THE EFFECTS OF POLYMER COATING ON UNDELINTED COTTONSEED

David Becker[1] and Norman W. Hopper[1,2]
[1]Texas Tech University, [2]Texas Agricultural Experiment Station
Lubbock, TX
Thomas C. Wedegaertner
Cotton Incorporated
Raleigh, NC

Abstract

In order for modern planting equipment to function properly seeds must readily flow in a singulated manner. The linters and a small amount of long fibers remaining on cottonseed after the ginning process cause the seed to clump together and resist this singulated flowing action necessary for planting. To overcome this problem, essentially all cottonseed intended for planting is delinted using an acid procedure. Concerns associated with acid delinting include potential seed damage, worker safety, waste disposal, and deterioration of equipment exposed to acid. Development of alternative systems for preparing gin run cottonseed for planting purposes could address some of the concerns associated with acid delinting procedures. The objective of this study was to evaluate the effects of different rates of Opadry Ag polymer on germination of reginned cottonseed. Polymer effects on reginned cottonseed were compared to cottonseed ginned once with no polymer application as well as cottonseed that was acid delinted (sulfuric acid) after one and two ginnings. Results from this study indicate that the application of Opadry Ag polymer up to 8% of seed weight does not decrease germination of seed that are reginned, while delinting reginned seed with concentrated sulfuric acid may significantly decrease germination. Polymer applications of 4 and 8% percent of seed weight combined with 4% talc seem to provide a coating with seed flowability that would allow for planting in commercial and research applications.

Introduction

In order for modern planting equipment to function properly seeds must readily flow in a singulated manner. The linters and a small amount of long fibers remaining on cottonseed after the ginning process cause the seed to clump together and resist this singulated flowing action necessary for planting. To overcome this problem, essentially all cottonseed intended for commercial planting is delinted using an acid procedure. This has been a very effective and relatively low cost method of preparing cottonseed for planting for many years. Yet, concerns associated with acid delinting include potential seed damage, worker safety, waste disposal, and deterioration of equipment exposed to acid. In addition, as commercial gins strive for increasing capacity, more aggressive ginning may cause increasing seed coat damage and subsequent damage by acid delinting. In addition, those involved in cotton research routinely need to prepare small seed samples for planting purposes in variety trials, breeding nurseries, and field experiments. Cottonseed intended for this purpose is typically delinted using concentrated sulfuric acid, with subsequent neutralization using sodium bicarbonate. Concerns associated with this process include worker safety, potential seed deterioration, and waste disposal. Development of alternative systems for preparing gin run cottonseed for planting purposes could address some of the concerns associated with these acid delinting procedures.

The EASI*flo*™ cottonseed coating system developed by Cotton Incorporated for the cattle feeding industry has generated interest in applying this or a similar coating to cottonseed to prepare them for planting purposes. Williams (1999) suggests that EASI*flo*™ starch coatings of 1.5, 3, and 4.5% of seed weight do not negatively affect germination or emergence. Williams (2000) found that 8% EASI*flo*™ starch coatings tended to decrease germination in cool germination tests while, 4% EASI*flo*™ starch and 4 and 8% Opadry Ag coatings did not affect germination or emergence.

A problem associated with coating gin run cottonseed is the small amount of long fibers remaining on the seed after ginning. These fibers tangle and cause clusters of seed to form as the polymer is applied. To address this problem Laird (1999), developed modifications to a conventional gin stand to allow reginning of cottonseed to remove these long fibers. This reginning facilitates polymer coating without the problems associated with the long fibers.

The objective of this study was to evaluate the effects of different rates of Opadry Ag polymer on germination of reginned cottonseed. Polymer effects on reginned cottonseed were compared to cottonseed ginned once with no polymer application as well as cottonseed that was acid delinted (sulfuric acid) after one and two ginnings.

Materials and Methods

A sample of cottonseed (Paymaster 2326RR) was obtained from the USDA gin lab at Lubbock, TX. A subsample of this seed was reginned to remove most of the long fibers on the seed. A portion of the reginned sample was then divided into seven subsamples and treated with polymer and talc rates as noted in Table 1. A portion of the original sample was divided into two subsamples and delinted with concentrated sulfuric acid (H_2SO_4) also noted in Table 1. In the polymer coating treatments, seed samples of 1 lb. were placed in a Hege seed treater, 3 oz of water were added in order to singulate the seed and to allow for polymer adhesion to the seed. Talc was found in previous work to improve coating characteristics and was added simultaneously with each polymer treatment. Polymer and talc mixtures were added dry. The seed were then allowed to roll and dry in the Hege seed treater for 8 minutes with forced air applied at 40° C. Each of the treatments received a standard fungicide treatment (label rates of each) of Captan, Vitavax PCNB, and Apron after the polymer application or acid delinting.

Treatments were evaluated by Warm Germination Test (WGT), Cool Germination Test (CGT), and Cool Warm Vigor Index (CWVI). In the WGT 50 seed from each treatment, replicated four times were rolled in standard germination towels and placed in a Stults germinator set at alternating temperatures of 68° F (20 °C) and 86 ° F (30 ° C) for 16 and 8 hours, respectively. Germination counts were made after four days (WGT-4) and ten days (WGT-10). Only the seedlings with a radical length of 1.5 inches or greater and normal were counted. The CGT was conducted in the same manner as the WGT except the germination chamber was set at a constant temperature of 64 ° F (18 ° C) and counts were made after 7 days. The results from the WGT-4 and the CGT were combined to give the CWVI.

Results and Conclusions

Results from the WGT-4 showed no significant differences in germination among the 0 to 8% polymer treatments when applied to the reginned seed (Figure 1.). Germination of the single ginned seed with no polymer was significantly higher than all the reginned treatments except for the reginned treatments of 0% polymer and 4% talc, and 1% polymer. Acid delinting of the seed ginned once significantly decreased germination compared to the undelinted, single ginned. The seed that was reginned and acid delinted showed significantly lower germination when compared to all other treatments. Trends in the WGT-10 were similar to the WGT-4 (Figure 2).

The CGT showed no significant differences among polymer rate applications (0-8%) except that the 0% polymer 0% talc treatment was

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significantly lower than the 1% polymer treatment (Figure 3). Acid delinted treatments again showed the lowest germination percentages with the reginned seed significantly lower compared to all the other treatments while the single ginned seed was significantly lower than all treatments except for the 0% polymer 0% talc and the 0% polymer and 4 % talc treatments. Comparisons using the CWVI showed no significant differences among polymer rates in the reginned treatments except that the 0% polymer 0% talc application was significantly lower than the 1, 4, and 8% rates (Figure 4). The reginned acid delinted treatment was significantly lower than all other treatments while the single ginned acid delinted treatment was significantly lower that all treatments except for the 0% polymer 0% talc treatment.

These results indicate that the application of Opadry Ag polymer up to 8% of seed weight does not decrease germination of seed that are reginned, while delinting reginned seed with concentrated sulfuric acid may significantly decrease germination. In addition polymer applications to reginned cottonseed showed increased germination in the Cool Germination Test, and CWVI when compared to single ginned acid delinted treatments.

The 4 and 8% polymer application treatments seem to provide a coating with seed flowability that would allow for planting in commercial and research applications. Future work to determine optimum application processes, rates, and additives would be beneficial, as well as studies to determine storability of coated seed.

Acknowledgments

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References

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Table 1. Summary of treatments.

Treatment Designation	Number Ginnings	Polymer Rates*	Talc Rates*
1-0-0	1	0	0
2-0-0	2	0	0
2-0-4	2	0	4
2-1-4	2	1	4
2-2-4	2	2	4
2-4-4	2	4	4
2-8-4	2	8	4
1-H_2SO_4	1	0	0
2-H_2SO_4	2	0	0

*Percent of seed weight

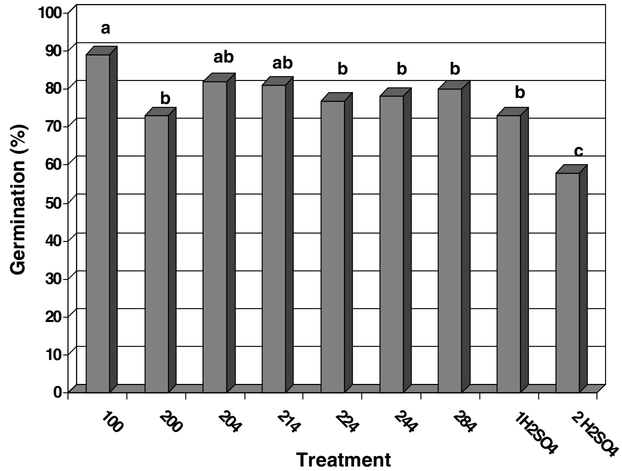

Figure 1. Effect of polymer coating on germination (Warm Germination Test, four-day count). Treatments with the same letter are not significantly different at the 5% level.

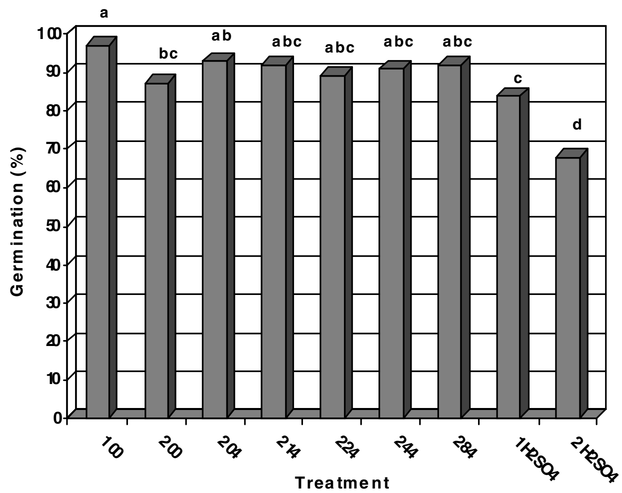

Figure 2. Effect of polymer coating on germination (Warm Germination Test, ten-day count). Treatments with the same letter are not significantly different at the 5% level.

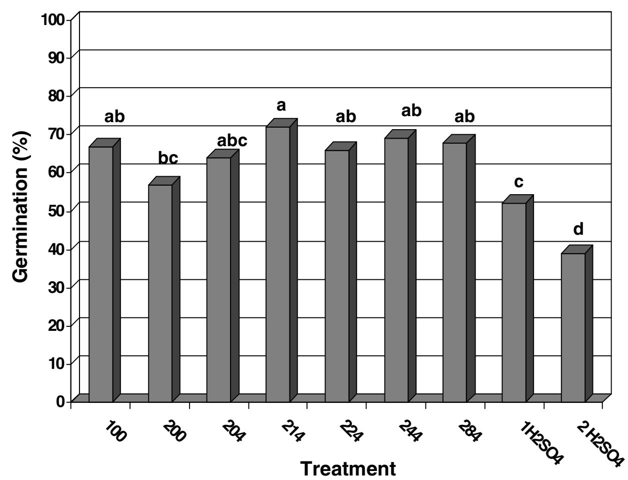

Figure 3. Effect of polymer coating on germination (Cool Germination

Test, 7-day count). Treatments with the same letter are not significantly different at the 5% level.

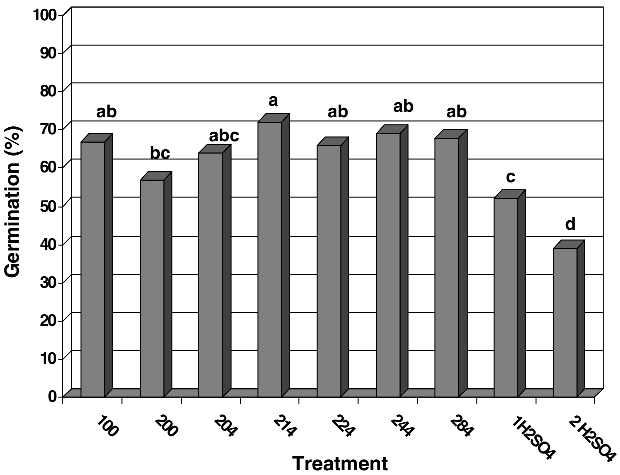

Figure 4. Effect of Polymer coating on Cool Warm Vigor Index. Treatments with the same letter are not significantly different at the 5% level.