Screening Program Development to Evaluate Varietal Potential for Seed Coat Fragments

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1. Abstract

A three-year field study is requested for the Shafter Research and Extension Center to evaluate the utility of modifications in specific management practices (planting date, irrigation rate and cutoff date management, and harvest aid timing and practices) on the development of and level of seed coat fragment problems (measured by several methods). These field evaluations would be done in several varieties previously identified (in SJV Cotton Board tests) as differing (low, moderate, high) in tendency to produce seed coat fragments as measured by several methods. The evaluations would focus on determining if a specific mix of management practices could be identified that would increase the consistency in expression of seed coat fragment problems. This could serve to both identify production management practices to avoid in years or with varieties more prone to development of seed coat fragment problems as well as help in developing a field screening procedure to better evaluate varieties for susceptibility to seed coat fragment problems.

2. Justification and Problem Statement

The presence of seed coat fragments as cotton lint is separated from seed can be an important factor impacting value of the raw and finished product. Seed coat fragment issues and potential price discounts can occur at several levels of processing of fiber, from the beginning stages of ginning on into yarn spinning and fabric production. At the level of ginned seedcotton, samples representing bales are evaluated directly from the gin in HVI classing by the US Department of Agriculture. Seed coat fragments can be part of a code 31 "call" in high volume instrumentation (HVI) classing done by the USDA classing office, and if it occurs can result in a discount in the price paid to growers. Seed coat fragments can also become a problem at the point of processing lint for yarn and eventually fabric production at mills, with either large or small seed coat fragments having potential to cause imperfections in final processing as the fiber goes into the mills to be made into yarn and other products.

In San Joaquin Valley Acala cottons, seed coat fragment problems at the level of calls made by the USDA classing office as well as some concerns expressed by mills have shown some tendencies for increases during the past ten or more years. Potential causes of problems with seed coat fragments have been investigated in scattered studies done over the past two decades in a wide range of locations in the U.S. and elsewhere, but few of the studies have been conducted in California. Factors which have been implicated as having potential to impact seed coat fragment amounts and frequency of detection include:

-varieties and genetic background
- production practices and environmental conditions
- genetic or production management or pest problems that impact production of immature seed, small seed or more extreme desiccation of seed during development
- weather and crop conditions at harvest, including temperature ranges and low humidity
- module storage conditions prior to ginning
- cotton condition at ginning time (seed moisture content, trash content and need for cleaning)
- some aspects of picking and ginning operations

Some apparent recent increases in the number of bales called for seed coat fragments in USDA classing offices, and increases in the perception of seed coat fragments in cotton reaching the mills from California have increased calls to identify the sources of the problems and calls to make some progress in turning around any developing trends toward increases in seed coat fragments. There is some evidence that several

specific varieties have been the source of the majority of the seed coat fragment calls from the USDA classing office in recent years, suggesting that most problems could be taken care of in the marketplace by just avoiding plantings of those varieties. It is important to recognize, however, that seed coat fragment calls by the USDA classing office are a very low incidence problem, with generally less than 5% of the total bales of the most-affected varieties having the problem in the worst of years. To make the picture even more complicated, UC and San Joaquin Valley Cotton Board data done at the level of yarn spinning also suggests that there are numerous other varieties approved or considered for approval as commercial varieties in the past five or six years that also show significant tendencies toward higher seed coat fragments than most varieties approved in earlier years. Concerns for the potential for seed coat fragment problems was a primary basis for some difficult decisions on variety approval made in this year's San Joaquin Valley Cotton Board deliberations.

One of the primary difficulties that will remain in any evaluation of seed coat fragment problems in individual varieties or groups of varieties comes with the fact that occurrence of seed coat fragments in quantities high enough to produce a USDA classing office call or consistent identification of problems at the mill are likely to remain a very low incidence problem even with the most seriously impacted varieties. This has been the history of these problems, suggesting that under the typical management practices of most farmers most years, you will not see many instances of seed coat fragment problems significant enough to produce a discount-level problem. This situation makes it a hard problem to investigate in field studies under grower conditions.

We propose to initiate a study in which planting date, irrigation amount and cutoff management, and harvest aid management practices will be manipulated to try to produce conditions which may more consistently bring the expression of seed coat problems. Goals would be to test if management practices could be identified which could more consistently be used to screen varieties for potential for seed coat fragment problems. Additional funding will be pursued to allow collection of

3. **Previous Work and Present Outlook:**
Most of the basic background discussion of this problem was covered in the prior section (#2). Some of the most comprehensive public data currently available to assess seed coat fragment levels is available in reports of the University of CA in the San Joaquin Valley Cotton Board reports of recent years. This data can be used to identify seed coat fragment levels for individual varieties entered in the testing program as expressed by several measurement methods. The data can also be used to assess year-to-year differences in seed coat fragment levels, some of which can be attributed to environmental and crop production conditions within any given year, with some also attributable to the shifting mix of varieties included in the approved variety trial evaluations across years.

Available San Joaquin Valley Cotton Board / University of CA data sets suggest trends toward increasing seed coat fragment levels (as measured using the Trash-Cam 50 approach) in varieties included in the testing program in recent years. Ongoing evaluations of these data sets may help in assessing the degree to which any trends are more related to environmental or prevailing management conditions in given years versus changes in varieties, but are not likely to fully resolve this question.

It is the opinion of the proposed Principal Investigators of this trial that the efforts proposed here could assess the utility of a potential screening approach for sensitivity to seed coat fragment problems.

4. **Objectives:**
Several objectives can be approached in this project, including: (1) evaluation to help determine if a specific mix of management practices (planting date, irrigation management practices, harvest aid management practices) could be identified and used in a controlled field test to increase the consistency in expression of seed coat fragment problems; (2) begin to answer the question of whether or not these identified production management practices are ones to avoid or modify in years or with varieties more prone to development of seed coat fragment problems; (3) assess this approach as a field screening procedure to better evaluate varieties for susceptibility to seed coat fragment problems.