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Hybrid Corn for Tennessee

University of Tennessee Agricultural Experiment Station

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By FREDERICK D. RICHEY

A Plant of a Prolific Southern Hybrid That Produced Four Ears Weighing 2½ Pounds

AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF TENNESSEE
COOPERATING WITH
THE BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
UNITED STATES DEPARTMENT OF AGRICULTURE

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SUMMARY

Hybrid seed corn is the first-generation cross or hybrid involving two or more inbred strains of corn.

The plants of a good corn hybrid are uniform for their superior characteristics. The hybrid therefore is a very efficient producer, yielding more grain of good quality per acre than the best open-pollinated varieties, which basically are mixtures of good and poor hybrid plants.

The plants of a poor hybrid also are uniform, but uniformly poor. They are not efficient, and using seed corn just because it is "hybrid" may result in low yields of damaged corn.

The full value of hybrid seed, namely the seed resulting from the immediate cross pollination of two unrelated stocks, is obtained only in that first hybrid generation. The crop grown from that (that is, second generation seed) may even be inferior to seed of good varieties or poor hybrids.

Hybrids are adapted to different localities just as definitely as are varieties, and a hybrid that is not adapted to Tennessee usually will produce a poor crop there, even though it might produce an excellent one if grown where it belongs.

Good hybrids are available for Tennessee and the surrounding states. Better hybrids are being developed. Ask your State Agricultural Experiment Station or your State Extension Service what hybrids they recommend for your locality.

Hybrid Corn for Tennessee

By FREDERICK D. RICHEY

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INTRODUCTION

The development of hybrid corn came about as a direct result of advances in the knowledge of genetics, the science of heredity. The application to the art of corn breeding of the principles learned through genetic advances was made practical by a combination of three condtions:

1. Pollination in corn can be controlled easily by pulling the tassels, before they shed pollen, from all plants that are not to function as male parents.
2. An individual corn plant produces a large number of seeds.
3. Only a small quantity of seed is needed to plant an acre.

These facts make it possible to produce hybrid seed corn anew each year at a relatively low cost per acre to be planted. This low cost of hybrid seed is combined with the advantages of large yields and superiority in quality; and in ability to withstand storms, disease, and other vicissitudes.

The importance of hybrid corn to Tennessee, where more than half of the total corn acreage was planted with hybrid seed in 1952, cannot be over-estimated. The proportion planted to hybrids will increase rapidly as suitable hybrids become available. As the value of hybrid corn in Tennessee becomes more generally recognized, there is an ever-increasing demand for information on what hybrid corn is, and how it is produced. It is the purpose here to supply information on these questions, and on how farmers can choose the kind of hybrid seed that will be most profitable to them.

THE WHAT AND HOW OF HYBRID CORN[1]

Probably the simplest way to give a general idea of what hybrid corn is, is to compare it to the mule. A corn hybrid, in fact, has many things in common with the mule. A mule is the first-generation hybrid between the mare and the jack, and partakes of the better qualities of both parents. It does not reproduce, but must be produced anew each generation for its value in itself, not

[1]Much of the material on pages 3 to 16 inclusive is from U. S. Department of Agriculture Farmers' Bulletin 1744, **The What and How of Hybrid Corn**, written by F. D. Richey and published in 1935.

for reproduction. A corn hybrid is the first-generation hybrid between two strains of corn. Its value is for seed in the production of a crop of commercial corn. This commercial corn will grow, if planted, but it cannot be used for seed without a serious loss in yield in the next generation. A corn hybrid, then, like the mule, must be produced anew each generation. During that generation, good hybrids produce larger acre yields of high-quality corn than do the best commercial varieties. And finally, neither all mules nor all corn hybrids are good.

REPRODUCTION IN CORN

In order to understand just what hybrid corn is, it is necessary to know how the corn plant reproduces. Each kernel of corn results from the fertilization of an egg by a sperm. The egg is at the base of the silk, and the sperm is in the pollen. It therefore is customary to speak of the plants on which the ears are produced as the female or seed parent, and of the plants supplying the pollen as the male or pollen parents.

Ordinarily, corn is wind-pollinated, the pollen being carried at random through the air, some of it falling on receptive silks. There it germinates, sending a pollen tube down the silk, through which the sperm passes to reach the egg and effect fertilization. Selecting an ear from a good plant, accordingly, is selecting a good female parent only. Each kernel on the ear may have been pollinated from a different male-parent plant.

It is this condition that has made it impossible to mass-select varieties of corn that breed true for any but the most simple characters. The breeder sees only what the female parent is like; the pollen parent is unknown. Moreover, many characters are not expressed in the hybrid condition. Thus, the ears of a true-breeding white corn that have been pollinated by a red corn are white, but if such cross-pollinated white seed is planted, all the ears will be red. Then, if this red corn is planted, about one-fourth of the resulting ears will be white and three-fourths red.

In spite of these difficulties, the better varieties of corn have been developed to a relatively high state of productiveness by careful selection over a long period. That is, by selecting seed from only the most productive plants each year, the frequency of the unfavorable characters has been so reduced that any one of them is seldom expressed. Always, however, even in the best varieties, most of the plants are below par because of one or more unfavor-

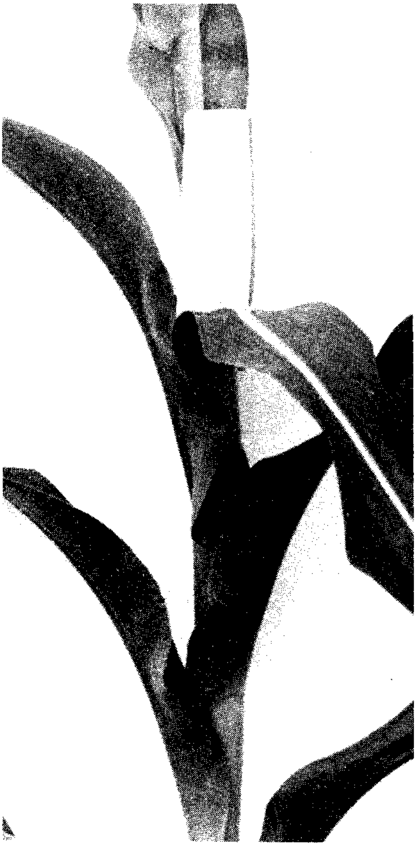

Figure 1. — Ear shoot covered with glassine paper bag to protect it from random pollination.

Figure 2. — Ear shoot after silks emerge, ready for controlled pollination.

able characters, and some of the plants produce only nubbins or are completely barren because of serious inherited faults.

SELECTING INBRED STRAINS

The development of a good hybrid comprises (1) obtaining the best possible inbred lines or strains; and (2) finding those that can be crossed into the best hybrid combination of one kind or another for commercial utilization.

The final hybrd is thus the product of many years' careful selection and experimentation. During this breeding period all pollinations are made by hand. Ear shoots are protected from stray pollen by being covered with small paper bags (Figure 1) until after the silks emerge (Figure 2). Pollen from tassels that also

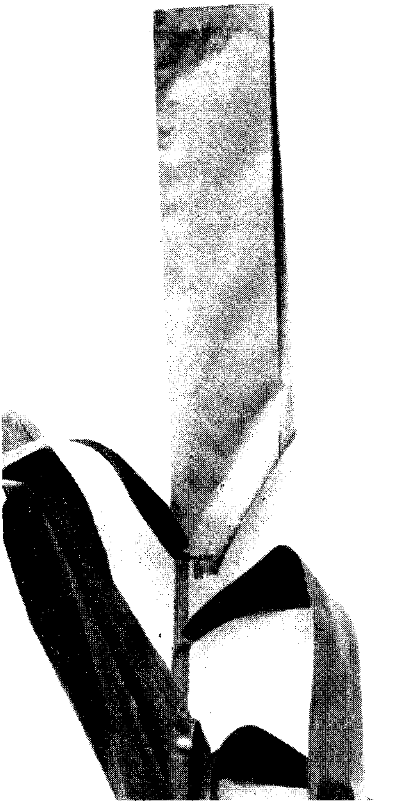

Figure 3. — Tassel bagged to obtain pure pollen of the kind wanted for controlled pollination.

Figure 4. — Pollinated ear shoot protected from any off-pollination by manila bag which is left on until harvest.

had been protected (Figure 3) then is applied to make the desired mating, and the pollinated ear shoot is again protected (Figure 4). In this way the parentage on both sides is definitely controlled.

In selecting inbred strains, good plants of one or more varieties of corn are "selfed" or self-pollinated: that is, pollen is placed on the silks of the plant from which it came. The best of the resulting ears are planted, an ear to a row, and good plants within these rows again are selfed, and so on for several generations. Each year, however, only the ears from the best plants from the best rows are selected for continuing the various strains.

Wide variation among the plants occurs following the initial inbreeding. With continued inbreeding, however, there is a marked increase in the uniformity of the plants within any progeny row, although the differences from row to row are large. Some strains are discarded almost at once because of grossly unfavorable characters. Others are better and are continued. After some five to seven generations of self-pollination the strains breed practically true for whatever characters they possess. Every plant of any strain is practically like every other plant (Figure 5). After this it is unnecessary to self pollinate in continuing a strain; pollination between plants of the strain then is essentially like self-pollination, and the strain can be continued in an isolated plot.


Figure 5.—The uniformity of plants in a row of a long-time inbred.

Among the thousands of inbred strains that have been isolated in this way, none has yet been found which even approaches ordinary corn in size or production. Nevertheless, no two strains have exactly the same set of faults, and some of them have characters of outstanding value. Thus, some regularly produce long ears, others have stiff stalks or good roots, or are resistant to heat, or cold, or disease and the like. It is the problem of the corn breeder to bring inbreds having a maximum of the best characters together in usable combinations.

Open-pollinated varieties were the only possible source from which to start inbred lines when the breeding for corn hybrids began. Following the isolation of these first inbreds, however, crosses among them have been a fruitful source from which to select new lines superior in various ways to those initially selected from open pollinated corn. This cumulative improvement of inbreds is one of the important ways by which corn breeders are achieving progress in obtaining more satisfactory hybrids.

It has been pointed out that white corn crossed with red and planted will produce only red corn in what is known as the first hybrid generation, but that white will recur in the following or second generation. Many other characters also are not expressed in the hybrid condition, and this is particularly true of characters unfavorable to growth and production. Consequently, when two inbred strains are crossed or hybridized, the better characters of both parents tend to be expressed in the first generation, just as the mule has something of the size of the mare and the stamina of the jack.

Because the inbred strains breed true, they provide the corn breeder with fixed material with which to work, the first he has ever had. The faults and virtues of the strains and of their hybrid combinations can be determined by actual test in successive years and under different conditions, with the knowledge that once hybrids are found that are good under several sets of conditions, they can be reproduced with reasonable certainty from year to year, indefinitely.

FINDING GOOD HYBRID COMBINATIONS

To a certain extent, the corn breeder can select inbred strains for crossing on the basis of his knowledge of their characters. Thus, strains with weak stalks, poor root systems, or short ears are likely in general to produce poor hybrids: even to provide a reasonable chance of using such strains in a hybrid, their faults must be covered up by crossing with strains having sturdy stalks, good root systems or long ears.

On the other hand, inbreds that have productive plants with good characters are likely to produce better hybrids. Performance of the inbreds is not completely reliable, however, and beyond that the corn breeder must rely on testing large numbers of hybrids to find strains that combine best (Figure 6). The inbred strains producing the poorer hybrids are discarded. Those producing the better hybrids are again crossed and the hybrids tested more adequately. Eventually, through continued elimination and selection, a few lines that combine to advantage in several combinations are found. Finally, some two or three hybrids that have been among the best in a given locality during several seasons are placed in commercial production.

Figure 6.—Weighing the yields from plots of experimental hybrids to determine the better ones.

Different Kinds of Hybrids

Inbred strains may be combined into several different kinds of hybrids. Thus the single cross or hybrid is between two inbred strains, the three-way cross involves three strains, the double cross four strains, and the top cross involves one inbred strain and one open-pollinated variety. Each of these has certain advantages and disadvantages or fits into the corn-breeding program in particular ways.

The simplest hybrid is the single cross, or hybrid between two strains. Thus, designating the female parent first in the customary way, **B** x **A** designates the single cross of strain **B** pollinated by strain **A.** The seed of the cross so produced on the plants of strain **B** usually will appear entirely like self-pollinated seed of **B.** When the crossed seed is planted, however, the vigor of hybridity becomes evident shortly after germination begins.

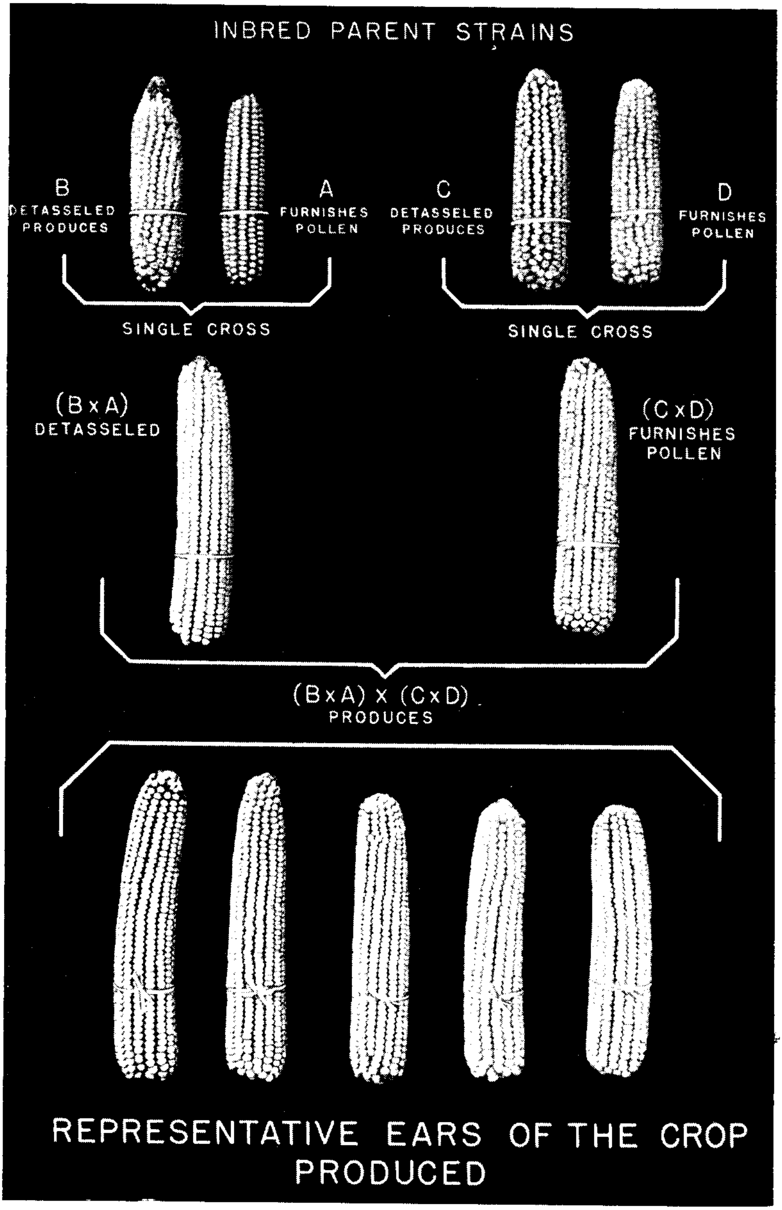

Figure 7.—Representative single ears of four inbred lines, the two single crosses between them, and five ears of the double-cross crop.

A three-way cross is the hybrid of a single cross between two inbred strains and a third inbred strain. It is customary to use the single cross as the female and the third inbred strain as the male parent in producing a three-way cross. Thus **(B x A) x C** designates the single cross **(B x A)** pollinated by strain **C.** The crossed seed produced on the vigorous **(B x A)** plants is superior in quality and quantity to that produced on inbred plants as in single crosses.

Double crosses are hybrids between two single crosses, involving four different inbred strains. Thus, the double cross or hybrid **(B x A) x (C x D)** designates the hybrid of the single cross **(B x A)** pollinated by the single cross **(C x D).** Here both the male and female parent plants are vigorous hybrids. The seed quality and production are high, and there is every possible assurance of abundant pollen from the male parent, which is not true when this parent is an inbred strain.

The cross of a commercial variety and an inbred strain has been variously designated as a top cross, inbred-sire cross, and the like. Hybrids between a single cross and a variety also have been called top crosses. In limited experiments, some such crosses have yielded more than ordinary varieties but less than comparable double crosses.

The make-up of double-cross hybrid seed is illustrated in Figures 7 and 8. The four ears labeled **B, A, C,** and **D** (Figure 7) represent the product of inbred parent lines **B, A, C,** and **D.** If these are self-pollinated they will reproduce ears like those shown, year after year. Line **B** even when pollinated with pollen from the plant producing **A,** produces similar ears in that season. But when planted, the seed from these ears produces the single cross **(B x A)**, ears of which are shown immediately below its parents. Similarly the single cross **(C x D)** is produced from seed on ear **C** that resulted from pollination by pollen from plants producing **D** ears. Finally, ears on the **(B x A)** plants, cross pollinated by pollen from **(C x D)** plants, then provide the first generation seed of the double cross **(B x A) x (C x D)**, which is used in growing the ordinary corn crop. The ears produced on the **(C x D)** plants, grown in the "male rows" to furnish pollen in the seed production fields, are used for feed or other commercial use. The ears at the bottom of Figure 7 represent what the farmer gets in his commercial fields.

The situation is confused by the fact that the crossed ears look like the selfed ears but behave differently when planted. It is clearer from Figure 8, which shows the system of crossing, beginning with the inbred plants. Plant **B** is pollinated with pollen

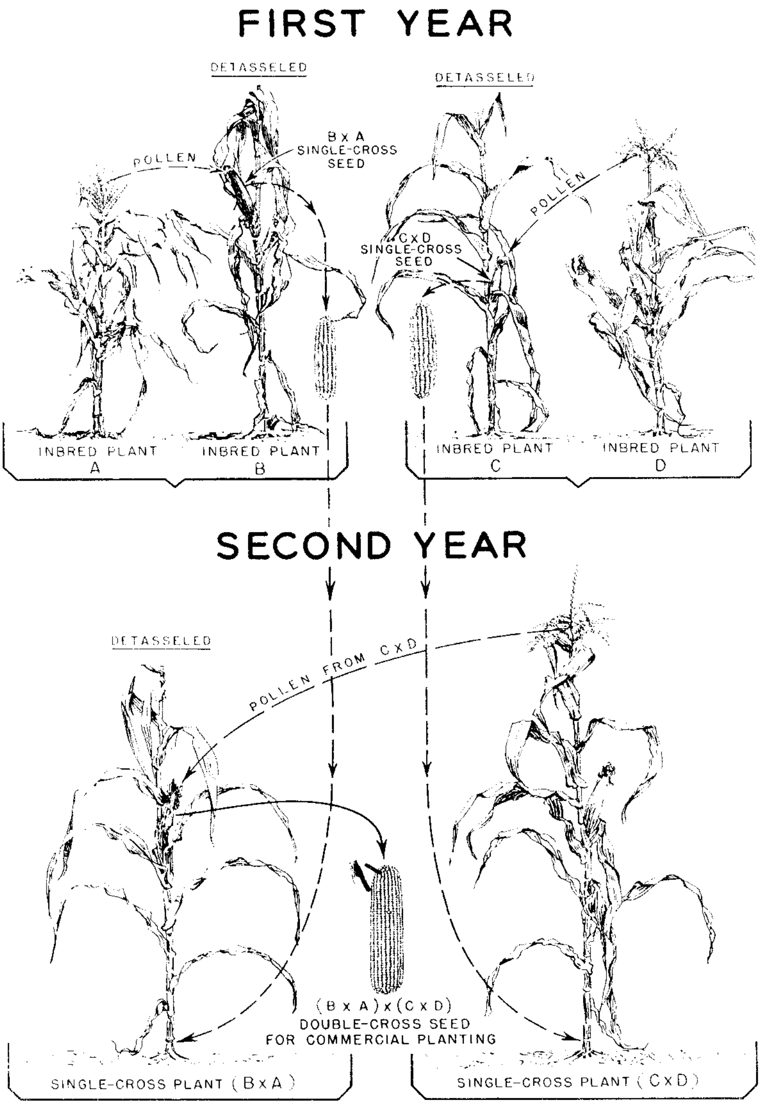

Figure 8.—Diagram of methods of crossing four inbred lines into two single crosses, and of crossing these to produce the double-cross hybrid seed used for commercial planting.

from plant **A**, and plant **C** is pollinated with pollen from Plant **D**. Seed resulting from these cross pollinations produces the single cross plants **(B** x **A)** and **(C** x **D)** shown immediately below the parents. Plant **(B** x **A)** pollinated by plant **(C** x **D)** furnishes the double-cross seed that is planted to produce commercial corn.

Any of the hybrids named can be used for commercial corn production. The single cross has a seed-production disadvantage because of the low yield of seed and its consequent high cost. Moreover, the irregular shape and the generally small size of kernels of present-day field-corn inbreds make the commercial utilization of single crosses impractical. Single crosses produce the most uniform plants and ears of any of the hybrids. They accordingly have special value where uniformity is most important. Thus uniformity is highly desirable in sweet corn for canning, and single crosses between inbred strains are being used commercially to a large extent for this purpose. For field corn, however, three-way and double-cross hybrids will be used unless much better inbred strains are developed than so far have been available.

The three-way cross has no particular advantage over the double cross. It is slightly more uniform but not importantly so. Probably the main reason for the commercial production of three-way crosses in the early days of hybrid corn development was that it was easier to find three reasonably good inbred strains than four. The serious disadvantage of the three-way cross is that an inbred strain must be relied upon to supply pollen for the cross. Unless an inbred that can be counted on for this purpose is available, the three-way cross is impractical. Even a reasonably good pollinating strain requires a somewhat larger proportion of male parent plants with a somewhat higher cost of seed production. For the present and for some time to come, therefore, the double cross seems to be the most practical source for hybrid seed corn.

The only value of top crosses of field corn for commercial use was in the fact that it was easier to find one inbred that combined fairly well with some standard variety than to find three or four inbreds that produced a good three-way or double cross. During the progress of a hybrid breeding program, top crosses provide an efficient means for the preliminary testing of inbred strains for later use.

The user of hybrids need not worry about whether he is getting single-cross, three-way cross, or double-cross hybrid seed, if it is of good quality (quality including size and shape suitable for machine planting) and if it has a definite record of productiveness in his community. The producer of hybrid seed will be governed largely by his individual facilities and the seed stocks that are available to him.

PRODUCING HYBRID SEED CORN

Regardless of what kind of hybrid seed is involved, only the first generation of the hybrid should be sold or used for commercial planting. Only from this generation, that is, the seed that was actually cross-pollinated by an unrelated strain or hybrid, is the full benefit of hybrid vigor obtained. The second generation of any double-cross hybrid, that is, the seed produced by the first generation, may be expected to yield about 10 to 25 percent less than the first generation, the exact decrease depending upon the particular hybrid. It is this fact that necessitates producing the hybrid anew for each season's use.

Hybrid seed is produced commercially by growing rows of the two parents in an isolated field and detasseling the plants of the female parent. In general, a field for this purpose should be not less than 40 to 60 rods from other corn. From two to four rows of the female parent can be planted to every row of male parent. An isolated crossing block with four rows of the female parent (detasseled) to one of the male parent, is shown in Figure 9. If an inbred strain is to furnish pollen, it is safer to plant not more than two rows of the female to one row of the male parent. If a vigorous hybrid is to be the male parent, four rows of the female parent can alternate safely with one row of the pollen parent. As the seed comes only from the female-parent rows, this is a practical reason for using a vigorous hybrid male parent, as in double crossing.

Figure 9.—An isolated field for producing double-cross hybrid seed corn commercially, with four seed rows (detasseled) to one pollinator row.

For commercial hybrid-seed production the primary single crosses also are produced in isolated fields. Here it is customary to use one row of male-parent plants to two rows of seed-parent plants.

Detasseling

During blossoming time the seed field is gone over at regular intervals, and all tassels are pulled from the female-parent plants before they shed pollen. With few exceptions, the tassels emerge enough to be seen before they begin to shed. A quick upward pull at this time takes the tassel out cleanly without damage to the plant. Tassels pulled too early are likely to bring with them too much of the top of the plant. This reduces yield. On the other hand, it is not safe to wait too long before pulling, lest the tassels begin to shed before they are removed. It is necessary, therefore, to go over the field practically every day until detasseling is completed.

A recent development in hybrid corn, however, has been the possibility of producing seed without detasseling. The method is being tested in Tennessee and elsewhere. If it proves practical, as seems likely, it will eliminate a very difficult step in hybrid seed production.

The possibility was created by the discovery of plants that are cytoplasmically male sterile. These plants shed no pollen and transmit this characteristic generation after generation in the cytoplasm in the eggs. The first such corn strain was found by Dr. M. M. Rhoades, of Cornell University, in 1931. Unfortunately, it did not remain sterile under all conditions and could not be utilized.

More recently, other examples have been found. One of these, discovered by corn breeders at the Texas Agricultural Experiment Station, is remarkably stable and provides the possibility of production without detasseling.

Use of the method is relatively easy and simple with some hybrids, more difficult with others, and may be impossible with a few. It already has been tried on small acreages under widely different conditions with unfailing success. Seed produced by this method will be as satisfactory to the farmer-user as seed produced by detasseling, so he need not be concerned; therefore no detailed description of the technique is given here. The method is of interest to the producer of hybrid seed and so is mentioned as a matter of general information as to this new development.

Processing Seed

Hybrid seed is harvested as soon as practical after it is mature. This is necessary in the North to avoid damage from early frosts. In the South it is necessary to prevent excessive damage from ear rots and by insects which otherwise frequently ruin much of the crop for seed. The harvested ears are dried rapidly to a moisture content of about 14 percent by forcing heated air through them. The seed is then shelled, cleaned and graded. It also may be treated with a disinfectant or an insecticide, or both before finally being bagged for market.

In grading, it is usual to discard extra large kernels from the butts of the ears and the very small kernels from the tips. The former are too irregular and the latter frequently too weathered to make good seed. The rest of the seed is then separated into "flats," flat kernels that will pass through a slotted screen, and "rounds" that will not. The flats may be graded into "large," "medium," and "small" flats; and the rounds into "large" and "medium" rounds.

With modern efficient grading, these different grades plant equally well. The larger kernels will plant a somewhat smaller acreage, and therefore are a little more expensive at an equal cost per bushel. It has been proved in repeated experiments that there is no consistent difference in the yielding power of these different grades. In spite of this, there has been a prejudice against the round grades so that they frequently have been sold at a discount below the flat grades. It has even been suggested that the round seed will produce round grains. This is not true: actually, of course, they produce exactly the same kind of corn as do the other grades, and their use provides a desirable way to economize.

This very brief outline of what hybrid corn is and how it is produced gives at least some idea of the time and expense required to produce the bag of hybrid seed which the farmer buys.

HYBRID CORN FOR TENNESSEE

The influence of hybrid seed on corn production in Tennessee is illustrated in Figure 10. This shows the total acreage and total production of corn, and the yield in bushels per acre for the five-year period 1935 to 1939, and for the years 1940-1950, inclusive. The percentage of all the corn acreage planted with hybrid seed for those years also is shown. The total acreage used for corn had

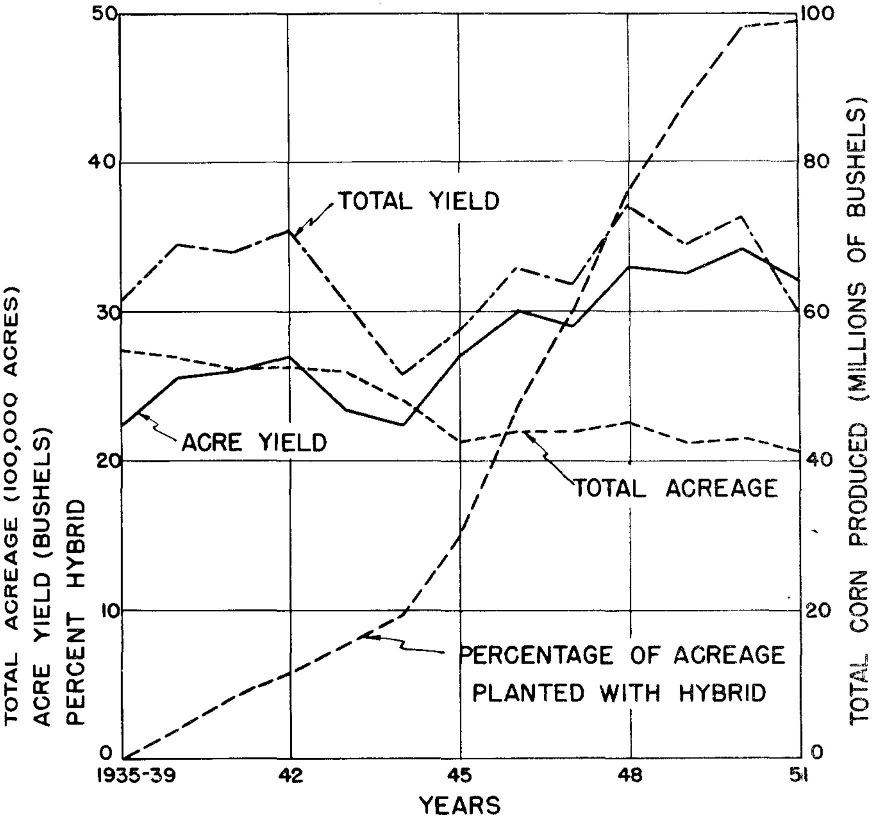

Figure 10.—Production, acreage, percentage of the acreage planted with hybrid seed, and yield of corn per acre in Tennessee for the years stated.

changed little until 1940. Since then, it has decreased approximately from 2.6 million acres to 2.1 million acres, a reduction of 19.2 per cent. During this same period the yield has risen from about 25 bushels to about 35 bushels per acre, an increase of 40 per cent.

This larger yield per acre has increased the total production from about 68 million bushels to 73 million bushels, in spite of the smaller acreage used. Finally, it will be noted that the most rapid increase in yield per acre began in 1945, just as the proportion of hybrid corn was becoming importantly large.

During this period, large acre yields from adapted hybrids developed by the State Agricultural Experiment Stations and the U. S. Department of Agriculture have become commonplace. As examples, acre yields of 227 bushels for Dixie 17; 213, 173, and 164 bushels for Tennessee 10; 153 bushels for Tennessee 602; and 126 bushels for Dixie 44 were made in county tests in Tennessee in 1948. This was all profitable production. Similar record yields were made with these and other adapted hybrids in other Southern States. But the hybrids must be adapted if such yields are to be achieved.

ADAPTATION

Adaptation is just as important for corn hybrids as it was for open-pollinated varieties. The farmers of Wisconsin and Minnesota suffered tremendous losses from immature and rotten corn in the early years of hybrid corn in those States by attempting to grow hybrids that were adapted to central Illinois and Iowa but were too late for Wisconsin and Minnesota.

Similarly, farmers in Tennessee have suffered heavy losses by using hybrids adapted to the Corn Belt. Although good where they belong, these Corn Belt hybrids do not utilize the full southern growing season. Accordingly, they yield less than adapted, longer-season hybrids. Moreover, they often mature so early that considerable damage occurs in the fields before the corn can be put into storage.

Such losses are greater because the husks on Corn Belt hybrids are too short or loose to protect the ears from the depredation of birds and insects. In fact, husk development can be used as an excellent example of what adaptation implies. In the Corn Belt a husk that covers most of the ear is all that is needed for protection. Anything more than that is undesirable: it only adds to the cost of harvest, as it must be removed for safe storage. Beginning about as far south as Tennessee, it is desirable to have a husk that completely covers the ear and thereby protects it from bird and insect damage. Farther south, more husk is needed for protection. Thus, in the area where the black, or rice, weevil is abundant, a husk projecting two to four inches and remaining tightly closed even after full maturity is essential to prevent excessive weevil damage (Figure 11). In Tennessee, however, it is undesirable to have that much husk, since it is more than is needed for protection.

Another element in adaptation is resistance to disease. Some of the diseases that cause serious losses of corn in the South do not occur, or are unimportant, in the Corn Belt. For example, the Physoderma brown spot disease usually does not occur north of Tennessee, but may cause heavy losses in Tennessee in some seasons.

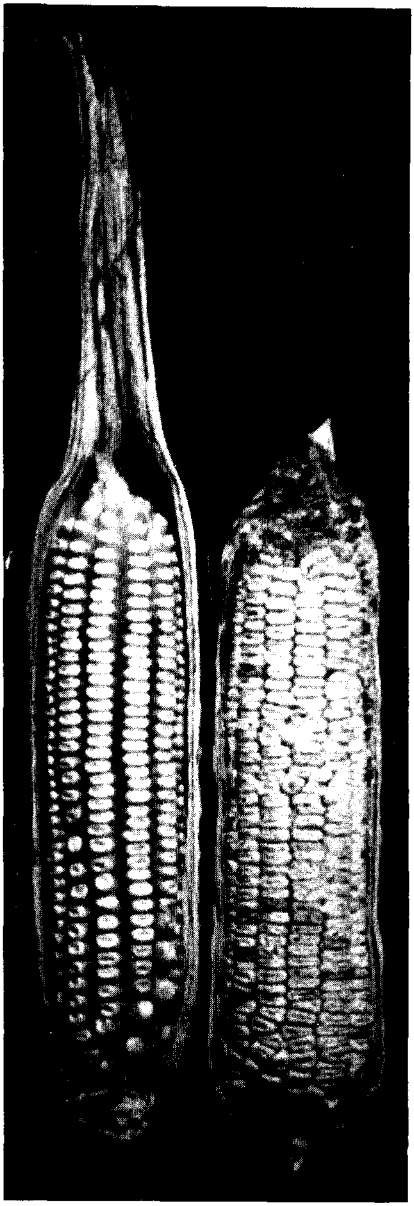

Figure 11.—Long, tight husks as protection against damage to corn by the black weevil. The ear on the right is all but destroyed, while the long husk on the other ear has afforded almost complete protection. (Photograph from Georgia Coastal Plains Experiment Station.)

The importance of utilizing the full available growing season as an element of adaptation and in obtaining satisfactory yields has been mentioned. Another advantage of adapted southern hybrids is their prolificacy. Under favorable conditions they tend to bear two or more ears per plant rather than the one ear that is customary in Corn Belt hybrids. This tendency permits large yields to be made from thinner stands than are needed with single-ear hybrids. At the same time, these thinner stands can tolerate drought, should it occur, with less damage than could thicker stands. How the prolific tendency permits yields of 150 bushels per acre and more from stands of 8,000 to 10,000 plants per acre is shown by the plant illustrated on the front cover page. The four ears from this plant weighed 2.5 pounds as shown in the inset. A stand of 8,000 plants with yields equal to this would provide 20,000 pounds of ear corn, or nearly 300 bushels per acre. All of the plants in a field are not this productive and yields are less than 300 bushels, but the example illustrates well the potential possibilities of prolificacy.

The influence of adaptation or its lack on yield is illustrated in results from the official State Yield tests in Tennessee. Table 1 lists 35 entries that have been tested at six locations in the State for two to five years, and gives the comparable acre yields for those entries. Jellicorse and Neal Paymaster are excellent open-pollinated prolific varieties that have been grown in Tennessee for many years. All other entries are hybrids.

Dixie 33[2], Dixie 17, and Dixie 22 are adapted to a section beginning approximately at the northern edge of Tennessee and extending southward into northern Mississippi, Alabama and Georgia, and into parts of the Piedmont of North and South Carolina. North Carolina 27, Georgia 101, Tennessee 10 and 602, and Kentucky 405 B, etc., are hybrids coming out of the experiment station programs in those States. T0120 and T0114 are new experimental hybrids awaiting release from the Tennessee program. They are listed now only to illustrate that corn breeding at the Tennessee Station has not stopped and that new and better hybrids may be expected from time to time.

TABLE 1. *The average relative acre yields of 35 entries tested for two or more years between 1947 and 1951, inclusive, in the Tennessee State Corn Test*

(Compiled from Tenn. Agri. Exp. Sta. Bulletins 206, 208, 214, 218 and Circular No. 108)

Rank	Designation	Acre Yield	Rank	Designation	Acre Yield
1	*T0120	95.7	19	Ky. 203	72.4
2	Dixie 33	95.0	20	Ky. 103	72.3
3	*T0114	93.3	21	Indiana 750	70.4
4	Georgia 101	92.5	22	Broadbent 235W	70.4
5	Dixie 82	91.2	23	Funk G 94	70.3
6	Dixie 17	90.0	24	DeKalb 898	69.3
7	Tennessee 10	89.0	25	Funk G 145	69.2
8	Dixie 22	85.4	26	Hunerkoch H 14	68.8
9	N. C. 27	84.3	27	Ky. 158	68.6
10	Funk G 711	81.2	28	Funk G 80	68.0
11	Tennessee 602	80.4	29	Missouri 148	67.5
12	Jellicorse	80.4	30	Pfister 170	67.4
13	U. S. 523W	77.5	31	U. S. 13	67.0
14	Neal Paymaster	77.3	32	Hunerkoch H 23	66.8
15	Ky. 405B	77.2	33	Ed J. Funk 840	66.7
16	Ky. 102	74.4	34	National 134	66.1
17	DeKalb 923W	73.8	35	Missouri 313	63.7
18	Dixie 44	73.6			

***New experimental Tennessee hybrids undergoing final testing. Their performance is given here in order to show that new hybrids are being developed and that recommendations may change.**

[2]Dixie hybrids are hybrids approved for one or more sections of the Southeast by a committee of the Experiment Station corn breeders in that region. To be approved for a Dixie number, a new hybrid must be "definitely superior to existing hybrids in the general area of adaptation in one or more characteristics of importance, and must possess no characters which are sufficiently deleterious to make it practically undesirable."

CHOOSING A HYBRID

The yields shown in Table 1 tell their own story of the importance of adaptation. They also point the way clearly to the choosing of a hybrid for growing in Tennessee. Of the 14 higher-yielding entries, 13 are southern full-season prolific hybrids or varieties. U. S. 523W, ranking 13, and the entries ranking 15 to 22 are Kentucky-adapted hybrids, or are white hybrids of the Indiana 750 type. These are somewhat earlier maturing, more nearly single eared, and definitely lower yielding than the standard full-season hybrids recommended for Tennessee.

At the bottom of the list come the typical Corn Belt hybrids. These are earlier maturing than the other two groups, and their yield of 10 to over 20 bushels less per acre is a direct reflection of their failure to utilize the full available growing season.

For the most profitable yields, Tennessee farmers in general should choose among the southern prolific hybrids recommended by the University of Tennessee. These recommendations are based on careful, unbiased experiments and take into account not only yield but quality of the crop and other desirable characteristics.

Too much weight should not be placed on small yield differences in the table in choosing the hybrid to grow. For example, Dixie 33 averaged five bushels more than Dixie 17 in this sample of comparisons, but in other experiments they have yielded about the same, and Dixie 17 might well be better in one year and one location. On the other hand, larger differences such as that of 10 or more bushels between Jellicorse and Neal Paymaster on the one hand, and Tennessee 10, Dixie 17 and Dixie 33 on the other, almost surely reflect true differences in productiveness.

At the higher elevations of extreme Eastern Tennessee, and occasionally elsewhere in the State, it may be necessary to sacrifice something in yield in order to have earlier maturity. Farmers should recognize, however, how much they are losing in yield to gain earliness, and should lose no more than they must to gain the earliness they require. For example, if Dixie 33 is too late maturing for some reason, it would be foolish to plant U. S. 13 and sacrifice some 28 bushels per acre, if U. S. 523W with its yield of only 17 bushels per acre less than Dixie 33 is early enough to meet the needs of the situation. Even earlier hybrids than any listed here are available from Minnesota, Wisconsin, etc. But for each added gain in earliness there will be an added loss in yield. Farmers should realize this and take the loss only when the gain in earliness is important enough to justify it.

Certification

Agencies have been established by law in most of the States with the responsibility of certifying seed which complies with certain requirements. The use of the word "certified" in connection with seed except under the authority of such agency is generally illegal. The official certifying agency in Tennessee is the Tennessee Crop Improvement Association, a non-profit organization which operates in close cooperation with The University of Tennessee.

The availability of Tennessee certified hybrid seed corn provides a source from which farmers can buy with assurance that the hybrid is adapted to Tennessee and that the seed has been produced and handled so as to be a high-quality product. Very briefly, hybrid seed corn to be eligible for certification must be seed of a hybrid recommended by the Tennessee Agricultural Experiment Station and must have been produced and processed under certain requirements as to seed stocks used, isolation, completeness of detasselling, grading and germination. The standards are somewhat alike in the different States, but most States recognize only those hybrids adapted within them. Accordingly, certification by another State indicates adaptation of the hybrid to that State from which can be judged its adaptation to Tennessee.

CULTURE

A discussion of methods of corn cultivation is beyond the scope of this bulletin. It cannot be emphasized too strongly, however, that hybrid corn will not produce satisfactory yields unless the crop is grown on productive soil, suitably fertilized and properly cultivated. There is no magic in hybrid corn: it is just more efficient in utilizing the opportunities provided by the farmer who grows it. But with abundant fertility and adequate cultural methods, the corn hybrids recommended locally by the State Agricultural Experiment Station can continue to increase the acre yield of corn in Tennessee in the future just as they already have in the past.

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