

Good Varieties of Cotton for Missouri

B. M. KING



Capacity to produce high yields is the most desirable feature of a variety, but other features must also be considered.

Early maturity is a very important feature of a variety for growing in Missouri under all soil conditions, and it is especially important in a variety for deep, fertile soil where cotton naturally tends to grow rank and mature late. It is sometimes advisable to sacrifice high yielding capacity for earliness, for the variety that opens its crop in time for harvesting before the bolls are damaged by frost, or the grade reduced by fall and early winter rains, may prove the most profitable over a long period of years..

Good quality of lint meaning here the staple length, is a feature too often overlooked in selecting a variety. Varieties which produce a good uniform fiber 1 to 1 $\frac{3}{32}$ inches long are best for Missouri under the existing price relations and methods of growing and handling cotton in this state.

Large bolls are important in that boll size is closely related to the economy of harvesting and storm resistance. With rare exceptions the medium to large boll varieties hold their cotton over a longer period

and through adverse weather conditions, and are more easily picked than small boll types.

High lint percentage is an attractive feature of a variety but high acre yield of lint is more important than high gin-turnout.

Resistance to wilt and rust is an important feature of a variety for the areas in which these diseases occur. No varieties are available that are immune but some are more resistant than others.

ADAPTED VARIETIES—WHICH TO GROW?

Cotton variety tests conducted at the Sikeston Experiment Field on a moderately productive phase for Lintonia Silt Loam and in cooperation with farmers on other soil types have as their purpose the discovery of the best adapted varieties for Missouri conditions. Those which have consistently shown good performance as measured by high yield, earliness, and other essential features are listed under the succeeding heading. Their relative adaptation to the various soil types is explained and a brief statement of their origin is given that may be of interest and value to the reader.

Delta Pine Land 11 and 11A

Delta Pine Land 11 originated as a plant selection from a hybrid between an unnamed non-commercial hybrid and Delta Pine Land 10. Strain 11 A is a selection from No. 11 for greater uniformity and better lint. These strains were registered under the name "Deltapine" by the 1936 Committee of Varietal Standardization and Registration.*

The relative merits of the two strains under Missouri conditions have not been fully determined but 11 A clearly shows a greater uniformity in plant characters than the parent strain. Both have ranked among the highest yielding varieties in all the varietal experiments. The medium-large open type plant growth produced by them is a desirable feature from the standpoint of their usefulness under a wide range of soil conditions. Because of their tendency toward rank growth, however, they are not recommended for very fertile soils where cotton normally tends to mature late and produce excessive vegetative growth.

The Delta Pine Land strains have not been grown experimentally in Missouri where wilt and rust cause appreciable damage, but from observation of commercial plantings they appear to be moderately susceptible to injury by these diseases. One of their most remarkable features is the combination of a good staple length and high lint percentage. A few growers have reported gin turnouts of almost 40 per

*Brown, H. B., Registration of Improved Cotton Varieties, Journal of American Society of Agronomy, Vol. 28, No. 12, Dec. 1936.

cent while an average of 36.5 per cent has been recorded for these strains in tests at Sikeston. Their staple ranges from 1 1/32 to 1 3/32 inches in length, depending on environmental conditions. Their bolls are of medium size, easily picked, and fairly resistant to adverse weather conditions.

Stoneville 5 and 5A

Stoneville 5 and 5 A are descendants from Stoneville 2 which originated as a plant selection from Lone Star 65. Number 5 A has been tested in Missouri only one season but it seems as well adapted as No. 5 and possibly superior to it in certain features.

No outstanding differences in the yield of Stoneville 5 and Delta Pine Land 11 have been found in our experiments, though the latter has rather consistently outyielded the Stoneville strain by a small margin. The plants of both are similar in form and vigor of growth. Further similarities have been found in relative earliness, size of bolls, storm resistance, ease of picking, and disease resistance, all of which indicates that both are adapted to the same general soil conditions in the cotton section of Missouri.

Stoneville 4A

Stoneville 4 A is a selection from Stoneville 4 which in turn was selected from Stoneville 1, each successive selection representing improvement over the parent strain in boll size, lint percentage, uniformity, and possibly productiveness.. Stoneville 4 was registered under the name "Ambassador" by the 1936 Committee on Varietal Standardization and Registration.

Stoneville 1 was first recommended and grown commercially in Missouri about 1931 and was soon widely grown on heavy rich land. It was later replaced largely by No. 4 and 4 A is now rapidly replacing No. 4.

These strains have rather consistently produced high yields in farm plantings and varietal experiments, although they have seldom ranked first in the experiments during any particular season.

Stoneville 4 A produces a good quality lint, 1 to 1 1/16 inches in length and a lint turnout of 32 to 34 per cent, average in our trials about 33 per cent.

The semi-dwarfing, spreading type of plant growth, extreme early maturity, rather large storm-proof bolls that are easily picked, and the capacity to produce good yields, marks this variety as being exceptionally well adapted to very fertile soils where cotton normally tends to grow too rank and mature late. Because of its extreme earliness it is also well suited both for late planting, and for planting along the ex-

treme northern edge of the cotton growing section of Missouri, on nearly all soils where wilt and rust are not a serious factor.

Arkansas Rowden 40

Rowden 40 was developed by the Arkansas Experiment Station from Texas Rowden, a rank growing, late maturing variety widely grown in Missouri at one time. It produces good yields of high quality lint from 1 to 1 1/32 inches in length. The bolls are large, storm resistant, and easily picked. This variety has considerable resistance to wilt and rust and is recommended for growing on sandy soils where these diseases commonly occur. Newer strains of Arkansas Rowden, including numbers 2088 and 5056, are also resistant to wilt and rust.

DETERIORATION OF COTTON VARIETIES

A larger quantity of good pure seed of adapted varieties is in the hands of Missouri growers for planting their 1937 crop than ever before at any one time in the history of cotton culture in this state. The exact quantity cannot be stated but it is estimated as being sufficient for planting more than 20 per cent of the normal state acreage. Some of the seed is direct from breeders. The remainder is only one year removed and was produced in large amounts by a relatively few Missouri growers equipped to keep the seed pure. Unless precautions are taken to preserve these stocks and others that become available in future years, only a small fraction of their potential value will be realized.

Experienced growers recognize the fact that superior varieties soon deteriorate in yield, uniformity of lint, and other essential features of a good variety, unless means are used to prevent it. But the rapidity with which this "running-out" process occurs and all the reasons for it are not always fully appreciated. Growing a number of varieties in the same community and ginning the crops at custom gins are the principal causes. These conditions cause the seed of a variety to become mixed not only with the seed of other varieties but with badly degenerated stocks of "gin-run" seed.

The amount of mixing that takes place in the gin is surprisingly large, where different varieties follow each other in single bale lots through the modern machinery. Experiments by Ballard and Doyle* show that more than 25 per cent of mixing may occur. These experiments also show that even if the varieties are ginned in lots of several bales mixing will occur, but in successively smaller amounts up to the ginning of the fourth bale, and even later bales if the seed is allowed to pass through screw conveyors.

*Ballard, W. W. and Doyle, C. B., Cotton Seed Mixing Increased by Modern Gin Equipment, U. S. Department of Agriculture, Department Circular 205, 1922.

Although gin mixing is the principal cause of deterioration of cotton varieties it is by no means the only cause. Cotton varieties are cross-fertilized readily by pollen transferred by natural agencies from the flowers of one variety to those of another. Because of the sticky nature of cotton pollen it is not blown about by the wind in the same manner as corn pollen but is carried from one flower to another by bees and other insects. Crossing takes place freely between varieties in the same field where gin mixed seed are planted, or where two varieties are grown near each other. Naturally the amount of crossing depends on the number of insects present, the distance between varieties, and possibly to a smaller degree, on other factors such as the relative time of blooming of the two kinds. Where two varieties are grown in close proximity in adjacent fields or sections of the same field, anywhere from five to ten per cent of crossing is likely to take place in the first few rows of each. With an increasing distance between the two kinds the percentage diminishes. Some crossing may take place between varieties separated by a distance of 200 yards or more but the percentage is very small.

After a superior variety has been subjected to gin mixing and crossing of the plants with other kinds for a few years, it becomes so badly mongrelized that it shows little resemblance to its former type. The yield is lower. The staple is inferior in quality. As a result of crossing, many hybrid plants are present some of which are decidedly inferior to the parent varieties. They present a wide range in height, time of maturity, productivity, general growth habits, leafiness, boll size and shape. "Slick-seeded" plants often appear and they are the unmistakable and frequently the first indication to the farmer that his variety is running out.

Even if all gin mixing and cross pollination is prevented a variety will eventually deteriorate as the result of the appearance of worthless off-type plants from time to time. However the rate at which a variety deteriorates through this natural tendency to "go to pieces" is comparatively very slow. By roguing out these faulty plants as soon as they appear a variety can be maintained at a high state of productivity and uniformity almost indefinitely. But this cannot usually be done very effectively except by a trained plant breeder or some one who is especially adept in work of this nature.

Keeping a Cotton Variety Pure

In view of the seriousness of gin mixing and cross pollination as a cause of the deterioration of cotton varieties, it becomes readily apparent that measures should be employed to correct the faulty practices in cotton growing and handling that permit these degrading influences

to exist. Simply by growing a pure variety in an isolated field, cross pollination can be prevented. Or where for any reason isolation is not possible, that part of the crop most favorably located for crossing to take place can be discarded as a source of planting seed. The control of gin mixing, however, is not so simple and requires considerable effort on the part of the grower and the cooperation of the ginner.

In handling the crop from a pure seed increase field a number of special precautions must be taken to prevent mixing of the seed by the gin and by other mechanical means if more than one variety is produced on the same farm, and also to insure that the seed will germinate properly. The chief precautions are as follows:

(1) All picking sacks, wagons, cotton houses, or other containers used in harvesting and storing the crop should be thoroughly cleaned before picking begins.

(2) The crop should be picked over as often as necessary to insure that the seed will not be unduly exposed to the danger of loss by storms or lowering of germination by weathering.

(3) Before the crop is ginned, all gin parts where mixing may occur, including the suction pipe, overhead cleaner, gin stands, distributor belt, and seed conveyor should be thoroughly cleaned. A screw conveyor is very difficult to clean, and unless a gin is equipped with the belt type it is best to allow the seed to fall on the floor in front of the stands after it has been swept clean of stray seed, dirt, and trash.

(4) The seed should then, as a rule, be sacked in even weighted bags and properly labeled. Seven or eight ounce burlap bags that will hold 100 pounds of cotton seed is a convenient size, and the open weave permits the seed to dry. They should be stored in dry, well ventilated buildings by stacking in such a manner as to permit the air to circulate freely between them. Additional precautions may be required in handling the seed from that part of the crop harvested early in the picking season or shortly after rains, in order to prevent heating and loss of germination while in storage.

Considerable time is required to clean a gin and gin operators are justly reluctant to stop their machinery on busy days long enough for a thorough job of cleaning to be done. For this reason it is best for the ginner and farmer as well, to postpone the ginning of the good variety until such time as the gin would otherwise be idle. Slack periods occur after rains or toward the end of the picking season that can be utilized to an excellent advantage for saving pure seed. In the meantime, of course, storage must be provided for the seed cotton, preferably in a separate cotton seed house or a special bin in such a house constructed in a manner that no mixing with other seed cotton stored in the adjacent bins can take place.

But notwithstanding all these well known safeguards for maintaining pure seed of superior, adapted varieties, it cannot, or at least has not, been done very effectively in many cases where the seed is subjected to even the small amount of crossing and mixing year after year, which necessarily follows the prevailing system of growing a number of varieties in the same community and ginning them on the same gin. Obviously then the only alternative left for farmers who are interested in keeping their seed pure is to unite in growing only one variety and ginning on a cooperating gin that handles this variety exclusively. This one variety plan is by no means new, but has long been advocated by Cook and his co-workers in the United States Department of Agriculture, and by State Experiment Stations.

Clearly the outstanding advantage of the one variety plan is to be found in the fact that it provides year after year an easy means of higher production and better quality of lint, through the use of good seed that automatically becomes available to the farmer at the lowest possible cost. But there are other advantages. Communities that build a reputation for the production of high quality seed can often dispose of their surplus to unorganized growers at a premium over oil mill prices. Also there is a price advantage to be derived from the sale of large commercial quantities of good uniform fiber that is not possible in a mixed variety community.

Through the efforts of the Missouri College of Agriculture and a few large growers during the past few years, four gin communities will be on a single variety basis in this state in 1937. Preliminary steps have been taken toward the organization of other communities on a one variety basis, but the success of these is not yet assured.

The type of organization required for the successful operation of a single variety community may vary from one community to another. There are, however, certain fundamental features on which there should be definite understanding and agreement in all cases.

(1) A variety must be chosen that is acceptable to all of the growers. Most well informed Missouri growers would readily agree at the present time that the choice should be made from a very small group. But a final agreement on some one of these might not be so easily reached, except through the realization that a good variety grown on a community basis is more profitable in the long run than a slightly better one brought in and grown on a many-variety basis only to become mixed and mongrelized after a few seasons.

(2) Pure seed stocks must be made available to the grower. The cost of a sufficient quantity of pure seed direct from the breeder

for planting the entire acreage of all cooperative growers the first year might be prohibitive. It would then be necessary for one or more growers to accept the responsibility of producing the required amount of pure seed to be sold to the others at an equitable price agreed on in advance. The plan of having a few growers, or preferably one, produce enough seed each year to plant the entire acreage the next, has several distinct advantages. The seed increase fields could be isolated and rogued each year to remove off-type plants, or could be planted to fresh stocks of seed of the same variety obtained direct from the breeder. A community operating on this basis could easily change to a different variety in one year if for any reason a change is necessary. A change should never be made except on the basis of results obtained from carefully conducted variety tests covering a period of several years.

(3) Arrangements must be made for ginning the crops on a gin that excludes all other varieties. By separate ginning to prevent mechanical mixing of seed, careful isolation to prevent crossing, and on roguing to remove off-type plants, a superior variety can be kept pure and productive for many years.

OTHER FACTORS IN PRODUCING GOOD COTTON CROPS

There are several additional factors involved in the production of profitable cotton crops. Among these are:

1. Keeping the soil productive by growing legumes and returning at least a part of these crops to the land in the form of animal or green manure.
2. Putting the land in good condition for the crop by thorough seedbed preparation.
3. Planting as soon as temperature conditions are favorable for prompt germination. Usually this is about the first of May, though in some seasons excellent results are obtained from earlier plantings.
4. Planting 1 to 1½ bushels of seed high in germination to insure enough plants for thinning to a uniform stand of one to three plants in the hill with the hills 10 to 14 inches apart.
5. Careful and thorough cultivation, especially during the early growth stages of the crop, that will conserve the stand and control weeds and grass. Cultivating deeper or more often than necessary for complete control of weeds may, particularly in the case of deep, late cultivation, cause a reduction in yield.
6. Picking the cotton with reasonable promptness after the bolls are open. This can regularly be accomplished only by making certain well in advance that the required labor force will be available when it is needed. Growers who depend mainly on transient pickers frequently suffer losses both in quality and quantity of their crop.

All of these are important, and the neglect of one will partly nullify the others. The use of better adapted varieties offers one of the quickest and most efficient means for a majority of the growers to obtain larger returns, under the prevailing soil conditions and with generally good cultural methods.