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EXPERIMENTS WITH FOREIGN COTTON.

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EXPERIMENTS WITH FOREIGN COTTON.

BY

P. H. MELL.

Within recent years much attention has been attracted to foreign cottons, especially those of India and Egypt, because of the yearly increased importation of the staple into this country. It is claimed by a few experts that the fibre, in some respects, is superior to the ordinary "upland" varieties grown in the South, and that there is danger of the importation increasing to such an extent as to seriously injure the trade in American cottons. The Indian cotton is generally noted for its rich creamy color, its ready adaptability for certain dyes and the property the thread has of swelling in the process of bleaching, so that the cloth made of it becomes more substantial than that manufactured from the coarser grades of American cottons. These foreign staples are also used in the United States for mixing with the low grade American fibres to improve their color and the quality of the cloth.

Several of the Experiment Stations in the South have cultivated some of the varieties of the cotton from India and Egypt in order to compare their properties with our native forms, but, so far as the knowledge of the writer goes, there have been no regular systematic experiments conducted in any state extending over a period of several years, except at the Alabama Station. Of course nothing definite can be determined about any foreign plant until it has become acclimated by several years careful cultivation. The experiments at Auburn have been planned to accomplish first this result.

The first step taken in these investigations was, therefore, to acclimate the plants; secondly, to secure the best results possible in health of plant, maturity of fibre and the yield of lint that the conditions of the soil and climate would

permit; and thirdly, to so blend the best properties of the foreign cotton with those of the superior grades of American varieties as to produce an exceptionally fine cotton plant.

This bulletin contains the results secured through the first and second steps, and the data are much more gratifying than the author anticipated. During the season of 1895 several hundred crosses were made between the best American cottons and these foreign species and the seeds were carefully gathered and assorted for cultivation during the coming season. From the present outlook some very interesting facts will be secured from these experiments. It is the intention of the writer to issue a bulletin after this crop is gathered to discuss the results secured by the third step in the plan outlined above.

In conducting these experiments the following so-called varieties were secured from India, Egypt and Mexico, and most of them were first planted in 1894. (Three of the varieties, however, viz: Mit Affi, Bamieh and Mannoah were first planted in 1893):

Bajwara,	Mirzapore,
Bamieh,	Mit Affi,
*Bani,	"Mexican resists drought,"
*Bombay,	"Mexican,"
Broach,	"Mexican,"
*Bourbon,	*"Nagpur jari,
‡Creula,	Narma,
Deshi,	Nadam,
Ghoghari,	Nimari bani,
*Guchard,	*Painaa,
Herbucco,	‡Roji,
Indrepur,	Surat Kupas,
*Jari,	*"Tree cotton" (Mexico),
Jakko,	"Upland Georgian" (Mexico),
Mannoah,	*Wagaria Wadhwan.

*These failed to germinate.

‡Requires two years for maturing balls.

As an indication of the importance of continued and careful experiments with these cottons before final conclusions are drawn the following extracts are taken from bulletin No. 65 issued by this Station June, 1895. The Department sent out to the cooperative seed test experimenters some of these foreign cotton seeds before they were acclimated at this station and the reported results of one season's cultivation are thus given :

Franklin County.—"Bamieh, Egypt. Yield 600 lbs per acre; quality good; growth vigorous and large, but bolls are too small for a desirable cotton."

Perry County.—"India Cotton No. 1. Quality poor; growth large stalks; yield very poor; staple short, and is inferior to any of our native varieties."

Madison County.—"Affi, Egyptian. Lint, cream colored, medium length and very fine and silky. Appears to be hardy as to cold; was not injured by spring frosts when other varieties were damaged. Grows from six to ten feet high. Yield about 300 lbs per acre.

Bibb County.—"Egyptian cotton. Yield per acre very poor; quality inferior; lint short and yellow."

Tallapoosa County.—"Egyptian cotton. Yield about 600 lbs per acre. Lint very long and strong. Another variety is worthless on account of the smallness of bolls and being so few on the stalk."

Pickens County.—"Egyptian cotton. Yield per acre about 200 lbs. Quality of product, fine strong fibre, dingy color. Stalk large, bolls small, does not pay for cultivating."

[The expression "fine strong fibre" seems to contradict this hasty conclusion.]

Morgan County.—"Egyptian cotton. Yield about 200 lbs per acre. Lint very fine and weak. Stalks from 3 to 6 feet high, very few limbs and bolls."

Chilton County.—"Egyptian cotton. Yield about one-third bale per acre. Lint short, bolls scattering, very large growth."

Etowah County.—"Egyptian cotton. Complete failure."

Hale County.—"Egyptian cotton. Yield per acre 1,200 lbs. Quality good."

Blount County.—"Egyptian cotton. Yield about 400 lbs seed cotton per acre. The quality of the lint was very fine and yellow. The growth tall, limbs long, bolls very small and scattering."

Pike County.—"Egyptian cotton. Yield about 300 lbs per acre. Growth rapid, stalks from 6 to 10 feet high."

Lauderdale County.—"Egyptian cotton. Yield about 250 lbs per acre. Quality of product good. Growth vigorous, 3 to 5 feet high. Yield poor on account of maturing so late. Affi. Yield practically nothing. Growth extremely vigorous, from 6 to 10 feet high."

The statements made by these experimenters appear quite contradictory for the reason that three important factors are overlooked. 1. The term "Egyptian Cotton" is too indefinite. The list given on page 300 will show that there are several species growing in Egypt as prominently distinct from each other as exists between the so-called "Peerless" and the sea Island species. 2. The soil in one county differs materially from that in another—particularly is this true when the counties are separated by the length of the state. 3. The seeds sent out from Auburn were those direct from Egypt and India, and therefore not acclimated.

The following items in reference to the derivation of the local names of these cottons may be of interest:

Broach, Baroach or *Bharuch*, is a comprehensive term and is used to indicate the finer grades of cotton. It is the name of a district in India.

Manuah, Mannoah or *Jettooe*, in its native clime yields one-eighth of clean cotton, but it is cultivated with other crops. It requires nearly a year to mature.

Miduopore or *Mirzapore* is the largest cotton mart in India.

Nadam is an inferior grade of cotton and is grown in the district of the same name in India not for exportation, al-

though it is used for adulterating the best grades which are sent to other countries. It is a triennial and poor bearer, and the fibre is cleaned with difficulty.

Narma or *Nurma*, sometimes also called *Deo-Kupas*, is a fine silky cotton. It is the name of a section in India. The plant bears ten to twelve years in its native country. The fibre is more than one inch long and is used for the manufacture of the finest linens. It is cultivated near the temples for making the robes of priests.

Surat Kupas is named after an important seaport town through which most of the cotton from one district is shipped. This term is often used in a general sense for cotton coming from *Surat*, *Broach*, and *Berar* districts. *Kupas* signifies clean cotton, or ginned.

Wagaria, *Wagriah* or *Wadhwan* is also the name of a district in India and represents an annual cotton growing to the height of 2 or 3 feet with a single tapering stem. The bolls do not open wide, but remain closed except a crack at the apex. There is considerable trouble necessary to force them open and extract the fibre. The bolls are gathered from the plants and afterwards opened by children. This cotton is suitable for the manufacture of only the coarser grades of cloth.

The other names mentioned in the list are local rather than descriptive.

Prior to 1810 the Indian and Egyptian cottons were coarse and of an inferior quality. But since that year a systematic effort was made by the English Government to improve the character of the plant by blending it with the American upland and sea Island varieties with remarkable success. The war between the states from 1861 to 1865 greatly encouraged the cultivation of cotton in these foreign countries. Commissioner Young in his report of the cotton exhibit at the Paris Exposition in 1878, says: "From this exhibition I learned that the cotton of all or nearly all of the Indian provinces has been greatly improved by the introduction of American seed. It was in Dharwar that our

American planters obtained the greatest success, and I am told that the entire crop in this province is now from seed originally American."

BOTANICAL CLASSIFICATION.

A careful examination of the foreign cottons under consideration would classify them as follows :

1. *Gossypium herbaceum* var *microcarpum* Tod: Broach, Ghoghari.

2. *G. Wightianum* Tod: Nadam, Deshi, Jakko, Roji, Nimari bani.

3. *G. roseum* var *albiflorum*. Tod : Indrepur, Ghoghari, Surat Kupas, Mirzapore, Roji.

4. *G. hirsutum* var *album* Tod: Indrepur, Herbucco, Surat Kupas, Mirzapore.

5. *G. maritimum* Tod: Jakko, Manuah, Mit Affi.

6. *G. maritimum* var *polycarpum* Tod: Bamieh.

7. *G. Braziliense* Macf: Guchard, Creulo.

The seed, when delivered at Auburn in 1893 and 1894, were badly mixed, rendering it difficult in most instances, to determine which plant represented the local name given on the package. It will thus be noted that in the above seven species and varieties the same local name has been repeated. After gathering the first year's crop the seeds were carefully assorted, however, and the classification made as above stated.

A detailed description of these species is given in accordance with "Relazione sulla Cultura dei Cotoni—Monografia del Genere *Gossypium*" by Agostino Todaro.

1. *Gossypium herbaceum*, var *microcarpum* Tod. Stem erect, covered with long soft hair; branches spreading, slightly pyramidal; leaves 3-5 lobed, rarely 7 lobed, lobes rotundate obtuse, apex minutely mucronate; stipules linear lanceolate, acuminate very short; peduncle erect and nearly equal to half of peteole; bracts ovate cordate, with sharp cut teeth, general outline of bract leaf rotundate, bases united; corolla longer than the bracts, obovate, unequally wedge shaped, yellow, marked at base with purple spots, after flowering the outside surface turns reddish; bolls small ovate, hardly

subrotundate, apex deeply hollowed out, 4-5 celled, cells 6-7 seeded; seeds ovate, short mucronate at hilum, covered with thick closely adhering fibre, in some cases white ash-gray, short, in other cases rather long and white.

Broach—Ghoghari.

2. *Gossypium Wightianum* Tod. Stem erect and covered with soft hairs; branches spreading, slightly ascending, leaves rather rotundate, obscurely obovate, 3-5 lobed, lobes ovate, obtuse with bases drawn together or wrinkled, the depressions between two lobes obtuse with small dentiformed lobes now and then interjected, stipules semiovalate, somewhat sickle shaped, otherwise linear lanceolate, all acuminate; peduncles erect during the blooming period but recurved during fruiting; bracts ovate, very small, base united, cordate, acute, small serrated; corolla longer than bracts, obovate, unequally shaped, yellow, base spotted dark purple but after flower opens, petals turn red; bolls very small, ovate, 8-seeded; seeds small ovate-subrotundate, densely covered with fibre; fibre short and closely adhering and white.

Nadam, Deshi—Jakko—Roji—Nimari barie.

3. *Gossypium martimum*, Tod. Glabrous, stem erect, branched, tall; branches graceful, spreading, subpyramidal ascending, and later recurving; leaves rotundate-ovate, sub-cordate, 3-5 lobed, sometimes intermingled with other entire leaves, lobes ovate, ovate-lanceolate, or lanceolate-oblong, depressions between lobes subrotundate; single peduncle above the axis of leaf and stem, an inch long during flowering period, but afterwards elongating; bracts broadly ovate, cordate, adhering at middle of base with calyx, but not coalescing among themselves, deeply cut into lobes, lobes near base slightly broader, lanceolate, terminating with an elongated point; corolla longer than bracts, petals yellow, or pale sulphur color, not entirely expanded during flowering period; lower part of style free from stamens and equal in length to anther-bearing column. Style somewhat three parted; boll ovate-conical, acute, three to four celled, 6-9 seeded; seeds beaked at hilum, black, smooth and covered with long silky fibre.

Jakko, Manuah, Mit Affi.

4. *Gossypium maritimum* var *polycarpum* Tod. Stem erect, simple; 1-3 peduncles in the axis of each leaf; few if any branches.
Bamieh.

5. *Gossypium roseum* var *albiflorum* Tod. Stem erect, branches slender, spreading profusely, pyramidal, slightly ascending; leaves palmate parted, cordate, marginally fringed with hairs, segments 5-7, lanceolate acute, base somewhat narrowed, depression rotundate,

two lower segments containing little interjected lobes; stipule near peduncle semiovate, dentate, the other linear-lanceolate, somewhat curved like a scythe, both acute and covered with downy hairs bracts rotundate covered with long weak hairs throughout its entire length, ovate, cordate, deeply dentate from apex to middle, in the lower portions much less dentate, half united; flowers bell shaped and corolla is about equal in length to the bracts. Short bract-like petals of corolla in the act of flowing approximately convolute in the tube, obovate, base coalescing to each other almost contracted into a claw, apex rotundate, dirty white, and purple spotted from the base nearly to the middle; calyx base contracted unequally dentate; naked anther column pubescent beneath, the remaining portion of style tube anther-bearing; boll very small ovate-acuminate, reddish, three celled, cells 5-6 seeded; seeds clothed with thick fibre, in some instances ash gray, very short and strongly adherent, while in other cases the fibre is short and rather reddish.

Ghoghari—Indrepur—Mirzapore—Surat. Kupas—Rogi.

6. *Gossypium hirsutum* var *album*, Tod. Stem erect, branches spreading, slightly ascending, pyramidal, hairy; leaves ovate rotundate cordate, 3-5 lobed, those found at end of branches are at times acute and entire, lobes truncate-semiovate, subtriangular, acute or acuminate, the middle lobes larger and longer, at fold acute plicate; stipules ovate lanceolate, unequalateral, sharp rigid pointed, the other portion lanceolate acuminate; bracts large ovate, acuminate, in the upper portion deeply cut into many narrow lobes, in the lower part simply dentate, the clefts are elongate linear produced at the apex into an attenuated point; corolla large, longer than bracts, during flowering period considerably expanded, petals pale sulphur color, afterwards rolling up and turning red; style long, exserted; boll large, walnut shaped, generally four celled, apex rotundate terminating abruptly into a short point; seeds ovate covered with short white fibre firmly adherent.

Indrepur—Herbucco—Surat Kupas—Mirzapore.

7. *Gossypium Braziliense* Macf. Stem strongly, shrubby, erect, branched; leaves very deeply cordate, 5-7 lobes, widely radiate, spread out below the base nearly the length of the petiole; bracts ovate-rotundate, longer than the convoluted corolla, deeply cut into narrow lobes; boll ovate, acuminate, shorter than bracts, cells 7-9 seeded, seeds closely adherent, wrapped up in long fibre.

Guchard—Creulo.

The following table shows the results of microscopic examination of the foreign cottons. Three of the best varieties of the American cottons are also given for the purposes of comparison.

LOCAL NAMES OF COTTON.	Length of fibre, Millimeters*.	Diameter of fibre, Millimeters*.	Maturity of fibre.	Condition of twist of fibre.	Rupture Strain of Fibre Expressed in Grammes*.	
					Several trials to rupture a single strand.	Average.
Bajwara.....	32.0	0.024, 0.032	Medium	Fair	5.140, 5.875, 10.460	7.158
Bamieh.....	42.0	0.024, 0.040	Excellent	Excellent	16.700, 22.733	18.717
Broach.....	30.0	0.028, 0.032	Fair	Fair	5.810, 6.840, 15.600	9.413
Deshi.....	29.0	0.024	Irregular	Good	7.475, 8.775, 15.350	10.533
"Georgia Upland," India.....	36.0	0.032	Excellent	Excellent	13.600, 14.535	14.068
Ghoghari.....	30.0	0.032	Fair	Fair	12.200, 14.460	13.330
Herbucco.....	30.0	0.032	Irregular	Fair	5.320, 9.830, 6.315, 12.575	8.610
Indrepur.....	38.5	0.032	Good	Good	4.110, 8.885, 9.335	7.443
Jakko.....	40.0	0.028, 0.032	Good	Good	14.260, 16.380	15.320
Mannoah.....	31.5	0.032	Good	Good	10.200, 12.750, 18.750	13.933
Mirzapur.....	38.4	0.032	Medium	Poor	6.250, 7.920	7.085
Mit aifi.....	38.0	0.032, 0.048	Excellent	Excellent	12.610, 10.335	11.472
Mexican.....	27.0	0.024, 0.048	Medium	Fair	2.925, 4.100, 6.705	6.865
Mexican.....	28.0	0.016, 0.048	Good	Good	9.250, 11.075	10.163
Narma.....	23.0	0.016, 0.032	Good	Good	9.585, 15.585	12.585
Nadam.....	33.0	0.032, 0.048	Fair	Good	7.120, 9.780	8.450
Nimari bani.....	27.0	0.016, 0.032	Fair	Fair	10.055, 11.668	10.862
Surat Kupas.....	28.0	0.032	Fair	Good	6.750, 12.375	9.562
Cherry Cluster.....	22.4	0.019, 0.027	Excellent	Excellent	9.348, 17.608, 19.345	15.434
Cook, W. A.....	38.7	0.020	Good	Good		7.590
Peerless.....	18.5	0.016, 0.024	Fair	Medium	5.811, 10.276, 14.022	10.055

* 1 Gramme is equivalent to 15.43 grains; 1 Millimeter is 0.039 of an inch.

