TECHNICAL BULLETIN

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STICKY COTTON RESEARCH IN THE UNITED STATES

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INTRODUCTION

Over the past few years, textile mills and cotton growers worldwide have become increasingly concerned with the problems associated with sticky cotton. Although U.S. cotton has not been generally perceived as a major source of sticky cotton, we have instituted a major effort to prevent the occurrence of stickiness and find solutions to this problem. The following report reviews the sources of sticky cotton and the efforts being made to address this issue by the U.S. cotton industry and specifically Cotton Incorporated, the research and promotion company of the U.S. cotton producer.

STICKY COTTON SOURCES/CAUSES

Aphids and Whiteflies feed by extracting their nutrients from juices that they suck from plant leaves. To obtain the required nutrients, large amounts of juices have to be processed. The unneeded material undergoes some chemical changes and is excreted as honeydew by the insect. In cases of very heavy whitefly infestation, it is estimated that the material excreted by the insects can contain up to 450 kilograms of sugars per hectare. The chemistry of all these sugars is not yet fully understood. In recent years, a new strain (the B strain) of the sweet potato whitefly has become predominant in the United States and the world. This type has the ability to process large amounts of plant juices, to migrate relatively long distances, to reproduce very rapidly, and to exist on a very wide range of host plants other than cotton. Whiteflies and aphids are economic pests of several valuable crops, among them cotton, lettuce, melons, cabbages and tomatoes.

RESEARCH ACTIVITIES

The Sticky Cotton Action Team was organized by American cotton growers through their company, Cotton Incorporated. The objective of SCAT is to focus research and extension resources on the problem of sticky cotton until it is no longer a problem. Studies under SCAT deal with stickiness due to whitefly, aphid and natural cotton sugars. These studies deal with both prevention and treatment of the problem. Cotton Incorporated has retained services of a consultant entomologist who coordinates SCAT researchers so that the effectiveness of the resources can be maximized. The funding for SCAT projects come from cotton growers, through Cotton Incorporated. In 1992, projects are funded for more than $450,000.

Because whiteflies are a pest of many valuable crops, the United States Department of Agriculture is proposing expenditures in excess of $6,000,000 a year in an effort to gain control of this insect. Most of the vegetable crops and many ornamental plants are involved. Field crops such as sugar beets are also involved. This funding is in addition to that noted under SCAT, and results are shared within the United States research community.

TREATMENT STUDIES

The traditional ways for reducing stickiness in textile mills is to allow the cotton to age, to reduce the relative humidity in the mill, to blend sticky with non-sticky cotton, and to apply a textile lubricant to the fiber in the opening room. To avoid the cost and inconvenience of treating sticky cotton at the textile mill, SCAT studies are also aimed at applying treatments during harvest time or ginning. Experiments by the USDA and Cotton Incorporated have shown that improved processability can result from the application of two commercially available products tested. These materials were applied during the ginning process. Experiments will be conducted in 1992 to determine whether these products can be effective when applied during harvesting.

Several attempts have been made to find enzymes that will break down the sugars present in honeydew-contaminated cotton. The USDA and the university/scientists working with SCAT have not found significant benefit to be gained from any commercially available products sold for this purpose. Whitefly honeydew contains a number of unusual sugars, among them trehallulose, which can account for up to 50% of all sugars present.

Trehallulose is not identifiable by use of indicators that detect the presence of reducing sugars. Two SCAT studies have the objectives of (a) understanding the chemistry of the sugars contained in whitefly and aphid honeydews and in the material found naturally on cotton, and (b) finding enzymes, either synthetic or produced by microorganisms that can be used to break these sugars down into harmless products. Progress with these two studies gives reason to believe that suitable enzymes can be found. When that has been accomplished, other SCAT studies will determine the best way and the best location in which to apply enzymes to fiber. Needless to say, if the use of enzymes is recommended, it will only be after exhaustive tests have shown that the enzymes have no adverse effect on fiber properties.

PREVENTIVE PRACTICES

It seems unlikely that aphids or whiteflies can be controlled by use of chemical pesticides. Cultural methods of control are being studied. These include removal of food supplies during the winter; nurturing of predators, parasites and pathogens; and reducing the length of the growing season so that populations do not have time to expand. Control over whitefly and aphid populations is likely to result from a combination of all cultural, chemical and management strategies. The use of chemicals will likely be confined to off season applications on weed-type host plants rather than on fiber or food crops intended for the market.

To accomplish cultural control, scientists are studying the behavioral habits of both of these insects, especially the whitefly strain B. The host range, feeding habits, reproduction habits and migratory range of the insects are all important. Specifically, it is important to identify the annual cycle through which the insect lives and to break that cycle at its weakest point.

Development of strains of cotton resistant or less desirable to the whitefly and aphid is another approach that is being employed. Strains of cotton that are less susceptible to whitefly

infestations are available, but they are not commercially viable. The challenge for plant breeders is to incorporate this trait into commercially and agronomically viable varieties. Cotton Incorporated and SCAT are involved in this process.

IDENTIFYING STICKY COTTON

Several physical and chemical methods are available for identifying sticky cotton. The physical tests that seem to reliably predict stickiness are somewhat cumbersome and often expensive. Chemical indicators that are said to identify sticky cotton are available, but because the ones that we know of identify **only** reducing sugars, they are not as reliable as we wish a test would be. For this reason, Cotton Incorporated is funding a study to find a convenient, inexpensive test that will identify the potential for stickiness in a sample of seed cotton so that appropriate treatments might be applied. Our experience at Cotton Incorporated makes us conclude that use of near-infra-red technology will not be a reliable way to identify sticky cotton.

CONCLUSION

Although the final solution to the sticky cotton problem is elusive, the U.S. cotton industry, including Cotton Incorporated and the growers we represent, is investing significant resources in research. We recognize that providing a quality product is an absolute necessity in today's marketplace and that textile mills must have satisfactory fiber input to accomplish this goal. No other cotton growing country has the unique combination of organizations and resources that is available in the U.S., and we are confident that economically viable solutions will be found.

RESEARCH AND TECHNICAL SERVICES

Cotton Incorporated is a research and promotion company representing cotton worldwide. Through research and technical services, our company has the capability to develop, evaluate, and then commercialize the latest technology to benefit cotton.

- Agricultural research leads to improved agronomic practices, pest control and fiber variants with properties required by the most modern textile processes and consumer preferences. Ginning development provides efficient and effective machines for preservation of fiber characteristics. Cottonseed value is enhanced with biotechnology research to improve nutritional qualities and expand the animal food market.

- Research in fiber quality leads to improved fiber testing methodology and seasonal fiber analyses to bring better value both to growers and then mill customers.

- Computerized fiber management techniques result from in-depth fiber processing research.

- Product Development and Implementation operates programs leading to the commercialization of new finishes and improved energy and water conserving dyeing and finishing systems. New cotton fabrics are engineered -- wovens, circular knits, warp knits, and nonwovens -- that meet today's standards for performance.

- Technology Implementation provides comprehensive and customized professional assistance to the cotton industry and its customers -- textile mills and manufacturers.

- A fiber to yarn pilot spinning center allows full exploration of alternative methods of producing yarn for various products from cotton with specific fiber profiles.

- The Company operates its own dyeing and finishing laboratory, knitting laboratory, and a laboratory for physical testing of yarn, fabric, and fiber properties including High Volume Instrument testing capable of measuring micronaire, staple length, strength, uniformity, color, and trash content.

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