5-1-1961

# Study seeks to improve quality of cottonseed

W. P. Caldwell

R. E. Parker

# STUDY SEEKS TO IMPROVE QUALITY OF COTTONSEED[1]

William P. Caldwell[2]
Rayburn E. Parker[3]

The overall quality of cottonseed produced in Mississippi has been unsatisfactory for the past several years. Viability of the majority of cottonseed used for planting purposes since 1957 has averaged between 60 and 70 percent, with many lots going as low as 40 percent. This has necessitated lowering of certification standards and temporary alteration of state laws to meet the demands for planting seed.

Considerable interest has been expressed by farmers and seedsmen in a research program to investigate the causes of this deterioration in cottonseed quality. This is the object of a current cooperative research project of the Mississippi Agricultural Experiment Station and U. S. Department of Agriculture.

Field experiments were conducted at the Delta Branch Experiment Station, Stoneville, in 1960, to determine the effects of preharvest environment, from time of boll opening until picking, upon cottonseed and lint quality. The first step was to measure the effects of temperature and humidity on seed and lint deterioration. In order to establish plant microclimates of differing humidities, three levels of nitrogen fertility and two levels of irrigation were used.

Blossoms were tagged at three dates to give a large sample of like age bolls at the bottom of the plant, middle of the plant, and top of the plant. These bolls were harvested at three dates: 1 week, 3 weeks, and 6 weeks after opening. Recording hygrothermographs were placed in the plots to give a continuing microclimate record of temperature and relative humidity.

Although the levels of nitrogen fertility and irrigation have some effect on the temperature and humidity in the boll microclimate, the position of the boll on the plant and the length of exposure after opening had a greater effect.

Several measurements were made to determine the quality of the seed and lint. Viability, vigor, and emergence under field conditions were determined on the seed by the Mississippi Seed Technology Laboratory. Fiber color, fiber strength, upper half mean fiber length, and mean fiber length were determined by the Clemson Cotton Laboratory.

---

1/ Reprinted from Mississippi Farm Research, August 1961, Volume 24, No.8

2/ Mr. Caldwell is Assistant Agronomist, Mississippi Agricultural Experiment Station, State College, Mississippi.

3/ Mr. Parker is Agricultural Engineer, Agricultural Engineering Research Division, Agricultural Research Service, United States Department of Agriculture.

Table 1 lists means of the various measurements taken. It was found that field exposure of 3 and 6 weeks caused a significant loss in seed quality over that exposed for 1 week. Also, significant losses in seed quality occurred in bolls on the bottom and middle portions of the plant when compared with those in the top of the plant.

The degree of lint quality deterioration in nearly all cases paralleled that of seed quality deterioration. It was found that fiber strength was significantly reduced when bolls were exposed from 3 to 6 weeks before they were harvested. Also, in irrigated cotton, fiber strength was significantly less for the bottom crop than for the middle or top crop. Fiber upper half mean length was significantly reduced by field exposure of 3 to 6 weeks in plots which received a high rate of fertilizer (135 pounds N per acre). The length of the fibers from the bottom crop was significantly lower than that of the fibers from the middle and top crop. As shown in Table 1, the best fiber color was realized when the open bolls were exposed only 1 week. It also appears that the higher the boll on the stalk, the better the fiber color.

It is evident that if one is to realize maximum fiber length, strength, and color, and overall seed quality, he should harvest as soon after the boll opens as possible.

Correlations were made of the various quality measurements with the temperature-humidity index. With the exception of fiber strength and mean fiber length, these correlations were all highly significant.

Although this particular set of data indicates that the greatest amount of deterioration occurred in those bolls located on the bottom and middle portions of the plant, this may not necessarily hold true for every season. In the 1960 season, the highest combination of temperature and humidity occurred while the bottom and middle bolls were opening, and had decreased by the time the top bolls opened. In another season, the highest temperature and humidity might occur at some other time, in which case the portion of the crop exposed at that time would be damaged most.

It is important to remember that the deterioration which occurred was caused by exposure to high temperature and humidity. Nitrogen and irrigation levels, boll positions, and dates of harvest are secondary factors which controlled the intensity of the temperature and humidity to which the bolls were exposed. In seasons when the temperature and humidity is lower than the 1960 season, less deterioration may be expected.

Several factors are evidently contributing to the present lowered quality of seed and lint produced in Mississippi. Last year over 50 percent of the cotton produced in the Mississippi Delta was picked by machine. In many fields, only one picking was made - after all the bolls were open. The lower bolls may have been open for as long as 2 months before being picked. This prolonged exposure undoubtedly lowers the quality of the seed as well as the lint. Modern cultural practices, including high plant populations, high fertility levels, and irrigation, all contribute to higher humidity in the microclimate surrounding the lower bolls. This will tend to lower the quality of the seed and lint.

Table 1. Averages of seed and lint quality measurements from test conducted in 1960.

| Variables | Seed measurements | | | | Lint measurements | | | |
|---|---|---|---|---|---|---|---|---|
| | Viability | Vigor[1] | Field Emergence | Fiber Color[2] | Fiber Strength | Upper Half Mean Length | Fiber | Temperature-Humidity Index[3] |
| | Percent | | Percent | | Gms/tex | Inches | Inches | |
| Field exposure after boll opening | | | | | | | | |
| 1 week | 78.99 | 28.72 | 28.25 | 93.6 | 23.19 | 1.06 | .76 | 149.0 |
| 3 weeks | 64.64 | 24.58 | 23.42 | 90.0 | 21.83 | 1.03 | .73 | 378.1 |
| 6 weeks | 54.11 | 21.86 | 19.70 | 87.2 | 22.13 | 1.04 | .75 | 637.8 |
| Boll position on plant | | | | | | | | |
| Top | 82.10 | 31.54 | 36.53 | 92.2 | 22.49 | 1.05 | .76 | 264.8 |
| Middle | 64.32 | 25.27 | 21.73 | 90.6 | 22.44 | 1.05 | .75 | 423.5 |
| Bottom | 51.32 | 18.34 | 13.11 | 87.9 | 22.23 | 1.03 | .73 | 476.5 |

[1]A vigor index based upon rate of germination.

[2]Measured as percentage of value of 1 inch white Middling grade.

[3]Number of hours exposure to temperature plus relative humidity over 140.

Practices which would minimize the length of exposure of open bolls to high temperature and humidity would be expected to improve quality. This might be accomplished by lowering the humidity in the boll microclimate and also by picking as soon after boll opening as possible.

Research is in progress on various means of improving the quality of Mississippi's cotton lint and seed. These efforts are being directed toward reducing humidity in the boll microclimate by various cultural practices and toward effecting means of earlier machine harvesting. Work is also being done in the laboratory to clarify the effects of specific humidity and temperature levels upon cotton deterioration.

# PRODUCTION OF HYBRID SEED CORN IN MICHIGAN

Michigan's largest producers of Michigan Certified Hybrid Seed Corn are Mantey's Pedigreed Seed Producers of Fairgrove, Michigan. The business of producing Certified Seed Corn was started in 1921 with open-pollinated varieties. Hybrid Seed Corn was added to the production in 1939. This year, 1961 marks the 40th consecutive year that a crop of seed corn will be produced and marketed by the Mantey's. Fritz the father and Carl and Ed the sons have operated as a partnership for several years. Two years ago they decided to change their drying operation and at that time installed a tower dryer and began to field shell their Hybrid Seed Corn.

---

Carl E. Mantey[1]

"We are firmly convinced after two seasons of field shelling Hybrid Seed Corn that it is both possible and practical.

In 1959 we had reached the position in our Hybrid Seed Corn operation that made it necessary to make a major change in our drying system. We had gradually changed through the years from a system of placing the individual ears on a lath rack and circulating warm air around the racks to a crib or bin system using forced warm air. The repeated elevating and handling of our ear corn not only damaged the seed, but was costly. Our dryer was so small and slow that it held up our harvest. We considered a new crib type dryer of the size which would give us the capacity we wanted. The cost and labor involved in the construction of this type of dryer seemed prohibitive. At this point the idea was presented that we might install a tower type, continuous flow dryer for our shelled seed corn. As we first thought about this, we believed that field shelling Hybrid Seed Corn was impossible but the thought did intrigue us because of the possibilities of the amount of labor it would save and the simplicity of the harvest operation. At this time it was brought to our attention that a few people in the Hybrid Seed Corn business were harvesting their seed this way. We decided that if it were possible for some to field shell Hybrid Seed Corn, then we could adapt it to our Michigan conditions. With some logical actions and an amount of knowledge which has accumulated through forty years in the Seed Corn business we made the change from drying seed corn on the ear to field shelling and tower drying.

We believed from past experience that there would be two possible places in the harvest which would be trouble spots. One could be the shelling, the other might be through exposing the germ face of the seed to forced warm air.

---

[1] Mr. Mantey is Co-owner of Mantey's Pedigree Seed Producers and President, Michigan Seed Dealers Association.

In the shelling operation, logic and common sense must be followed. We found that we should run the combine cylinder as slowly as possible and still get the corn from the cob. We use a self propelled combine with a rasp bar cylinder. We definitely feel that the weakest link in the harvest or shelling is the elevator or conveyor which equipment companies place on their combines to carry the shelled or threshed grain to the bin. The equipment manufacturers could help the seed producer greatly if they would use an elevator at this point suitable for handling of seed. This would help not only the Hybrid Seed Corn producer, but any and all seed producers from beans to wheat. We feel now that we have suddenly become more "damage conscious" than we were before we decided to try our new operation. In examining samples of the same variety of seed corn which was dried in an ear-crib-type dryer and corn which was field shelled and dried, we actually found less damage in the latter. We believe that each variety of corn must be handled as an individual, that there are some characteristics which affect the handling of some varieties. It is possible that some varieties can be harvested at a higher moisture content than others. We feel that optimum moisture content for our corn harvest is from 18 - 22%. Local conditions of humidity and varietal characteristics may cause this to vary. We think that it is possible that a heavy coating of husks on the ear when it hits the combine cylinder may have a beneficial affect. We have found that a variety which tends to flinty type corn may give more trouble than some others. It may be true that a long kernel shells more easily than a short one.

We now believe that our fears regarding the actual drying of shelled Hybrid Seed Corn were groundless. In our tower dryer, the kernel is actually exposed to warm air for a much shorter time than in our old crib-type dryer, where the ear was held in a stable, fixed position and warm air was continuously forced past it for between 50 and 100 hours. The temperature of the seed itself is held at a much lower level in our tower dryer than it was in the crib-type dryer.

We find that field shelling actually gives us an increase in yield of seed as we have practically no loss of shelled corn either in the field from the snapping rolls of the picker, or from handling through the husking beds and conveyors necessary for handling ear corn.

The germination reports on our seed corn which was field shelled and dried in our continuous flow tower dryer have been very satisfactory. This year we have our first cold germination reports on field shelled seed corn which was carried over for one year. These cold germination reports also came up to all our expectations and hopes.

Since production costs from the standpoint of equipment and labor have risen so tremendously in the past 15 years and the price of seed corn has remained practically the same, the only way that we can realize and maintain a reasonable measure of profit is by increasing the efficiency of our operation.

We feel that going to a field shelling operation at harvest is the first major "break-through" in increasing our efficiency. We also feel that in doing this, we have eliminated many of the steps of handling and re-handling which were necessary in harvesting ear corn for seed. In eliminating these steps which were costly, we have also eliminated much chance for damage to the kernel cap or the seed coat.

We strongly feel that in this type of a seed drying operation, the dryer must be of the tower-type with a continuous flow, and should be constructed so that it can be easily cleaned. Special care must also be given to the installation of the legs and conveyors as it should be whereever seed is handled. We feel that these points contribute much in the production of high quality seed.

We installed our continuous flow tower dryer ourselves, with only supervisory assistance from the manufacturer. The cost was less than half what it would have been to install a crib type dryer of the same capacity.

We have found that by harvesting and drying our Hybrid Seed Corn this way, we have eliminated two-thirds of the labor which was necessary for harvest when we dryed the corn on the cob.

We cannot emphasize too strongly that any common sense or practical knowledge which has been accumulated through any kind of harvest or handling of seed can be applied to this type of operation. This line of thinking dictates that if corn is field shelled for seed and it cannot go directly to the dryer, it must be placed in a bin which is equipped with some type of aeration.

We are very confident of the success of our venture into this system of harvesting Hybrid Seed Corn. The ease and simplicity of harvest involved in this kind of operation is incomparable when considering any major change in fall harvest."