PREDICTING MICRONAIRE VALUES USING THE COASTALPLAINS CROP WEATHER STATION NETWORK

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Abstract

In 1995, 600,000 acres of cotton were grown in a 14-county area of the Texas Coastal Plains. Each year, there is a difference in cotton micronaire values, depending on environmental conditions in June and July. In 1996, 39.7% of the cotton produced received price discounts due to high micronaire. The micronaire price discounts were equal to a 6.7 million dollar negative economic impact to the cotton industry and the region.

Thirteen crop weather stations located in nine counties throughout the region are able to monitor environmental conditions pertaining to cotton growth and development. In this demonstration, the Crop Weather Station located at the Texas A&M Research and Extension Center at Corpus Christi, TX, was utilized, along with the 1990-1996 actual-to-historical DD60 ratio information it collected from June 1 - July 15 for each of the past seven years.

1990-1996 micronaire values for seven cotton varieties were then obtained from yearly Extension cotton variety trials located at the Research and Extension Center to determine if a relationship can be found in predicting micronaire values during the bloom and boll fill period utilizing actual-to-historical DD60 ratio information.

Yearly average micronaire values increased as the actual-to-historical DD60 ratio increased during bloom and boll fill period until the DD60 ratio reached 1.08.

By utillizing this information before harvest preparations begin, crop management decisions pertaining to marketing and cotton defoliation timing could greatly enhance fiber quality and economic returns to producers.

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Introduction

A simple and easy method of determining micronaire values is needed before cotton harvest is initiated. Cotton micronaire values vary from year to year depending on DD60s accumulation during bloom and boll fill period (June 1 - July 15). This yearly variation in values makes it extremely difficult in determining marketing and cotton defoliation management decisions. In the Coastal Plains of Texas, high micronaire values can especially be a problem resulting in price discounts. Varietal differences also affect micronaire values in a given year as well.

This demonstration was established to utilize the Texas Coastal Plains Crop Weather Station Network to enhance marketing and defoliation management decisions by determining micronaire values before harvest.

Methods and Materials

Thirteen crop weather stations located in nine counties throughout the Coastal Plains of Texas are able to monitor the following weather data to aid in crop management decisions: solar radiation, air temperature (avg., min., max.), relative humidity (avg., min., max.) wind speed and direction, soil temperature, rainfall, accumulated rainfall, DD60s, accumulated DD60s, as well as actual-to-historical air temperature, rainfall radiation and DD60s.

The Crop Weather Station located at the Texas A&M Research and Extension Center near Corpus Christi, Texas, was utilized in this demonstration. Actual-to-historical DD60s ratio information was utilized for the years 1990-1996 and the time period of June 1 to July 15 for each of these years. This time period coincides with our bloom and boll fill period. 1990-1996 micronaire values for seven cotton varieties were then obtained form yearly Extension cotton variety trials located at or nearby the Research and Extension Center. The purpose of collecting this information was to determine if a relationship could be found in predicting micronaire values during the bloom and boll fill period utilizing 1990-1996 actual-to-historical DD60 ratio information and previous years micronaire values from seven cotton varieties.

Results and Discussion

Micronaire values varied from year to year as well as between varieties in the same given year. The yearly combined average values of the seven varieties ranged from 4.01 to 5.17 for the seven years. Actual-to-historical DD60s ratios ranged from .91 to 1.08 in comparison to the average actual-to-historical DD60 ratio which is equal to 1.00.

The lowest average micronaire value of 4.01, which was in 1995, coincided with the lowest actual-to-historical DD60 ratio of .91.

The 1993 and 1994 average micronaire values were 4.33 and 4.67. However, actual-to-historical DD60 ratios were .97 and .96, respectively. Ideally, one would have hoped to have seen the two micronaires closer in value for these two years, but we still see a trend upward in micronaire when we compare it to 1995.

As expected, 1992 and 1996 average micronaire values were 4.90 ad 4.91, respectively, as well as both of these years having the same actual-to-historical DD60 ratio of 1.00. Incidentally, 1.00 is also equal to the historical average value as well.

In 1991, the average micronaire value reached 5.27 and the actual-to-historical DD60 ratio was 1.03. As the DD60 ratio increased above the historical average of 1.00, micronaire values continued to trend upward.

When the actual-to-historical DD60s ratio reached 1.08 in 1990, the micronaire trend upward did not follow. The value fell to 4.49 for some unknown reason. In a year like 1990, with above average warm temperatures, the cotton plant could have quit functioning and completely stopped sending carbohydrates to the bolls, or the stress was too rapid and severe. It is possible the cotton plant did not have time to shed all the bolls, leaving more bolls on the plant than it wanted. Depending on the maturity stage, some of the bolls may have opened and were of inferior quality. These bolls could have experienced fiber quality similar to premature defoliation: reduced micronaire, strength and possibly length (See Table 1 for results).

Economic Analysis

In 1996, 39.7% of the cotton produced in the Texas Coastal Plains received price discounts due to high micronaire. This was equal to a 2.3 million dollar direct cash loss, and a 6.7 million dollar negative economic impact to the region.

Conclusions

Yearly average micronaire values tended to increase as the actual-to-historical until DD60s ratio increased to 1.08. A possible explanation to the micronaire value decreasing at this point could be that stress was too rapid and severe for micronaire values to increase.

Utilizing the Coastal Plains Crop Weather Station Network and the actual-to-historical DD60s ratio information that it provides would be a simple and convenient method for farmers, consultants and county Extension agents to determine micronaire values before cotton harvest is initiated.

By having this information before harvest, crop management decisions pertaining to marketing and cotton defoliation timing decisions could be enhanced. This information would allow a farmer to customize his defoliation program for that year's weather situation, greatly enhancing the fiber quality and economic returns on his crop.

Also, the information that is collected by the Coastal Plains Crop Weather Station Network can be a vital source of information that can be utilized by more sophisticated micronaire models that are being developed.

Acknowledgements

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Table 1. Micronaire Values & Actual-to-Historical DD60 Ratios, Corpus Christi, TX, 1990-1996, 6/01-7/15.

	1990	1991	1992	1993
DPL 50	4.70	5.50	5.00	4.50
DPL 5415	5.10	5.25	5.20	4.70
DPL 51	4.90	5.70	5.40	4.50
STV 132	4.20	5.75	5.20	4.10
GP 74+	4.10	4.30	4.20	3.90
HQ 95	4.40	4.40	4.70	4.60
CAB-CS	4.00	5.30	4.70	4.00
AVG	4.49	5.17	4.91	4.33
DD60 Ratio*	1.08	1.03	1.00	.97

Table 1 (Continued)

	1994	1995	1996
DPL 50	4.90	4.20	5.40
DPL 5415	5.00	4.30	5.70
DPL 51	5.20	4.60	5.30
STV 132	4.70	3.90	4.00
GP 74+	4.40	3.80	4.30
HQ 95	4.20	3.80	5.00
CAB-CS	4.30	3.50	4.60
AVG	4.67	4.01	4.90
DD60 Ratio*	.96	.91	1.00

* 1.00 = Historical average