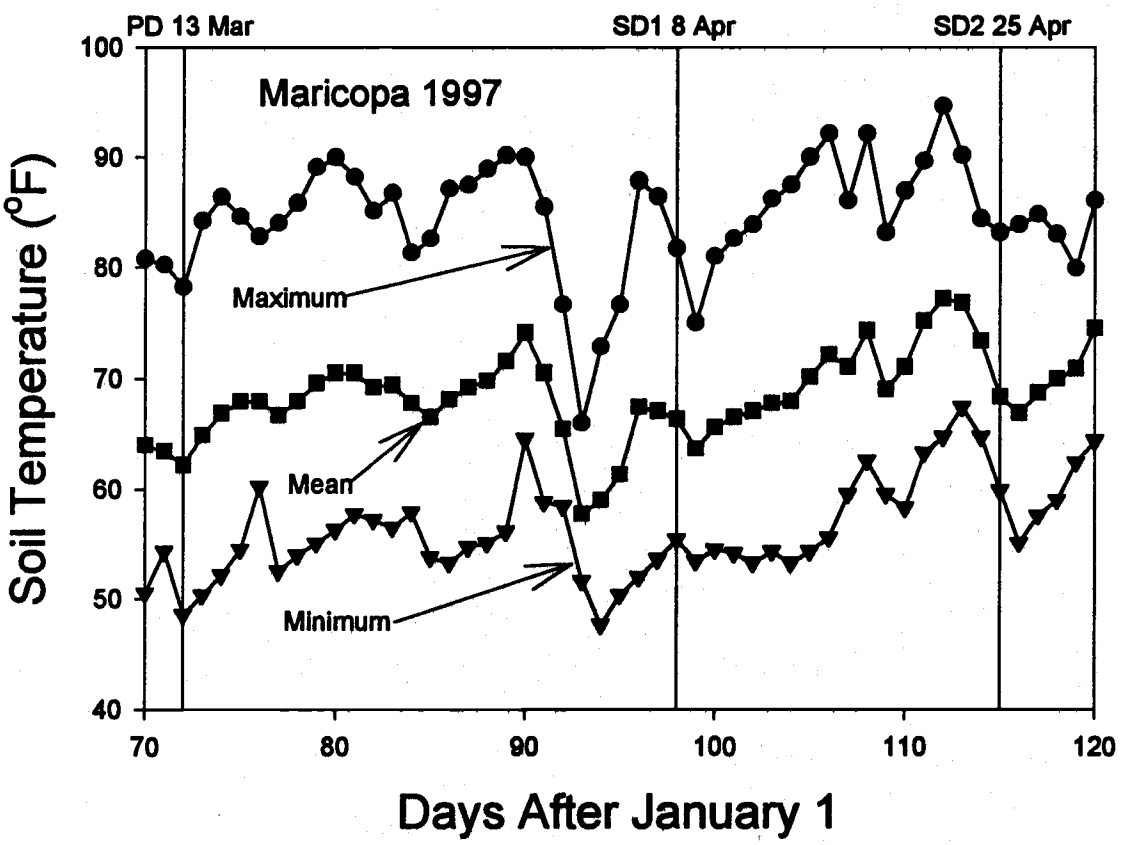

Figure 1. Maximum, mean and minimum soil temperature at a depth of 2.5" as a function of time for the duration of the seed treatment study at the Maricopa Agricultural Center, 1997.

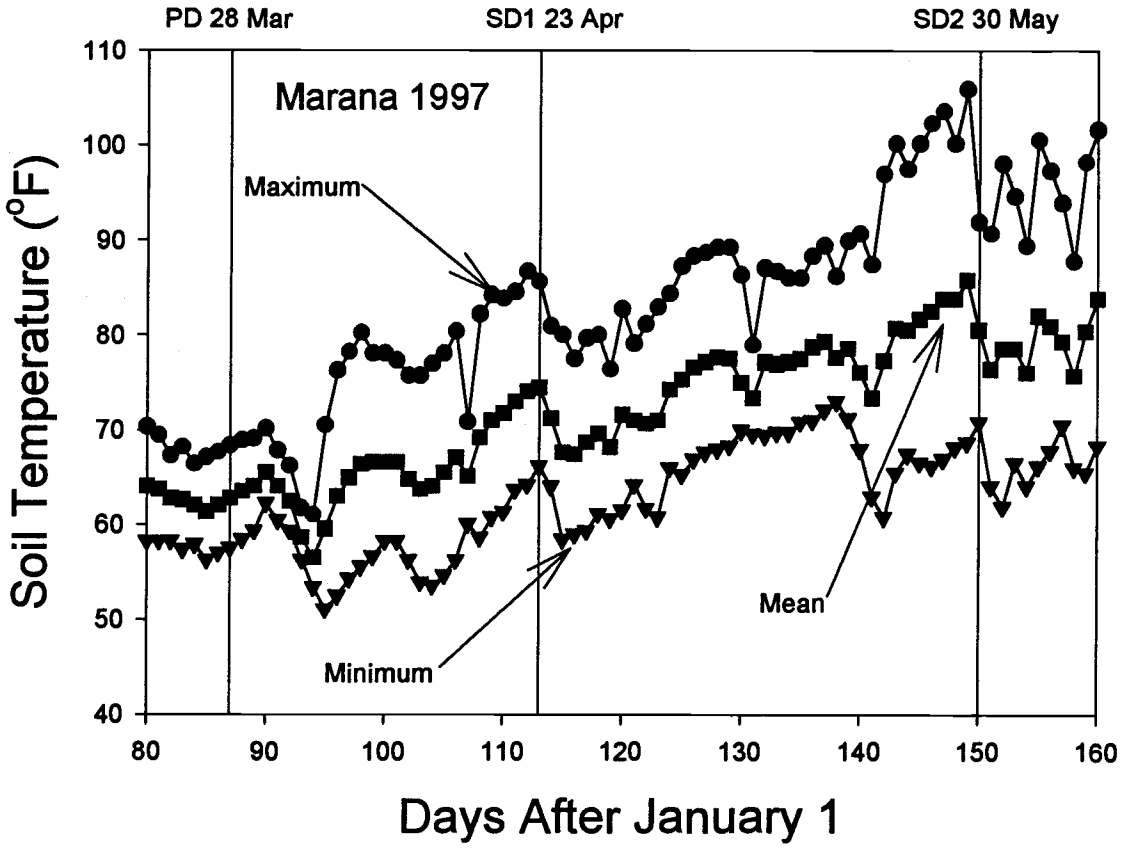

Figure 2. Maximum, mean and minimum soil temperature at a depth of 2.5" as a function of time for the duration of the seed treatment study at the Marana Agricultural Center, 1997.

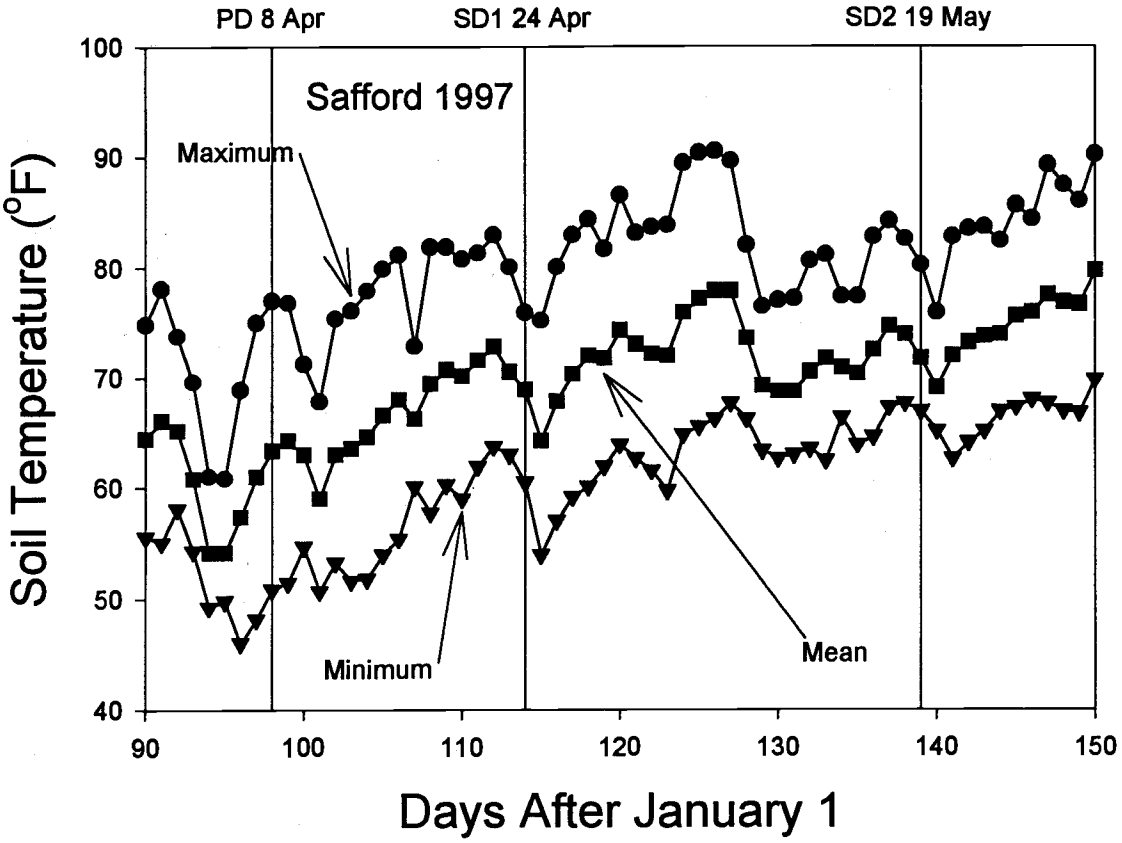

Figure 3. Maximum, mean and minimum soil temperature at a depth of 2.5" as a function of time for the duration of the seed treatment study at the Safford Agricultural Center, 1997.