

SWEET-CORN HYBRIDS

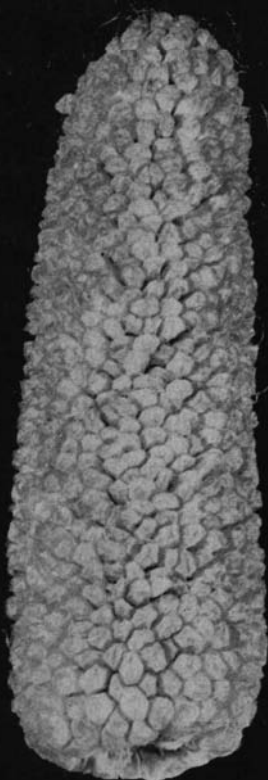
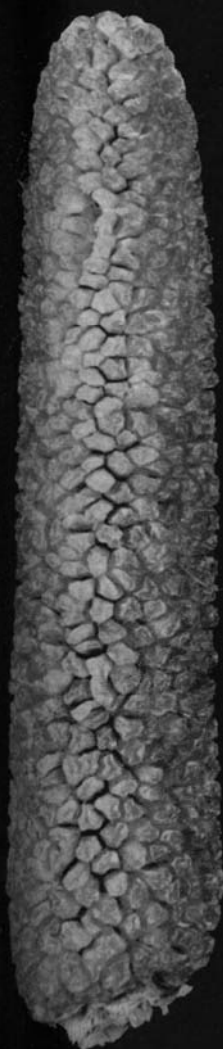
for Canning and Market

Released by the
Illinois Station

By W. A. Huelsen

Circular 504

University of Illinois • College of Agriculture
Agricultural Experiment Station and Extension
Service in Agriculture and Home Economics



Cross 8 x 6

=

Inbred 8

x

Inbred 6

POLICY GOVERNING SEED RELEASES

Seed of the new sweet-corn crosses described in this circular is not available at the Illinois Agricultural Experiment Station either for sale or for free distribution. It is available only from commercial seedsmen who have signed agreements with the Board of Trustees of the University of Illinois to produce the crosses under Station supervision. Inbreds are available only to seedsmen who have the necessary equipment and experience for maintaining them and for properly producing the crosses.

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New Illinois Sweet-Corn Hybrids: Country Gentleman and Narrow Grain Evergreen Varieties

By W. A. HUELSEN, Chief in Olericulture

THE GREAT DEMAND during recent years for better varieties of vegetables—varieties giving higher yields, having better quality, and adapted to such specific uses as shipping, canning, and freezing—has greatly stimulated breeding experiments with vegetables. Of all the vegetable crops, however, sweet corn has undergone the greatest improvement. Not only have practically all the open-pollinated varieties of sweet corn disappeared in favor of hybrids during the last five years, but frequently the hybrids themselves are entirely new types heretofore unknown.

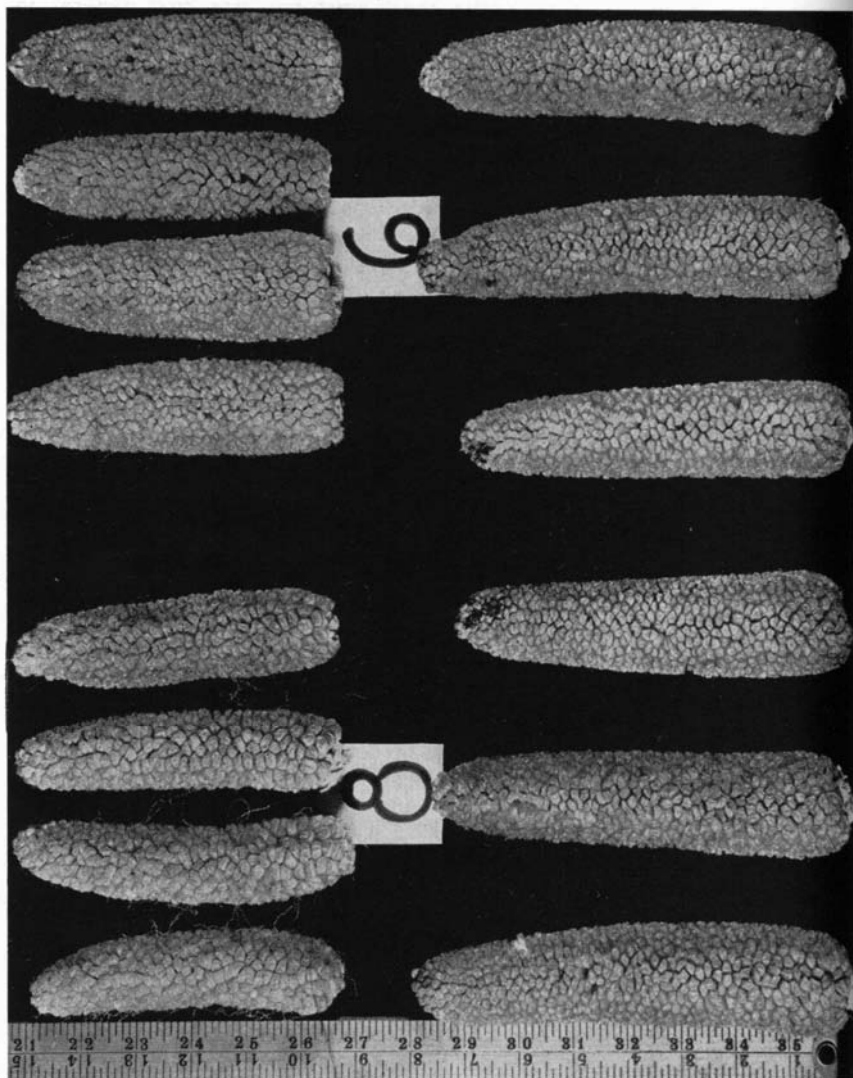
The most striking of the changes that have come about in sweet corn as a result of breeding experiments are in the types that are used primarily for canning. Acre-yields have increased materially, and the recovery secured by canners in terms of number of cans packed per ton of corn purchased has been boosted as much as one-third. And these increases have been accompanied by noticeable improvement in the quality of the canned product. All these changes have resulted in increased consumer demand for sweet corn, for canned corn is not only cheaper than ever before but it is also much better eating.

For the truck grower and shipper, hybrids have meant a much better market because the ears are more uniform in size and appearance and, in addition, the culinary quality is so much improved that consumer demand is better.

The Country Gentleman and Narrow Grain Evergreen hybrids described in this publication are primarily for canning purposes, but in certain sections where there is a market for late white varieties they have come into use by truck growers also.

EIGHTEEN YEARS OF BREEDING

The word "hybrid" is a term very loosely used to denote crosses of various types. The field-corn "hybrids" as purchased by growers usually have three or more inbreds as parents. Such crosses have not, however, proved to be of any practical value in sweet corn. The best



**Fig. 1.—Illinois Country Gentleman Cross 8 x 6 (right),
and Inbreds 8 and 6**

Cross 8 x 6 is in general probably the best of the Country Gentleman hybrids. The quality of the canned corn is excellent and the yields are high. Inbred 8 is used as the seed parent and Inbred 6 as the pollen parent.

sweet-corn hybrids, because the most uniform, are first-generation crosses, called *single crosses*, between two inbred lines. All the crosses discussed herein are single crosses.

Sweet-corn breeding work at the Illinois Station began eighteen years ago (in 1922) by inbreeding the best strains of Country Gentleman and Narrow Grain Evergreen sweet corn then available. Inbreeding consists of covering both silks and tassels with paper sacks and, in its most simple form, transferring the pollen from the tassel of each plant to the silk of the same plant, keeping the silk covered until it dries. In the second generation of inbreeding, the strain begins to show evidence of segregation. Plant selections are then made and carried along separately by continued inbreeding until they become uniform. This requires five to eight generations. Unrelated inbreds are then crossed in pairs and the resulting single crosses tested for yield and quality.

Work of this nature is costly, time consuming, and tedious. None of the parents of the crosses discussed here have been inbred less than fifteen generations. Thousands of inbred selections have been made at Urbana and more than four thousand crosses tested. Nearly all the crosses are defective in one or more characters, and the only way to determine the best ones is by means of painstaking trials. Many crosses from many sources are available to growers, but only a few of them can stand up under the searching requirements of numerous growers all over the country.

CROSSES AVAILABLE THRU SEEDSMEN

The placing of crosses in production is accompanied by numerous chances for error. The responsibility of an experiment station in this respect is to see that the crosses reach the growers free from mixtures and still possessing their original ability for yield and quality. Releasing the sweet-corn inbred parents to whoever will pay the price of the seed has proved to be unsatisfactory because few growers have the facilities for isolation and drying necessary to produce satisfactory crosses.

The method followed by the Illinois Station has been to release the sweet-corn inbreds under contract to seedsmen who make a specialty of sweet corn, employ trained breeders, and have the necessary drying equipment. These seedsmen are then supervised by Station representatives over a three-year period.

Since most of the sweet-corn seed is now produced in Idaho under almost ideal conditions, numerous problems have arisen that have to

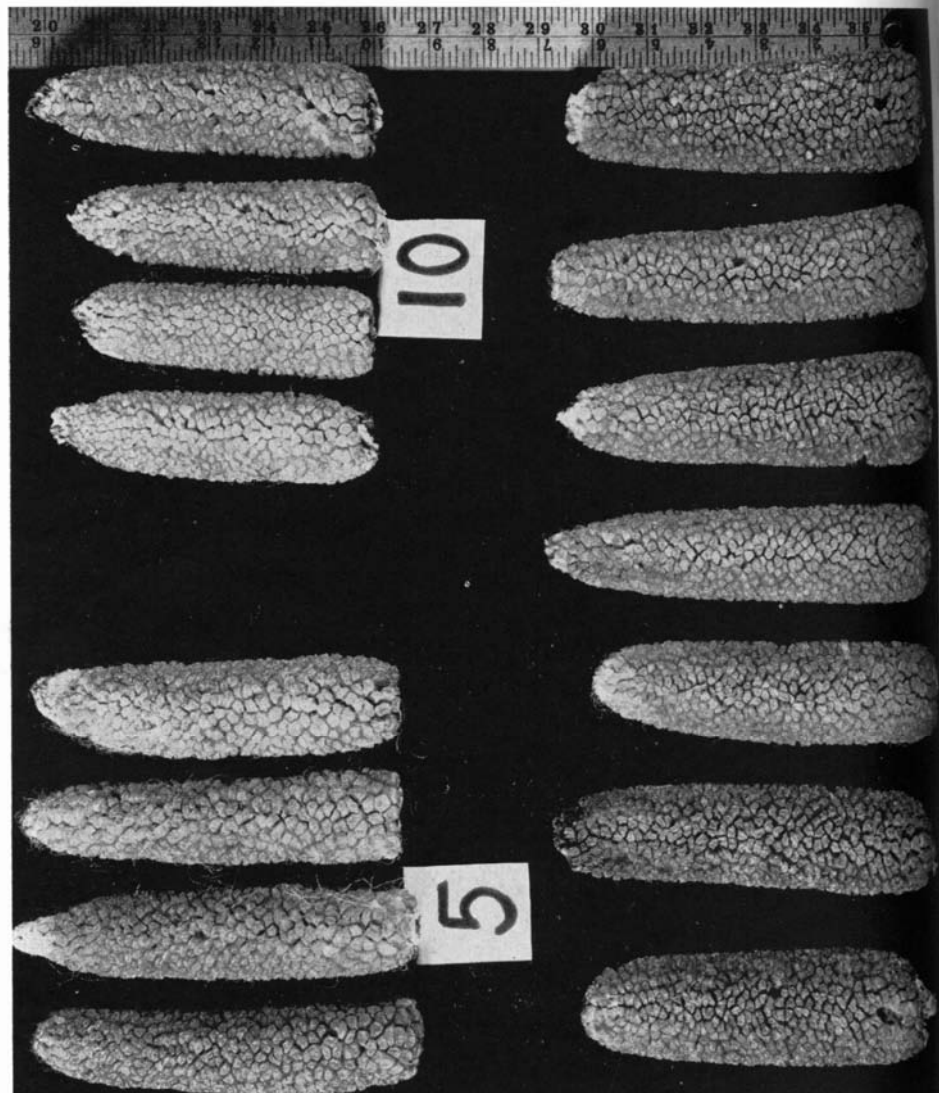


Fig. 2.—Illinois Country Gentleman Cross 5 x 10 (right),
and Inbreds 5 and 10

Cross 5 x 10 is one of the two most popular of the Country Gentleman hybrids in Illinois. Inbred 5 was the seed parent and Inbred 10 the pollen parent.

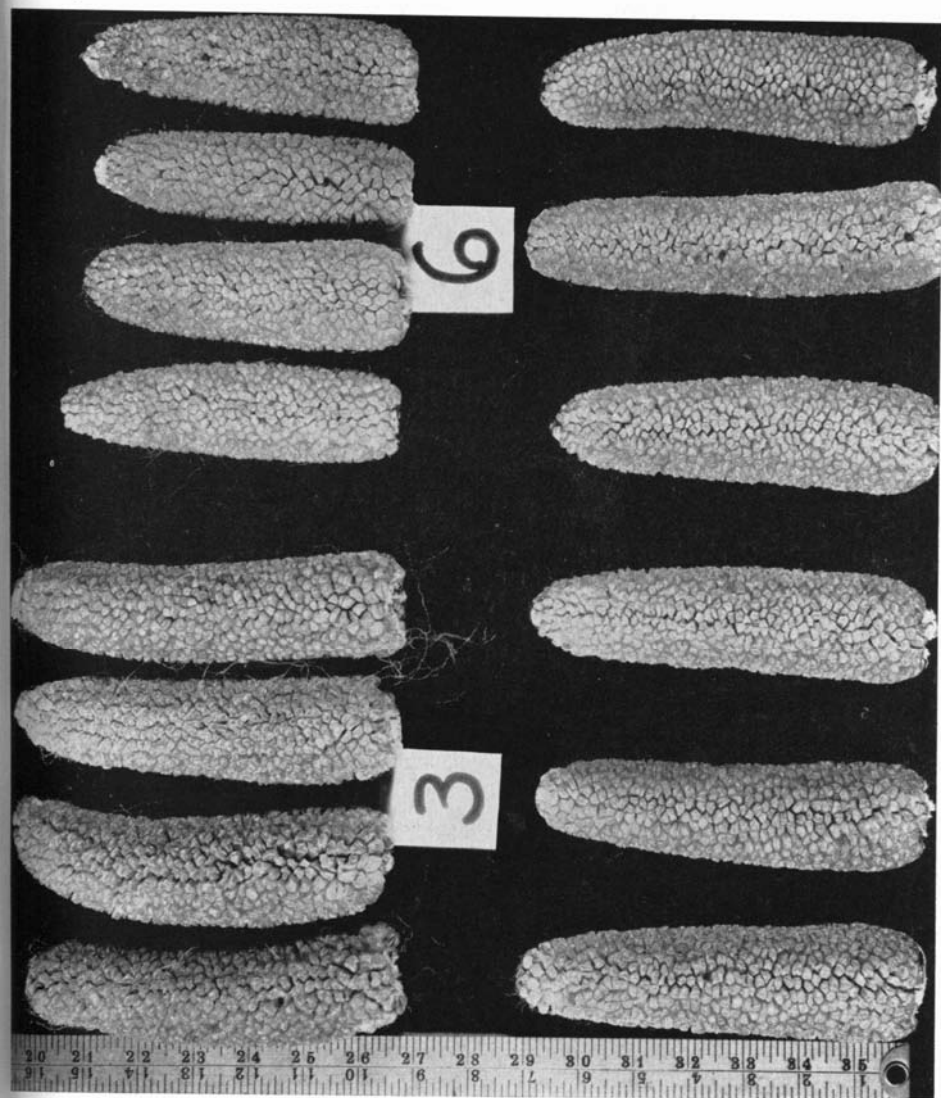


Fig. 3.—Illinois Country Gentleman Cross 3 x 6 (right),
and Inbreds 3 and 6

Inbred 3 was the seed parent and Inbred 6 the pollen parent. Cross 3 x 6 is not extensively grown in Illinois but is popular in some other states.

do with the effects of differences in climate on the inbreds and crosses. With accumulating experience in the management of inbreds and crosses since the first of the inbreds were released in 1935, however, capable seedsmen have been able to avoid such of these effects as lead to contaminating the parent lines both in maintaining them and in producing the crosses from them. Reliable seed of the best of the sweet-corn crosses developed at the Illinois Station is now available to growers thru leading seed houses.

PERFORMANCE OF COUNTRY GENTLEMAN CROSSES

Since the first release of the Country Gentleman inbreds, many thousands of acres of the crosses have been grown all over the United States. Crosses 8 x 6 and 5 x 10 are the most popular and widely used Country Gentleman crosses available at present. Their performance is well known thru canners' tests and experiences and a considerable number of experiment-station trials in nearly all of the sweet-corn-canning states.

Crosses 8 x 6 and 5 x 10 have also been tested over a nine-year period at Urbana, Cross 8 x 6 having been crossed first in 1928. Since commercial tests are of most interest to the grower, the data from a typical trial out of many hundreds is given in Table 1. This test was conducted by a central Illinois canner in 1938 and 1939, under the supervision of J. B. Corns of the Extension Service.

Superiority over open-pollinated strain. The yields reported in Table 1 show how Country Gentleman crosses perform under what may be termed average conditions. These crosses matured slightly earlier, in general, than the open-pollinated Country Gentleman. They produced slightly to moderately more unhusked ears than the open-pollinated strain, but a lower ratio of waste (husks, immature ears, and culls). Consequently, even the lowest-yielding cross produced higher acre-yields of prime husked ears than the open-pollinated check. On the basis of prime cut kernels, the best cross in 1938 produced more than twice as much per acre and the poorest cross about 50 percent more than the open-pollinated check. In 1939 the differences were similar but not quite so large.

Five crosses recommended. Among the crosses themselves there are great differences in yield performance. Some produce relatively large tonnages of unhusked ears, but usually such crosses give a low recovery of cut kernels because most of the additional weight is made up of waste—husks and cobs. Such crosses are not popular for canning

TABLE 1.—ILLINOIS COUNTRY GENTLEMAN CROSSES: YIELD TESTS ON ONE-ACRE PLOTS OF AVERAGE FERTILITY, 1938 AND 1939

(Tests conducted by a central Illinois canner under the guidance of J. B. Corns, Assistant Professor, Vegetable Crops Extension, University of Illinois.)

Cross	Stand	Number of days from planting to harvest	Yield per acre			From 100-pound sample of unhusked ears			Prime cut kernels per ton of unhusked ears
			Unhusked ears	Prime husked ears	Prime cut kernels	Prime husked ears	Immature and cull ears	Husks	
1938 test									
	<i>perct.</i>		<i>tons</i>	<i>tons</i>	<i>lb.</i>	<i>lb.</i>	<i>lb.</i>	<i>lb.</i>	<i>lb.</i>
8 x 6	81	89	2.005	1.343	1416	67	1	32	706
8 x 3	93	91	2.070	1.387	1449	67	1.5	31.5	700
5 x 10	87	90	1.855	1.233	1113	66.5	4.5	29	600
3 x 6	85	90	2.055	1.171	1007	57.5	9	33.5	490
5 x 6	85	90	2.060	1.112	948	54	9	37	460
Open-pollinated check..	89	91	1.850	.999	666	54	10	36	360
1939 test									
8 x 6	93	87	2.515	1.647	1635	65.5	7	27.5	800
8 x 3	97	89	2.680	1.635	1474	61	6	33	661
5 x 10	98	89	3.265	1.877	1698	57.5	10	32.5	640
3 x 6	95	89	2.580	1.587	1574	61.5	7.5	31	751
5 x 6	95	89	2.935	1.688	1702	57.5	10	32.5	714
Open-pollinated check..	98	91	2.355	1.272	1012	54	10	36	529

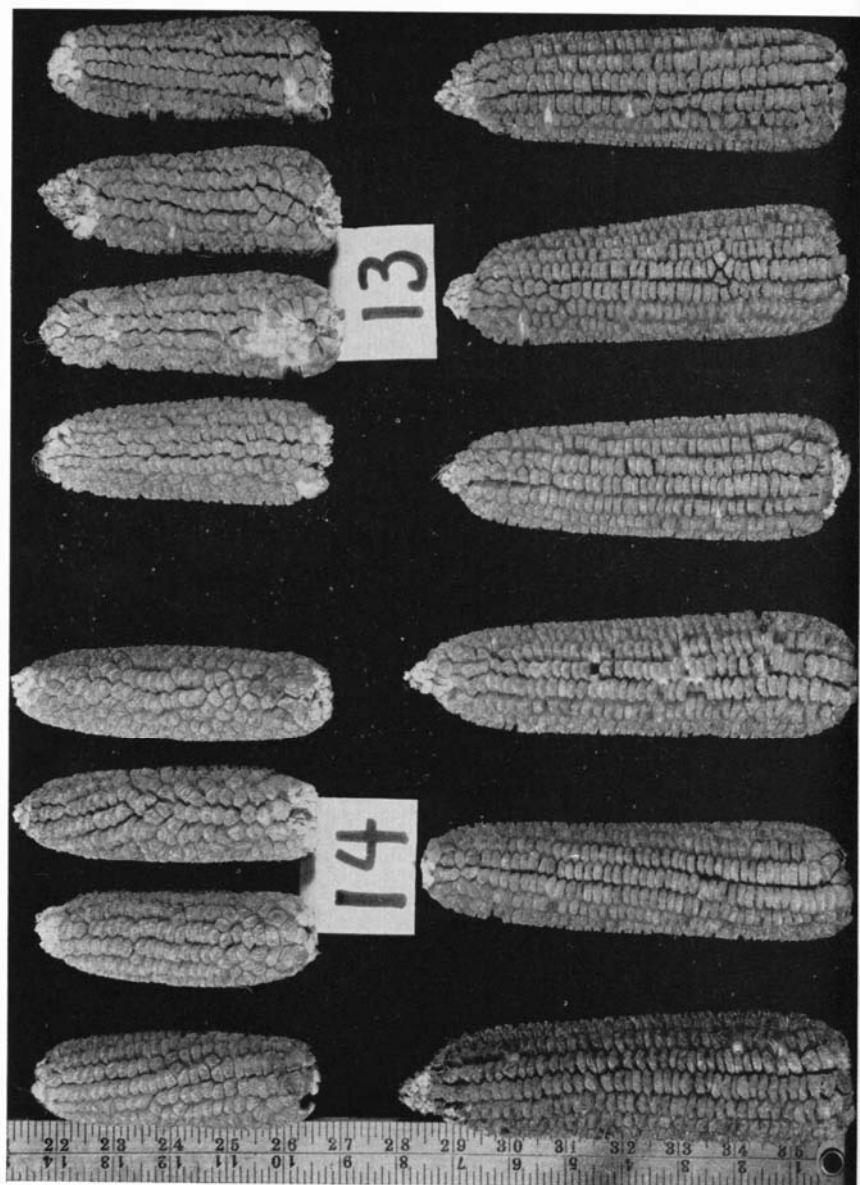


Fig. 4.—Illinois Narrow Grain Evergreen Cross 14 x 13 (right),
and Inbreds 14 and 13

Cross 14 x 13 is widely adaptable, has been in commercial production since 1936, and is suitable either for canning or for the fresh-vegetable market. Inbred 14 is the seed parent and Inbred 13 the pollen parent.

inasmuch as a high yield of edible kernels with as little waste as possible is important in keeping down canning costs. Even superior crosses such as those in Table 1, however, show considerable differences. In recovery of prime cut kernels per ton of unhusked ears Cross 8 x 6 was highest both years, but some of the other crosses were not far behind.

The conclusion should not be drawn that the cross having the highest recovery of cut kernels is necessarily the best. Crosses having a much higher recovery than Cross 8 x 6 have been bred at the Illinois Station, but extremes seldom prove to be practical. Experience has shown that no one cross can meet all conditions, and that there is a place for each of the five crosses listed in Table 1.

PERFORMANCE OF NARROW GRAIN EVERGREEN CROSSES

Narrow Grain Evergreen sweet corn is no longer as popular a variety as formerly, tho there are indications that some of its popularity may be regained. For a long time this variety and Stowell's Evergreen were the stand-bys of canners who produced a standard grade (Grade C) of canned corn, but during recent years the market for standard-grade corn has become more restricted as a result of the materially reduced spread between the prices of standard and of fancy grades. Since the Narrow Grain Evergreen crosses of superior quality have become available, however, there has been renewed interest in this type of corn because a pack can be put up which is definitely of fancy quality and, when canned whole-kernel style, is superior to Country Gentleman corn in the opinion of many persons in the canning trade.

The long popularity of Narrow Grain Evergreen has been due partly to the ease with which it is raised. It is not nearly so exacting in its requirements as Country Gentleman, and has a much wider range of adaptability. It is popular with growers of late market corn because the ears are among the largest available and yields are relatively high.

Superiority over open-pollinated strain. A summary of a two-year yield test conducted at Urbana is given in Table 2. No commercial test in which all six of the Narrow Grain Evergreen crosses were included was available. Of the six crosses tested all yielded substantially more than the highly selected Station strain of open-pollinated Narrow Grain Evergreen. As was true of the Country Gentleman hybrids (Table 1), the differences in weights of unhusked ears were relatively small compared with the differences in weights of husked



Fig. 5.—Illinois Narrow Grain Evergreen Cross
11 x 13, and Inbreds 11 and 13

Tho Cross 11 x 13 was released only in 1939 and its performance has consequently not been widely tested, it will probably prove to be as widely adaptable as Cross 14 x 13, both for canning and for market. Inbred 13 will probably be used as the seed parent and Inbred 11 as the pollen parent.

TABLE 2.—NARROW GRAIN EVERGREEN CROSSES: YIELD TESTS AT URBANA, 1937 AND 1938
(Yields expressed as percentages of increase over yields of open-pollinated checks,^a on weight basis.)

Cross	Number of trials averaged	Weight of unhusked ears			Weight of prime husked ears			Weight of prime cut kernels
		Total usable	Per ear	Total culls	Total usable	Per ear	Total culls	
1937 test								
14 x 13.....	6	24.6	18.4	34.3	32.3	19.6	-56.0	37.2
11 x 13.....	3	23.3	2.0	-28.5	42.2	19.5	-19.6	50.2
11 x 14.....	3	19.0	9.1	14.3	33.6	11.3	6.8	48.2
11 x 55.....	3	10.3	-3.7	-15.2	30.7	2.2	0	106.3
14 x 6 ^b	14	12.7	-1.0	-14.9	25.5	8.6	-3.2	31.5
14 x 10 ^b	5	2.1	4.5	-7.7	11.1	11.1	-56.9	19.0
1938 test								
14 x 13.....	12	34.7	10.2	10.0	46.8	15.6	9.8	57.5
11 x 13.....	6	16.2	7.5	10.6	37.3	11.7	-64.5	46.3
11 x 14.....	6	14.6	7.4	-8.6	39.2	21.6	-26.0	38.8
11 x 55.....	3	18.8	-.2	-12.6	30.8	6.0	-17.3	32.2
14 x 6 ^b	5	10.2	10.2	28.3	21.8	12.9	-38.0	37.3
14 x 10 ^b	5	-8.7	6.5	-52.6	57.7	9.2	-77.4	63.3

^aThe Station strain of Narrow Grain Evergreen was used as a check. Checks were paired with the crosses, so that there was a check for each trial made.

^bCombination crosses between Narrow Grain Evergreen lines and the Country Gentleman Inbreds 6 and 10.

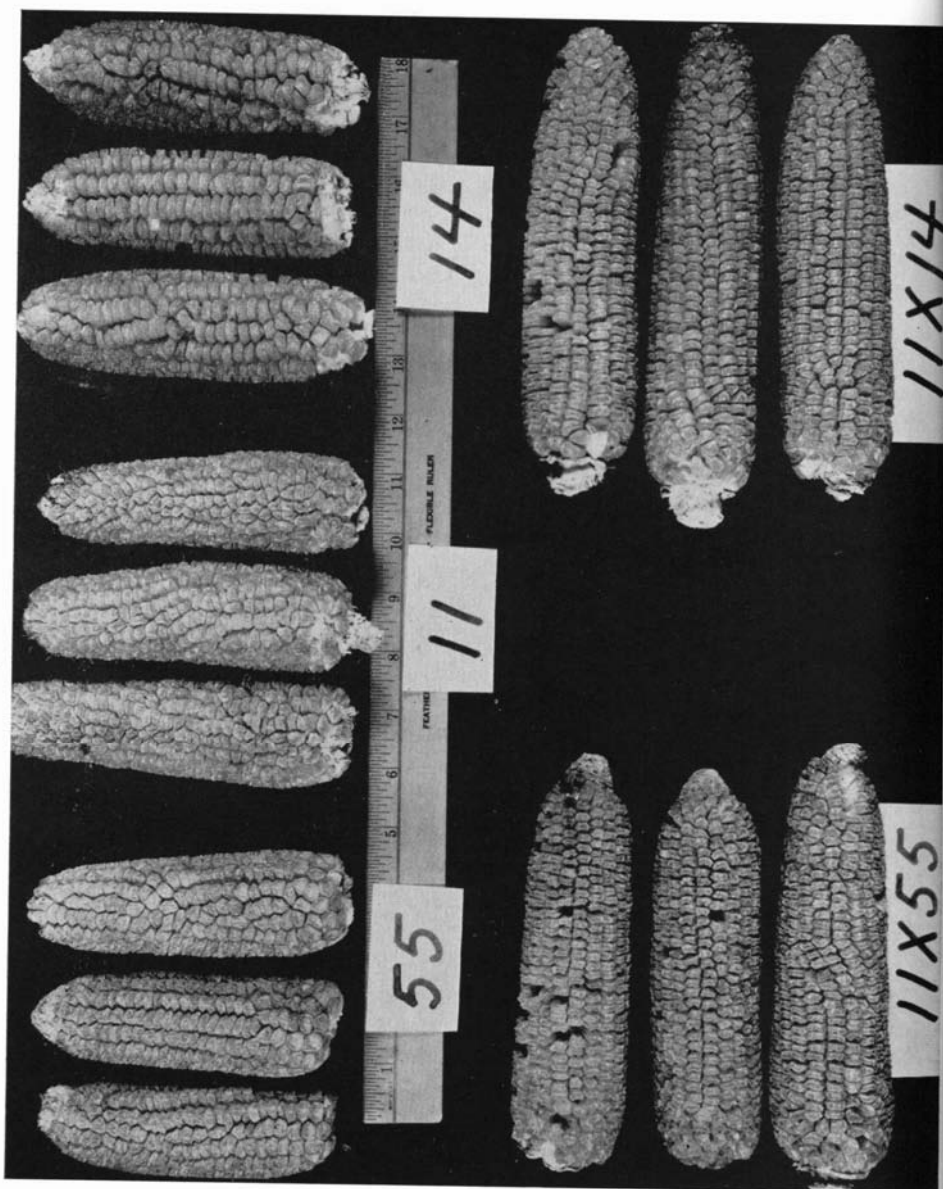


Fig. 6.—Illinois Narrow Grain Evergreen Crosses 11 x 55 and 11 x 14, and Inbreds 11, 55, and 14

These crosses, like Cross 11 x 13, were released in 1939 and have not been widely tested in commercial production. They promise, however, to be as widely adaptable as Cross 14 x 13. Inbred 11 will probably be used as the pollen parent in both crosses.

ears and of cut kernels. Similarly, the differences in weight per unhusked ear were small in comparison with the differences in weights of husked ears. There is no question whatever about the superiority of even the poorest of the crosses over the open-pollinated strain.

Six crosses recommended. The results listed in Table 2 do not indicate which of the crosses is the best in the group. According to these and other tests one cross is better than the others under some conditions, but under other conditions a different cross gives better results. For example, on the basis of yield of cut kernels (Table 2), Cross 14 x 10 gave the smallest increase in yield over the open-pollinated strain in 1937 but in 1938 it gave the largest increase.

All six crosses listed in Table 2 have been carefully selected from a large number and all have their places. The descriptions of the crosses in Table 4 will enable the reader to select the cross most suitable for his purposes. All the crosses are suitable for canning, the choice depending mostly on row number and kernel type. For market purposes only the four straight Narrow Grain Evergreen crosses are recommended. Crosses 14 x 13, 11 x 13, and 11 x 14 are probably the best because they have the largest unhusked ears (Table 2).

WHERE THE CROSSES MAY BE GROWN

Country Gentleman. Crosses 8 x 6 and 5 x 10 have been extensively grown for a number of years and are known to be adapted to the same range as open-pollinated Country Gentleman strains. The best sections in which to grow Country Gentleman are Illinois, Indiana, Ohio, Maryland, and some parts of Iowa. In New York, Wisconsin, and southern Minnesota, the crosses have not performed especially well, but these states are also outside the best territory for open-pollinated strains of Country Gentleman.

Cross 3 x 6 is produced to a more limited extent than 8 x 6 and 5 x 10 but is popular with some canners in Iowa, Indiana, and Ohio. It is not very often grown in Illinois.

Other crosses in more or less limited use are 5 x 6 and 8 x 3.

Narrow Grain Evergreen. Cross 14 x 13 has been in commercial production since 1936, and much more is known about it, therefore, than about Crosses 11 x 13, 11 x 14, and 11 x 55, all of which were first released in 1939. Cross 14 x 13 may be grown wherever open-pollinated Narrow Grain Evergreen strains succeed. Excellent results have been obtained from it in Iowa, Nebraska, Illinois, Indiana, Ohio, Maryland, Idaho, and parts of California, Oregon, and Washington.

Crosses 11 x 13, 11 x 14, and 11 x 55 have been tested to a more

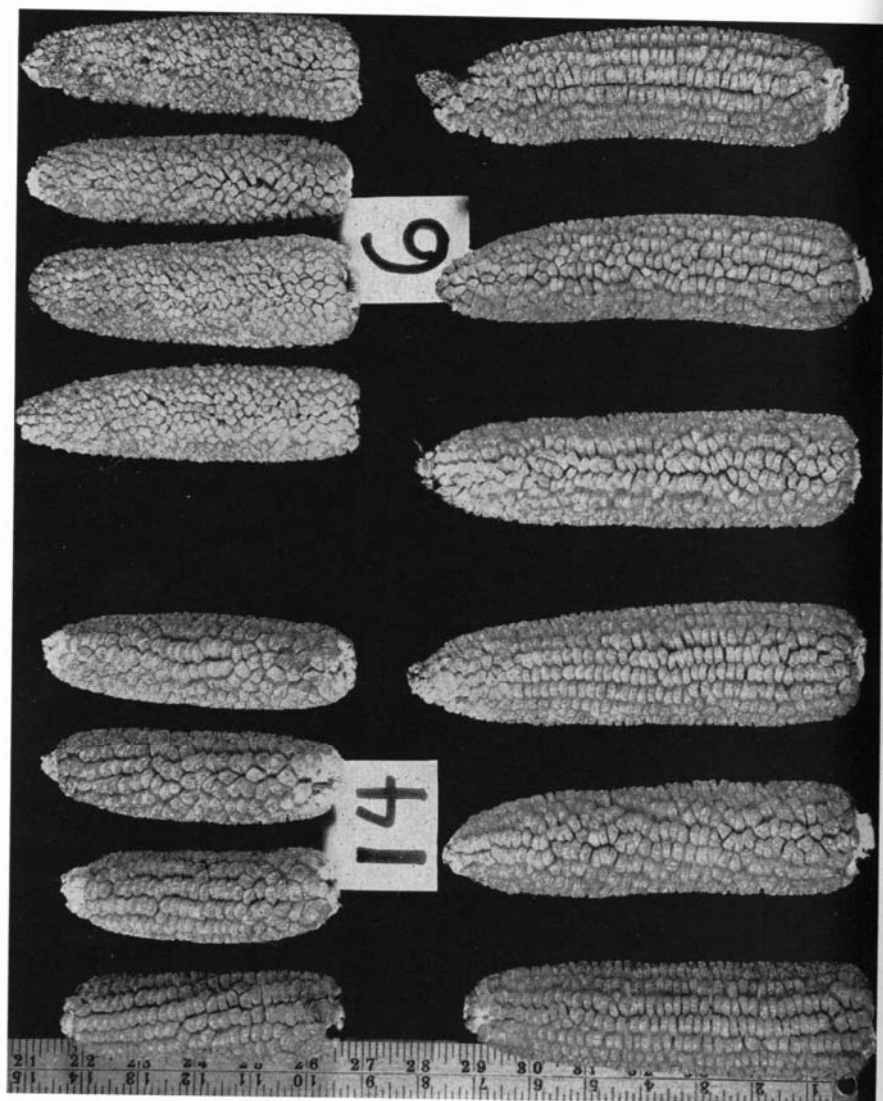


Fig. 7.—Cross 14 x 6 (right), and Inbreds 14 and 6

This cross between the Narrow Grain Evergreen Inbred 14 as the seed parent and Country Gentleman Inbred 6 as the pollen parent introduces a better canning quality than is obtained from crossing two Narrow Grain Evergreen Inbreds. Cross 14 x 6 is more suitable for canning than for the fresh-vegetable market.



Fig. 8.—Cross 14 x 10 (right), and Inbreds 14 and 10

This cross between a Narrow Grain Evergreen inbred and a Country Gentleman inbred is very similar to Cross 14 x 6. Neither of these crosses between two varieties is widely used. Inbred 14 is the seed parent and Inbred 10 the pollen parent.

limited extent.^a In 1939 tests they were successful in Illinois, Indiana, and Minnesota. In view of this range, it is probable that these three crosses will prove to be as widely adaptable as Cross 14 x 13.

Combination crosses. Crosses between Narrow Grain Evergreen and Country Gentleman inbreds are being made to a limited extent. These crosses are usually between Narrow Grain Evergreen Inbred 14 and Country Gentleman Inbred 6 or 10. The resulting two crosses, Crosses 14 x 6 and 14 x 10, usually yield just as well as the straight Narrow Grain Evergreen crosses, and usually have somewhat better quality when canned, but they do not have as good quality as Country Gentleman and cannot be so classed. The yield performance of Crosses 14 x 6 and 14 x 10 is shown in Table 2.

DESCRIPTIONS OF THE CROSSES

Since lengthy descriptions are of little value in visualizing crosses, the main characters are summarized and listed in Tables 3 and 4 so that the differences between the crosses can be readily seen. The crosses are very similar in many respects; and this similarity is according to plan because wide departures from an ideal type of the variety do not prove to be desirable or popular. For instance, the differences in plant type in Country Gentleman crosses are relatively slight, with the exception of Crosses 8 x 6 and 8 x 3 (3 x 8). In Narrow Grain Evergreen the differences are mainly in height. Suckers and lodging have been held to a minimum. The best tassels possible have been bred in all the crosses, but Crosses 8 x 6, 14 x 13, and 11 x 13 are a little more outstanding than the others in tassel quality.

With respect to ear type, Cross 8 x 6 is the outstanding cross in the Country Gentleman group. Cross 8 x 3 and its reciprocal Cross 3 x 8 have the poorest type of ear in the group. However, ear type has nothing to do with appearance of the corn in the can, which after all is the main objective. Kernel type in the Country Gentleman crosses varies but little, Cross 8 x 3 (3 x 8) having the largest kernel. All five Country Gentleman crosses are being canned commercially, and the quality is superior to open-pollinated Country Gentleman strains.

Ear and kernel type in the Narrow Grain Evergreen crosses vary much more than in Country Gentleman crosses, but there is surprisingly little difference in appearance and quality after they are canned.

^aSome seedsmen, instead of producing these three crosses, will probably produce and market their reciprocals (Crosses 13 x 11, 14 x 11, and 55 x 11), because by so doing they can reduce the production costs. By using Inbred 11, which is common to all three crosses, as the male rather than the female parent, only one isolation plot instead of three would be needed.

TABLE 3.—COUNTRY GENTLEMAN CROSSES: PRINCIPAL CHARACTERS

Descriptive character	Cross 8 x 6 (Fig. 1)	Cross 5 x 10 (Fig. 2)	Cross 5 x 6	Cross 3 x 6 (Fig. 3)	Cross 8 x 3, or 3 x 8
<i>Plants</i>					
Height.....	7-8 feet	8 feet	7 feet	7-8 feet	7-8 feet
Suckers.....	Few	Few	Few	Few	Some
Lodging.....	None	Very little	Very little	Very little	Little
Tassels.....	Excellent	Good	Good	Good	Excellent
Tassel burning.....	None	Rare	Rare	Rare	None
<i>Ears</i>					
Husk coverage.....	Good	Good	Good	Good	Good
Number of ears per stalk.....	1-2	1-2	1-2	1-2	1-2
Length.....	Long	Long	Long	Long	Long
Shape.....	Slightly tapering	Cylindrical	Cylindrical	Cylindrical	Tapering
Type.....	Excellent	Good	Excellent	Excellent	Fair
Cobs, size.....	Small	Medium	Small	Small	Medium large
<i>Kernels</i>					
Length.....	Long	Long	Long	Long	Long
Width.....	Very slender	Slender	Slender	Slender	Medium
<i>Quality of canned corn.....</i>					
	Excellent	Excellent	Excellent	Good	Good
<i>Miscellaneous</i>					
Fodder yields.....	Fair	High	Good	Good	Fair
Peculiarities.....	Droopy tassels	Droopy tassels

TABLE 4.—NARROW GRAIN EVERGREEN CROSSES: PRINCIPAL CHARACTERS

Descriptive character	Cross 14 x 13 (Fig. 4)	Cross 11 x 13 (Fig. 5)	Cross 11 x 14 (Fig. 6)	Cross 11 x 55 (Fig. 6)	Cross 14 x 6 ^a (Fig. 7)	Cross 14 x 10 ^a (Fig. 8)
<i>Plants</i>						
Height.....	7-8 feet	7-9 feet	8-9 feet	7-8 feet	7 feet	7 feet
Suckers.....	Very few	Few	Few	Few	Very few	Very few
Lodging.....	Very little	Very little	Very little	Very little	Very little	Very little
Tassels.....	Excellent	Excellent	Good	Excellent	Good	Good
Tassel burning.....	None	None	Rare	Rare	Rare	Rare
<i>Ears</i>						
Husk coverage.....	Good	Good	Good	Good	Good	Good
Number per stalk.....	1-2	1-2	1-2	1-2	1	1
Length.....	Long	Very long	Long	Long	Long	Long
Shape.....	Slightly tapering	Tapering	Cylindrical	Cylindrical	Cylindrical	Cylindrical
Number of rows.....	16-18	18-20	16-20	18-22	16-18	16-18
Type of rowing.....	Straight	Straight	Straight	Straight	Irregular	Irregular
Size of cobs.....	Medium	Medium	Medium	Medium	Medium	Medium
Type of ear.....	Excellent	Excellent	Excellent	Excellent	Good	Good
<i>Kernels</i>						
Length.....	Long	Long	Long	Long	Medium	Medium
Width.....	Medium	Slender	Slender	Slender	Medium	Medium
<i>Quality of canned corn</i>	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
<i>Miscellaneous</i>						
Fodder yields.....	High	High	High	High	Good	Good
Use.....	Canning or market	Canning or market	Canning or market	Canning or market	Canning	Canning

^aCombination cross between Narrow Grain Evergreen and Country Gentleman inbreds.