BIOREMEDIATION EFFORTS FOR STICKY COTTON

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Sticky cotton, the contamination of cotton lint by insect honeydew, is a serious problem that makes it difficult for the textile industry to process the cotton fiber. This stickiness reduces the price paid to the grower and damages the quality reputation of entire production areas. Although insect management is playing the major role in reducing or preventing sticky cotton, remedial measures to reduce the stickiness of contaminated lint are still needed. Bioremediation, the use of microorganisms to degrade the contaminating sugars, may offer an economical and effective way to reduce the stickiness of lint.

Objectives of the current USDA ARS project are to examine the ability of different strains of yeast to utilize the sugars in insect honeydew, to select strains suited for bioremediation, and to develop methods to monitor and control microbial activity as sugars are broken down.

Research has evaluated the ability of different yeast strains to grow on various sugars including honeydew sugars (Figure1). Further work is being done to identify which sugars are being metabolized and to select strains which can rapidly breakdown the sugars on seed cotton.

ARS research has also developed a CO2 flux measuring system to monitor microbial respiration on sugar contaminated lint. The system consists of an infrared gas analyzer, a flow controller, and a sample chamber. Tests showed that CO2 evolution can be detected from small samples of artificially contaminated lint inoculated with a strain of yeast (Figure 2). Continuing efforts are underway to develop additional equipment to measure cotton CO2 flux in cotton samples up to field module size. This CO2 flux system provides a rapid, sensitive, and scalable method of monitoring microbial degradation of sugars on cotton lint and will be used to identify the physical and biological parameters necessary for bioremediation of sticky cotton. It might also find use in on farm monitoring of cotton modules during bioremediation and subsequent storage before ginning.

In the future, bioremediation may offer a way to clean up sticky cotton. This technology would offer a rescue treatment for situations when insect controls fail and aphid or whitefly populations result in lint contamination. Bioremediation technology would not only offer options for individual producers but would also serve to protect the quality reputation of the entire production area.

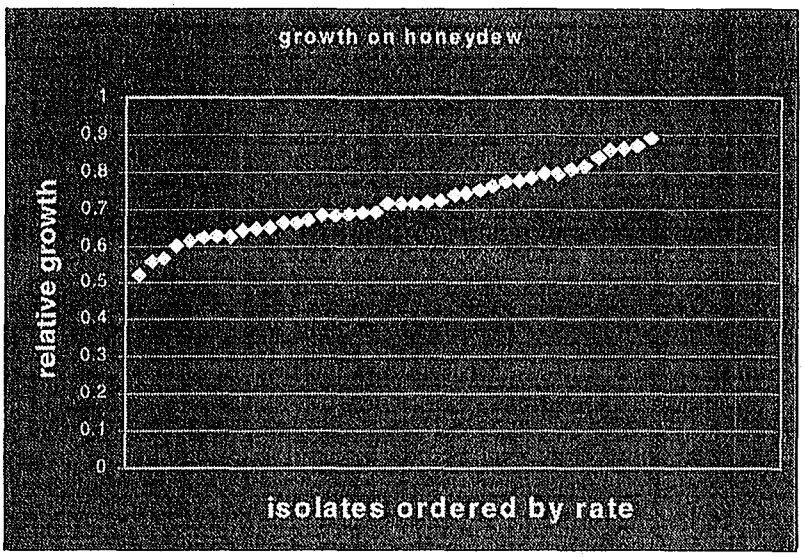

Figure 1. Different strains of yeast collected from cotton and other plants were tested for the ability to grow on insect honeydew. A comparison of the relative growth rate shows that most of the yeast were able to grow on some of the sugars in honeydew and that a considerable range of rates occurred. The more rapidly growing stains will be tested for their effectiveness in reducing the stickiness of cotton.

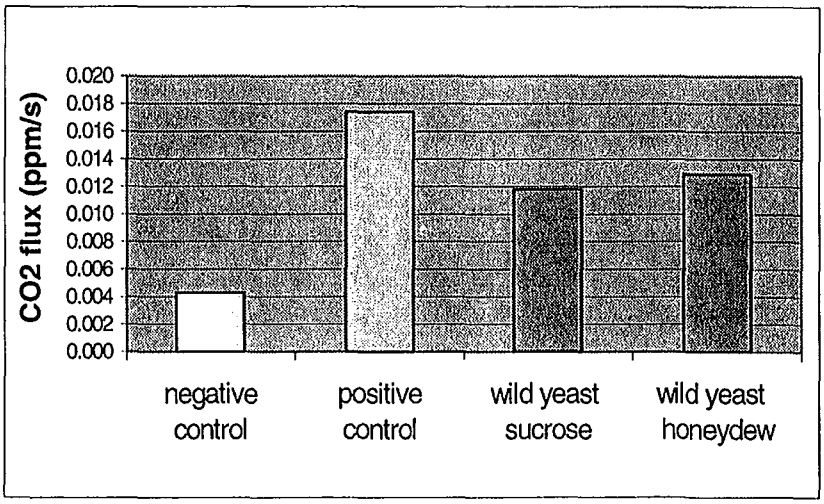

Figure 2. CO2 flux can served as an indicator of microbial degradation of sugar on cotton lint. CO2 production by wild yeast on sucrose or whitefly honeydew was significant and almost as great as a positive control of bakers yeast on sucrose.