LABORATORY AND FIELD PERFORMANCE OF POLYMER COATED FUZZY COTTONSEED

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Abstract

In order for modern planting equipment to function properly, seeds must readily flow in a single seed manner. After the ginning process, linters and small amounts of long fibers remaining on cottonseed cause the seed to clump together and resist this flowing action necessary for planting. Cottonseed for commercial planting is, therefore, delinted using an acid procedure which is very effective and is a relatively low cost method of preparing cottonseed for planting. Yet, concerns associated with acid delinting include potential seed damage, worker safety, waste disposal, and deterioration of equipment exposed to acid. Development of an alternative system for preparing gin run cottonseed for planting purposes could address some of the concerns associated with these acid delinting procedures. The objective of this study was to evaluate the effects of different rates and ratios of the polymer X-Pand'r and talc applied to reginned cottonseed on the germination (Cool Germination Test-CGT), vigor (Cool Warm Vigor Index-CWVI), emergence (Environmental Control Chamber Warm-ECCW and Field Emergence Rate Index-FERI), Field Establishment Percent (FEP), and Lint Yield (LY) of cotton. All treatment results were compared to the fuzzy and delinted controls. Data from this study indicated that none of the polymer/talc treatments used increased the CGT, CWVI, ECCW, and LY values on cotton when compared to the controls; however, the following treatments did increase the FERI and FEP when compared to both controls (unless otherwise noted): 1:8 (FERI- delinted only), W1 (FERI- delinted only), W2, and W5. The only treatments that were not significantly different from either control for all six parameters were the following: 2:4, 2.5:8, and W3. Results from the 2001 year suggested that cottonseed could be coated with certain of the treatments studied and not suffer any germination, emergence, and stand or yield loss.

Introduction

Cottonseed must flow in a single seed manner in order to be mechanically planted. However, after seed are ginned, small amounts of long fibers and linters remain on the seed, which cause the seed to clump together and resist this flowing that is necessary for planting. Cottonseed that is either planted commercially or in small-scale research plots (cultivar trials, breeding nurseries, and various field experiments) is typically delinted using an acid procedure that is both effective and inexpensive. However, certain disadvantages are associated with acid delinting and these include potential damage to the seed, worker safety, waste disposal, and deterioration of equipment exposed to acid. Further, as commercial gins strive for increasing capacity, more aggressive ginning may cause increasing seed coat damage and, therefore, subsequent damage by the acid delinting process. Development of an alternative system for preparing gin run cottonseed for planting purposes could address some of the concerns associated with these acid delinting procedures. The objective of this study was to evaluate the effects of different rates and ratios of the polymer X-Pand'r and talc applied to reginned cottonseed on the germination (Cool Germination Test-CGT), vigor (Cool Warm Vigor Index-CWVI), emergence (Environmental Control Chamber Warm-ECCW and Field Emergence Rate Index-FERI), Field Establishment Percent (FEP), and Lint Yield (LY) of cotton. Polymer/Talc combination effects on reginned cottonseed were compared to a fuzzy cottonseed control (no polymer application) and a delinted control (sulfuric acid).

Materials and Methods

A sample of reginned cottonseed was obtained from the USDA Gin Lab in Lubbock TX. Nineteen treatments, which included twelve polymer (X-Pand'r): talc combinations, 5 proprietary treatments, and 2 controls (fuzzy and delinted) were imposed upon the seed (Table 1). The seed were treated in a modified Hege seed treater. It had been previously determined that the addition of 40% by weight of water before the application of the dry polymer and talc mixture caused the fibers to mat down on the seed surface. The seed were then dried in the Hege seed treater with 40°C forced air for approximately 8 to 10 minutes and an additional 10 minutes in a modified seed blower with 40°C air. The modified seed blower allowed the seed to be agitated, thus exposing the entire seed mass to the warm air to insure uniform and complete drying.

Treatments were evaluated in the laboratory by subjecting seed from each of the treatments to the Cool Germination Test (CGT) and the Cool Warm Vigor Index (CWVI). In the CGT, four replications of 50 seeds each for the 19 treatments were placed on standard germination towels, rolled, and placed in a germination chamber set at a constant temperature of 18°C. Germination counts were made 7 days after planting. Only the seedlings with a hypocotyl/radicle length of 1.5 inches or greater and normal in appearance were counted. The CWVI was calculated by numerically combining the results of the standard Warm Germination Test 4 DAP and the Cool Germination Test 7 DAP. This is a measure of the seedling vigor.

In addition, the treatments were evaluated for their emergence from sand in a growth chamber (Environmental Control Chamber Warm). Fifty seeds were planted 1 inch deep in sand in plastic shoe boxes. Prior to planting, the sand was watered to field capacity and allowed to drain over night. Following the equilibrium period the seed were planted on the surface of the wet sand and covered with 1 inch of dry sand and firmed. The containers were then placed in a walk-in chamber set at a constant 30°C. Emergence counts were taken daily for 14 days and used to calculate the percent emergence.

The field plots were planted on May 10, 2001 using a cone planter at a rate of 5 seeds per foot of row in three of the four 40 inch rows that made up the individual plots. The plots were 30 feet long with a 2-foot border between each plot. In the fourth row of each plot, only 100 seeds were planted and the number of emerged seedlings was counted daily for 28 days. These data were used to calculate the Field Emergence Rate Index (FERI). The FERI is a measure that integrates the rate of emergence and the total emergence. The Field Establishment Percent (FEP) was also determined and is the percentage of seeds planted that resulted in established plants 28 DAP. At the end of the season plots were hand harvested and evaluated for yield.

Results and Conclusion

Cool Germination Test 7 DAP (CGT) – see Figure 1

Results from the CGT showed that none of the treatments performed significantly better than either the fuzzy or delinted seed. The following treatments had CGT values significantly lower than the fuzzy seed: 2:12, W1, W2, and W4. The following treatments had CGT values significantly lower than the delinted seed: 1:8, 1.5:8, 1.5:12, 2:12, 2.5:12, 3:12, W1, W2, W4, and W5. The following treatments were not significantly different from either the fuzzy or delinted controls: 0.5:4, 1:4, 1.5:4, 2:4, 2:8, 2.5:8, and W3.

Cool Warm Vigor Index (CWVI) – see Figure 2

The CWVI indicated that none of the treatments performed significantly better than either the fuzzy or delinted seed. The following treatments had CWVI values significantly lower than the fuzzy seed: 2:12, W1, W2, and W4. The following treatments had CWVI values significantly lower than the delinted seed: 0.5:4, 1:4, 1.5:4, 1:8, 1.5:8, 1.5:12, 2:12, 2.5:12, 3:12, W1, W2, W4, and W5. The following treatments were not significantly different from either the fuzzy or delinted controls: 2:4, 2:8, 2.5:8, and W3.

Environmental Control Chamber Warm – see Figure 3

Results from the chamber warm test showed that none of the treatments performed better than either the fuzzy or delinted seed. The following treatments had values significantly lower than the fuzzy seed: 2:8, 1.5:12, 2:12, 2.5:12, 3:12, and W1. The following treatments had values significantly lower than the delinted seed: 1.5:12, 2:12, 2.5:12, and 3:12. The following treatments had chamber germination values that were not statistically different form either the fuzzy or delinted controls: 0.5:4, 1:4, 1.5:4, 2:4, 1:8, 1.5:8, 2.5:8, W2, W3, W4, and W5.

Field Emergence Rate Index (FERI) – see Figure 4

Results from the Field Emergence Rate Index indicated that the following treatments performed significantly better than the fuzzy seed: W2 and W5. The following treatments proved to be significantly better than the delinted seed: 1:8, W1, W2, and W5. None of the treatments had a Field Emergence Rate Index significantly lower than either the fuzzy or delinted controls.

Field Establishment Percent (FEP) – see Figure 5

The following treatments had a Field Establishment Percentage significantly better than the fuzzy seed: 1:8, W1, W2, and W5. The following treatments indicated a significantly higher Field Establishment Percentage than the delinted seed: 1:8, 3:12, W1, W2, and W5. None of the treatments had a Field Establishment Percentage significantly lower the either the fuzzy or delinted seed.

Lint Yield – See Figure 6

At the end of the season there were no significant differences in yield among the 19 treatments.

In general, across all laboratory parameters, the following treatments were consistently good and were statistically and numerically equivalent to the fuzzy and delinted treatments: 2:4, 2.5:8, and W3. In general, across the field parameters tested, the following treatments were consistently good and were generally equal to or better than both the fuzzy and delinted treatments: 1:8, W1, W2, and W5. Results from the 2001 year would suggest that cottonseed can be coated with a number of the treatments evaluated and not suffer any germination, emergence, stand or yield loss.

Acknowledgement

We would like to thank Cotton Incorporated for the financial assistance in conducting this study.

References

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Table 1. Summary of treatments.

Treatment No.	Polymer/Talc*
1	Fuzzy seed
2	Delinted seed
3	0.5:4
4	1:4
5	1.5:4
6	2:4
7	1.0:8
8	1.5:8
9	2.0:8
10	2.5:8
11	1.5:12
12	2.0:12
13	2.5:12
14	3.0:12
15	W1
16	W2
17	W3
18	W4
19	W5

* % by weight of polymer: % by weight of talc.

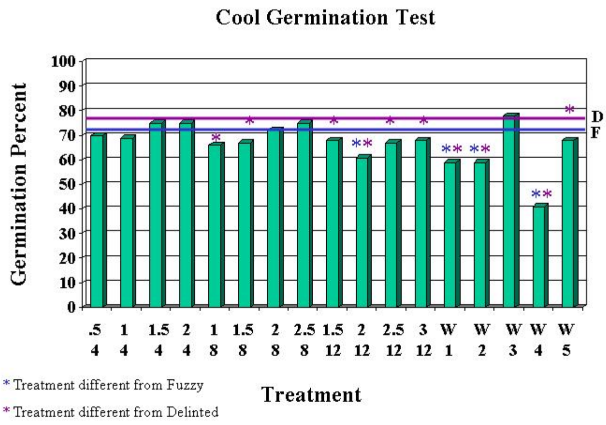

Figure 1. Cool Germination Test values for the 19 treatments.

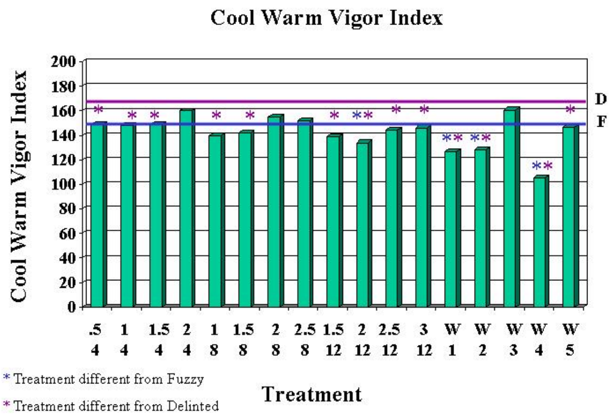

Figure 2. Cool Warm Vigor Index values for the 19 treatments.

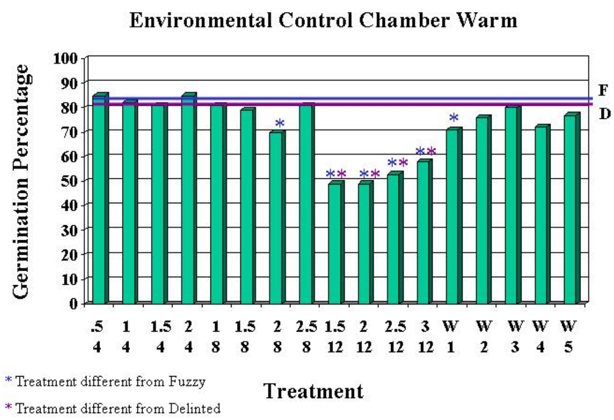

Figure 3. Environmental Control Chamber Warm values for the 19 treatments.

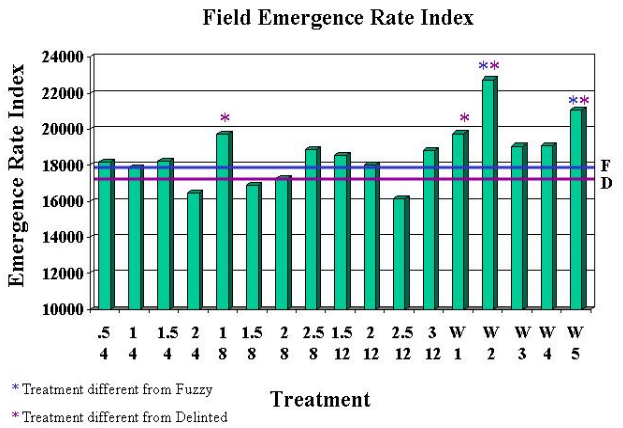

Figure 4. Field Emergence Rate Index values for the 19 treatments.

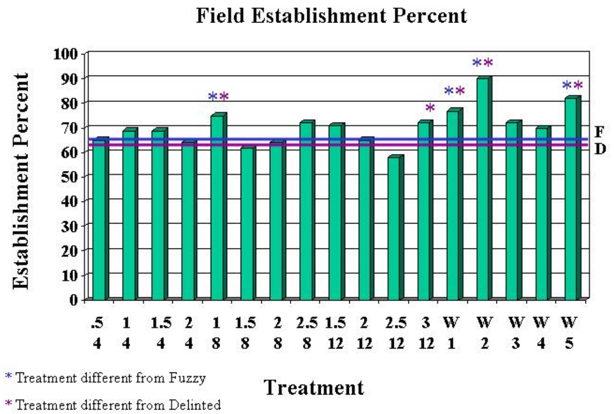

Figure 5. Field Establishment Percent values for the 19 treatments.

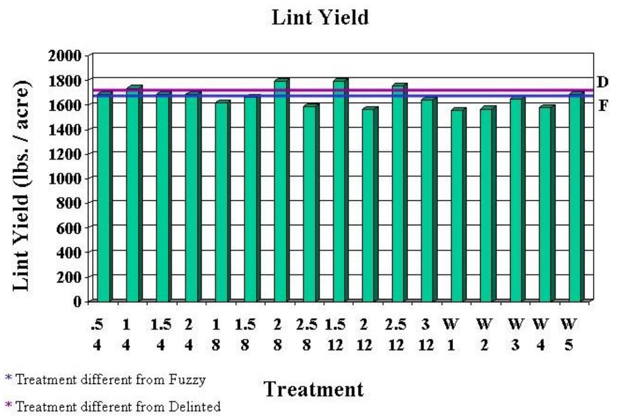

Figure 6. Lint Yield values for the 19 treatments.