Cotton Quality As Influenced by Lint Coarseness

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Testing Cotton Coarseness With A Micronaire

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In a Nutshell . . .

THE DRIVE FOR QUALITY COTTON is gaining strength. Merchants and mills stress tests for **fineness, strength,** and **uniformity.** The future markets are moving to prevent the tender of too-fine cottons against contract. The future will see grade and staple classifications just the beginning of the tests for quality. **Premiums and discounts will be applied** for these other qualities or the lack of them—just as they now are applied for grade and staple. Cotton will be penalized for excessive fineness and rewarded for better strength. To get the best prices, **plant seed that provide the best fiber.**

—"Cottoncast" by Gerald Dearing

Farm and Ranch, October, 1954

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Quality of Oklahoma Cotton As Influenced by Lint Coarseness

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Lint coarseness, as well as grade and staple, is now being measured by some buyers when deciding how much to pay for a bale of cotton. This is already affecting the price growers get for their lint. It probably will have still greater effect in the near future.

Coarseness is usually measured with a device called a "Micronaire."**

HOW COARSENESS AFFECTS MARKET VALUE

Spinners often specify a certain micronaire reading (or micronaire limits) along with the grade and staple they want to buy. Cottons with different micronaire values have different uses. Considering the staple lengths grown in Oklahoma, cottons with average to coarse (4.0-6.0) micronaire values have the widest uses.

Cottons that are very coarse (over 6.0) have more limited uses, but the demand for this type of cotton seems to be greater than the supply. On the other hand, cottons with low micronaire readings cause difficulties during processing in the mill—difficulties both in spinning and in dyeing. Immature cottons can be used only in low-grade goods.

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* Contributions of members of the cotton breeding staff and cooperating cotton growers to the conduct of tests and collection of data are gratefully acknowledged.

** Trade name of an air-flow instrument manufactured by the Sheffield Corporation. It estimates the relative coarseness of fibers in micrograms per inch, based on flow of air through a known weight of cotton compressed into a pre-determined volume.

As the use of the Micronaire has become more widespread, more and more spinners have refused to accept cottons with low micronaire readings; and, during the past year, many immature bales have sold only at a discount. As the use of the Micronaire increases, merchants will not be able to pay as much for bales with low micronaires as they will for cotton with average or above micronaires.

MICRONAIRE READINGS range from 2.3 to 8.0. These can be interpreted as follows:

Below 3.0	**Very fine**
3.0 to 3.9	**Fine**
4.0 to 4.9	**Average**
5.0 to 5.9	**Coarse**
6.0 and above	**Very coarse**

In mature lint, there is a definite relationship between length and coarseness, so spinners expect different micronaire readings in different lengths.

Cottons of the staple length classes grown in Oklahoma are commonly termed "immature" if the micronaire readings fall below 3.4.

A minimum micronaire value of 3.0 has been suggested for tenderability of the type of cotton grown in Oklahoma. Although there is no such requirement as yet, the suggestion does provide a minimum figure. It appears advisable, therefore, for Oklahoma cotton growers to avoid producing cotton with micronaire values less than 4.0.

FACTORS AFFECTING LINT COARSENESS

Among varieties differing visibly in staple length, fiber diameter or size is a factor in fineness. Within a variety and even within a group of varieties of similiar staple lengths, relative coarseness depends upon cell wall development. This in turn is influenced by:

1. The variety; and
2. The conditions under which it is grown.

Cotton growers can better assure themselves of a marketable product by:

1. Planting varieties that have the coarsest staple in their length group; and
2. Improving conditions under which the crop is grown.

Low micronaire values are found in cases where the bolls open prematurely or fail to develop normally. Immaturity of the fibers is also associated with poor development of the seed. Excessive drought, insect damage to the bolls, and the premature use of defoliants can all cause low micronaire values. It should be possible to control these factors, except droughts, by improving the conditions under which the crop is grown. By planting varieties which have the coarsest staple in their length and yield class, the grower will have additional insurance against low micronaire values.

COARSENESS TESTS ON OKLAHOMA VARIETIES

The effects of both variety and growing conditions can be seen in coarseness tests of cotton grown in Experiment Station variety trials. These tests are conducted on experiment stations and private farms. Practices followed in growing the tests are those followed by the better farmers, and the results should be generally applicable. It is true, however, that micronaire values for the entire crop will not run as high as the readings reported here. The boll samples tested are from the early crop, and the later crop can be expected to consist of finer fiber.

Table 1 shows the highest and lowest micronaire values found in coarseness tests of six common Oklahoma varieties grown at four locations each year from 1950 through 1953. The range between high and low is great for all six varieties. High readings were obtained in favorable growing seasons, and were usually associated with high yields. Low readings were on cotton grown under drought conditions.

The year-to-year variation in growing conditions at any one location has a large effect on micronaire readings. This can be seen in Table 2, showing the variation in one variety from year to year at four locations.

The effect of location on fiber coarseness is evident in the figures in Table 3. The small differences in range at Elk City and Perkins as compared to the wider ranges at Tipton and Chickasha are interesting, but no explanation for them is known.

WHAT IT MEANS TO THE COTTON GROWER

As suggested above, the increasing emphasis by cotton buyers and spinners on securing lint having a high micronaire value can be met by selecting the right variety and improving the growing conditions.

Variety.—No large shift in the varieties grown in Oklahoma appears to be necessary. All varieties now on the A. & M. College's recommended list have given satisfactory micronaire readings on the average. The combinations of variety, year and location which gave low micronaire readings in Station tests are shown in Tables 4, 5 and 6. Growers who recall conditions in those years and areas can use this information as a guide in choosing a variety likely to give satisfactory lint coarseness.

Caution should be used in trying new varieties which have not been tested under Oklahoma conditions.

Growing Conditions.—Any practice that reduces drought injury not only helps get higher yields but also helps produce a higher quality lint. Such practices as irrigation, deep plowing of sand, and increasing organic matter will help, where applicable. The local county agent can give suggestions based on research and on the experiences of farmers in his area. He also has useful publications on the subject, including:*

E-613 Methods of Applying Fertilizers.

E-504 Cotton Production—Variety and Fertilizer Recommendations.

B-387 Cotton Burs and Cotton Bur Ashes as Fertilizer on a Claypan Soil.

E-610 Soil Improvement Crops for Diverted Acres.

E-571 Development of Surface Irrigation.

E-553 The Use of Fertilizers in Oklahoma.

E-472 Vetch for Soil Improvement.

E-249 Irrigation in Oklahoma.

E-515 Sweet Clover.

E-412 Soil Improvement Program in Oklahoma.

E-588 Higher Crop Yields with Lime, Fertilizer, and Legumes.

* If it is inconvenient to visit the county agent's office, publications can be obtained by mail, free of charge. Address your request to: Agriculture Mailing Room, Oklahoma A. & M. College, Stillwater, Oklahoma.

TABLE 1.—High, Low, and Average Micronaire Readings Obtained on Seven Varieties of Cotton During Four Years at Four Locations.*

	Lockett 140	Hi-Bred	Paymaster 54	Lankart 57	Northern Star	Lockett No. 1
Highest	6.3	5.8	5.3	5.1	5.2	5.1
Lowest	3.8	3.7	3.7	2.7	3.1	2.8
Average	5.3	5.0	4.7	4.4	4.4	4.2

* Tipton, Elk City, Chickasha, and Perkins; 1950 through 1953.

TABLE 2.—Year-to-Year Variation in Lint Coarseness of the Same Variety* at Four Different Locations.

Location	1950	1951	1952	1953
Tipton	5.1	4.8	2.7	4.8
Elk City	4.6	4.5	4.5	4.3
Chickasha	4.1	3.4	3.6	5.0
Perkins	4.6	4.5	4.5	4.7

* Lankart 57.

TABLE 3.—Micronaire Readings on Four Varieties Recommended for Western Oklahoma (4-year Averages).

Variety	Perkins	Chickasha	Tipton	Elk City	Average
Lockett 140	5.1	4.9	5.6	5.6	5.3
Lankart 57	4.6	4.0	4.4	4.5	4.4
Northern Star	4.4	4.1	4.5	4.7	4.4
Lockett #1	4.3	4.0	4.2	4.5	4.3

TABLE 4.—Micronaire Readings on 4 Varieties Recommended for Central and Eastern Oklahoma (2-year Averages).

Variety	Webber's Falls	Broken Arrow	Caddo	Madill	Perkins	Chickasha	Average
D & PL Fox	4.9	5.0	4.7	5.1	5.0	4.6	4.9
Deltapine 15	4.9	4.7	5.1	4.9	4.4	4.5	4.8
Stoneville 62	4.5	4.4	4.5	4.6	4.4	4.1	4.4
Empire	4.1	4.1	4.3	4.3	4.2	4.1	4.2

TABLE 5.—Micronaire Values Obtained for Varieties Tested at 4 Locations from 1950 Through 1953.

Variety	Tipton					Elk City				
	1950	1951	1952	1953	Avg.	1950	1951	1952	1953	Avg.
Lockett #1	4.6	4.9	2.8	4.6	4.2	4.5	4.4	4.6	3.9	4.5
Lankart 57	5.1	4.8	2.7	4.8	4.4	4.6	4.5	4.5	4.3	4.5
Northern Star	5.2	5.2	3.1	4.6	4.5	5.2	4.9	4.9	3.7	4.7
Mebane 6801	5.0	5.7	3.6	5.0	4.8	4.8	4.9	5.5	4.4	4.9
Lockett 140	5.8	6.3	4.5	5.8	5.6	5.4	6.0	5.9	5.0	5.6
Hi Bred	5.7	5.8	3.7	5.5	5.2	4.8	5.8	5.4	3.9	5.0
Paymaster 54	5.2	5.2	3.7	4.7	4.7	4.5	5.3	5.4	4.0	4.8
Stoneville 62	5.0	4.8	*	—		4.7	5.0	—	—	
D & PL Fox	4.8	5.3	—	—		4.9	5.2	—	—	
Empire	5.2	4.2	—	—		4.4	4.1	—	—	
Deltapine 15	4.6	5.4	—	—		4.7	5.2	—	—	
Cr-2	5.4	5.4	—	—		5.3	5.7	—	—	

Variety	Chickasha					Perkins				
	1950	1951	1952	1953	Avg.	1950	1951	1952	1953	Avg.
Lockett #1	4.2	3.4	3.2	5.1	4.0	4.3	4.5	4.1	4.4	4.3
Lankart 57	4.1	3.4	3.6	5.0	4.0	4.6	4.5	4.5	4.7	4.6
Northern Star	4.5	3.7	3.3	4.8	4.1	4.6	4.6	4.1	4.3	4.4
Mebane 6801	4.8	4.5	3.5	5.5	4.6	4.6	4.7	4.6	4.7	4.7
Lockett 140	4.6	5.2	3.8	5.9	4.9	5.2	5.2	4.7	5.2	5.1
Hi Bred	5.2	4.6	4.1	5.6	4.9	5.1	5.5	4.9	5.0	5.1
Paymaster 54	4.3	5.0	4.0	5.0	4.6	4.0	4.7	4.6	4.9	4.5
Stoneville 62	4.7	3.9	3.1	5.0	4.2	4.5	4.8	4.1	4.7	4.5
D & PL Fox	4.6	3.9	3.8	5.4	4.4	4.5	5.4	5.0	4.9	5.0
Empire	3.9	3.9	3.1	5.0	4.0	3.8	4.8	4.0	4.3	4.2
Deltapine 15	4.7	4.2	3.6	5.4	4.5	4.5	5.0	4.4	4.3	4.6
CR-2	5.1	5.0	4.0	5.5	4.9	5.0	5.0	4.5	4.9	4.9

* These varieties not tested in Western Oklahoma variety tests after 1951.

TABLE 6.—Micronaire Values Obtained on Varieties Tested at 4 Eastern Oklahoma Locations in 1952 and 1953.

	Webber's Falls			Caddo			Madill			Broken Arrow		
	1952	1953	Avg.	1952	1953	Avg.	1952	1953	Avg.	1952	1953	Avg.
CR-3	5.2	4.7	5.0	4.9	5.2	5.1	5.3	5.1	5.2	4.7	4.8	4.8
Lockett #1	4.5	4.3	4.4	4.5	4.8	4.7	4.4	4.4	4.4	4.1	4.4	4.3
Lankart 57	5.2	5.1	5.2	4.4	4.9	4.7	4.2	4.8	4.5	4.5	5.1	4.8
Lankart 611	4.5	4.2	4.4	4.2	4.9	4.6	4.0	4.7	4.4	4.2	4.4	4.3
Northern Star	4.4	4.4	4.4	4.0	5.1	4.6	4.1	4.5	4.3	4.3	4.4	4.4
Stormmaster	4.4	4.7	4.6	4.1	5.1	4.6	3.6	4.6	4.1	4.0	4.6	4.3
Macha #1	4.0	4.1	4.1	3.5	4.6	4.1	3.5	4.2	3.9	3.6	4.1	3.9
Mebane 6801	5.1	5.1	5.1	4.7	5.2	5.0	5.1	5.1	5.1	5.1	5.0	5.1
Lockett 140	5.4	5.6	5.5	5.3	5.5	5.4	5.5	5.9	5.7	5.4	5.5	5.5
Hi Bred	5.1	5.3	5.2	5.3	6.0	5.7	5.0	5.9	5.5	5.1	5.4	5.3
Paymaster 54	5.0	4.3	4.7	4.3	5.0	4.7	4.0	5.2	4.6	4.7	4.5	4.6
Stoneville 62	4.6	4.3	4.5	3.9	5.0	4.5	4.0	5.1	4.6	4.0	4.8	4.4
D & PL Fox	4.6	5.1	4.9	4.3	5.1	4.7	4.7	5.5	5.1	5.0	4.9	5.0
Empire	4.2	3.9	4.1	3.9	4.6	4.3	3.8	4.7	4.3	4.0	4.1	4.1
Deltapine 15	5.0	4.8	4.9	5.0	5.2	5.1	4.7	5.0	4.9	4.8	4.6	4.7
CR-2	5.2	5.3	5.3	4.9	5.7	5.3	4.7	5.8	5.3	4.7	5.4	5.1