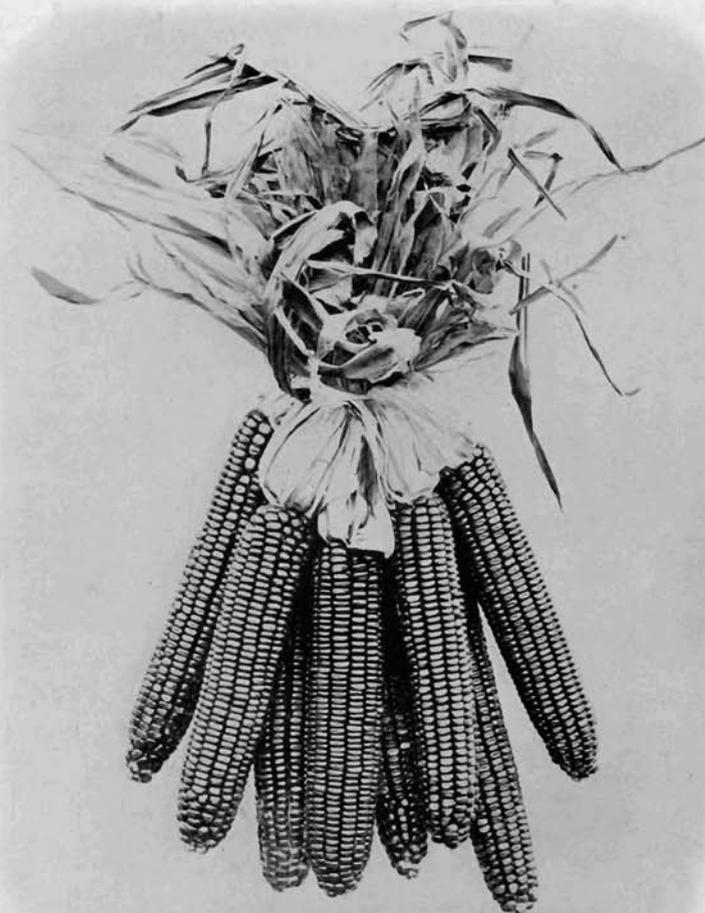


Connecticut Agricultural Experiment Station

New Haven

Canada-Leaming Corn



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Donald F. Jones
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CANADA-LEAMING CORN

As the result of many years of study of the effects of inbreeding and crossing upon corn the Connecticut Agricultural Experiment Station, at New Haven, produced a new type of corn called Double Crossed Burr-Leaming and first sent it out for trial in 1917. The history and development of this corn is given in the Connecticut Agricultural College Extension Bulletin No. 108. Burr-Leaming has been grown in an increasing amount since its first introduction and is well adapted to many parts of southern New England for grain and silage.

There are many parts of northern New England where Burr-Leaming and other varieties of a similar season will not mature properly for silage. To meet the need for a variety of corn which has a large stalk growth and heavy grain yield and which at the same time ripens sufficiently early to give a good quality of silage in short seasons, the Connecticut Agricultural Experiment Station has produced a new type of crossed corn called Canada-Leaming. This has been tested three years, 1927, 1928 and 1929. Farmers find it to be early maturing and high yielding.

A NEW TYPE OF CORN

Canada-Leaming is an entirely new type of corn, being a first generation hybrid of selected inbred strains of Canada Yellow flint and Leaming dent. It has long been known that crossing in both animals and plants gives an immediate stimulus to increased growth and greater yield in the first generation following the cross. This tendency to augment production is commonly called hybrid vigor. It has long been utilized in the mule, the sterile hybrid of the horse and the ass. Shorthorn-Angus and Shorthorn-Galloway crosses in cattle, Poland China-Chester White and Berkshire-Yorkshire crossbreds in swine and Shropshire-Merino combinations in sheep have been valued for many years and are becoming increasingly important. In all of these animals no attempt is made to use the crossbreds for breeding purposes. Animal husbandry-men have learned by long experience that these hybrids do not reproduce their own good qualities in their offspring. While the first cross is uniform in type, large, free from disease and fast growing, the second and later generations are variable, smaller, and often feeble and sometimes abnormal.

It has been demonstrated that this same principle of hybrid vigor which has long been used in animals can be applied to plants and particularly to corn. Plants have the added advantage that they can be put through a previous process of severe inbreeding

which rids them of many abnormalities and hereditary weaknesses that make their appearance from time to time in barren plants, nubbin ears and stunted stalks.

QUALITIES OF FLINT AND DENT CORN

The eight-rowed flint corn now grown in New England is about the only type of this plant, still extensively used, that has come down from the Indians practically unchanged. It is raised in preference to dent corn where the growing season is short, where



FIG. 1. Canada-Leaming has the earliness of the flints and yields as much grain as many of the dents.

the spring is cold and wet, and where many of the days in mid-summer are cool. Under these conditions flint corn germinates better in early spring, starts with a more vigorous growth that gets ahead of the weeds and ripens into good sound grain before killing frosts come in the fall.

Dent corn is preferred wherever it can be properly matured on account of its large straight stalk that is free from tillers and its heavier production of grain where the growing season is long enough and sufficiently warm to permit its full development.

A first generation hybrid of the best of the New England flints with a suitable type of large, early-maturing dent corn, combining

many of the desirable features of both types with the advantage of hybrid vigor, would have value for New England conditions and other places having a similar season.

ORIGIN OF CANADA-LEAMING

An extensive corn variety test carried out by the Connecticut experiment stations at Storrs and at New Haven, reported in Bulletin 259 of the latter station, had shown many varieties of flint and dent corn to be well adapted to this part of the country. A Canada Yellow flint grown by E. E. Burwell of New Haven was selected as one of the best of the flints. Leaming grown for 20 years by Heman Beardsley at Roxbury, Connecticut was selected as a large, productive, dent corn that matured every year.

These two varieties were put through a process of inbreeding by self fertilization as described in Bulletins 266 and 273. Sixteen of the best of the inbred flint strains were selected for crossing. The strains were first crossed by pairs. Each of these first generation hybrids was then cross-pollinated by each of the others and the resulting seed mixed and planted in an isolated field. Selected ears from this mixture have been used to propagate the parental types from year to year. The original inbred strains were produced by hand pollination but this is now no longer necessary in multiplying seed.

A similar combination of the best inbred strains of Beardsley's Leaming was made in the same way. Both of these re-synthesized varieties are about the same in general appearance as the original varieties but yield somewhat more and are freer from hereditary defects and abnormalities.

PRODUCING CROSSED SEED

The Canada Yellow flint stock, produced in this way, is used as the seed parent while the Leaming stock produces the pollen. In practice, two rows of the flint are planted with one row of the dent alternating throughout the field. Both kinds of seed are planted at the same time. The tassels on the flint plants are all pulled out before pollen is shed. This very important task is somewhat tedious, but it is the only way that crossed seed corn can be produced at present. When the silks appear on the detasseled plants, pollen has just begun to be shed by the dent pollen parent, planted solely for that purpose in every third row.

Care is necessary in planting to make sure that the pollinator plants are properly distributed throughout the field. It is also essential that they produce pollen at exactly the right time. Furthermore, the tassels of the flint seed parent must be removed before they produce any pollen; otherwise part of the seed will not be crossed.

All of the ears borne on the dent pollinator plants are self bred and can not be used as crossed seed. Stock seed of both parental types is maintained in separate fields. Although seed from the pollinator plants can be used for planting the pollen producing rows in the crossing field another year, it is not advisable to use this seed for that purpose. It is practically impossible to get all of the tassels on the seed parent pulled out at the right time. In spite of careful attention some pollen will be produced. This will contaminate the pollen parent and if this seed is used continuously such mixing may destroy the type.

For all these reasons it will be appreciated that crossed corn seed costs considerably more to produce than ordinary seed. Silage corn seed as now obtained in common practice is grown in the western states from seed that may or may not have been grown in the east the year previous. Unless the stock seed is grown under proper supervision in the east and the fields grown for seed guarded against cross-pollination with unadapted varieties no dependable supply of seed corn can be maintained.

The question now before us is: does this method of producing crossed seed give sufficiently greater yields of grain and silage over an average period of years to justify the increased cost of the seed?

CHARACTERISTICS OF CANADA-LEAMING

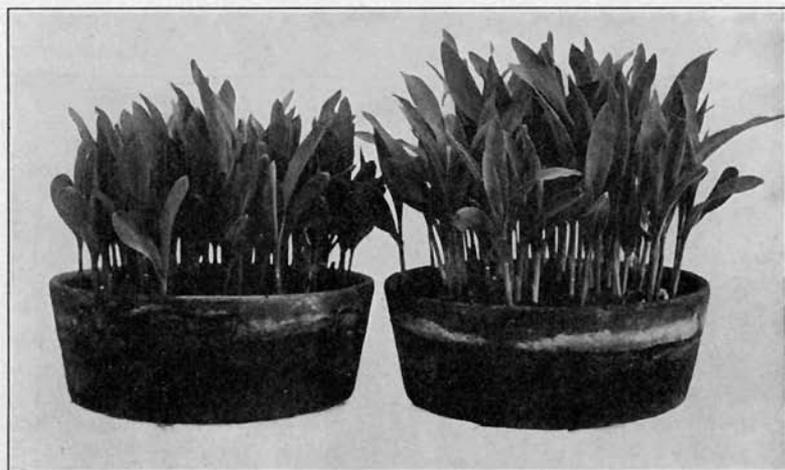
Using the flint type to produce the seed kernel has a distinct advantage. The plants ripen early in southern Connecticut, the grains are plump, hard, bright and dry out thoroughly, practically every year before cold weather. This insures a good quality of seed corn—a matter of prime importance with any seed. The cross-bred flint kernels germinate better and the young seedlings grow more vigorously than those of the dent type, as shown in Figure 2. Planted at the same time, in the same soil and treated exactly alike the two lots of seedlings are quite different in size within a few days after they are up. This difference is easily apparent in the field where dent corn is grown by the side of Canada-Leaming and this quick start is an advantage in permitting early cultivation, thereby getting ahead of the weeds.

At New Haven, Canada-Leaming produces strong, sturdy stalks from 8 to 9 feet tall and usually one or more tillers. These side branches vary in size from a few inches to the height of the main stalk depending on the thickness of planting and the seasonal conditions. When planted 4 stalks to the hill with the hills 3' by 3' or the equivalent in drilled rows, few tillers are formed. Where the corn is grown for grain 3 stalks in the hill space 1 3.5' by 3.5' will give better developed ears.

Usually one large ear is produced on each stalk with many

having two or more. Very few barren stalks and nubbins are found in crossed corn where the soil and season are favorable and this is the big advantage of crossed seed based on inbred strains over ordinary seed corn.

The ears of this flint-dent combination are from 8 to 12 inches long with usually 12 rows of smooth, round kernels showing a slight indentation. They are intermediate in form between the flint and the dent kernel, but are somewhat more like the flint in hardness and texture. The kernels are not so large as the flint and are better adapted for feeding whole to poultry.



Leaming

Canada-Leaming

FIG. 2. The flint type of kernel gives Canada-Leaming a quick start in the spring.

EARLY MATURITY

Canada-Leaming ordinarily matures for grain in about 100 to 110 days when planted the latter part of May in southern Connecticut. It often can be cut and shocked before this time and give corn that will cure properly in the crib. In maturity it is fully as early as the medium-sized flints of the Canada Yellow type although it is not as early as some of the small-eared strains of early-maturing flint corn.

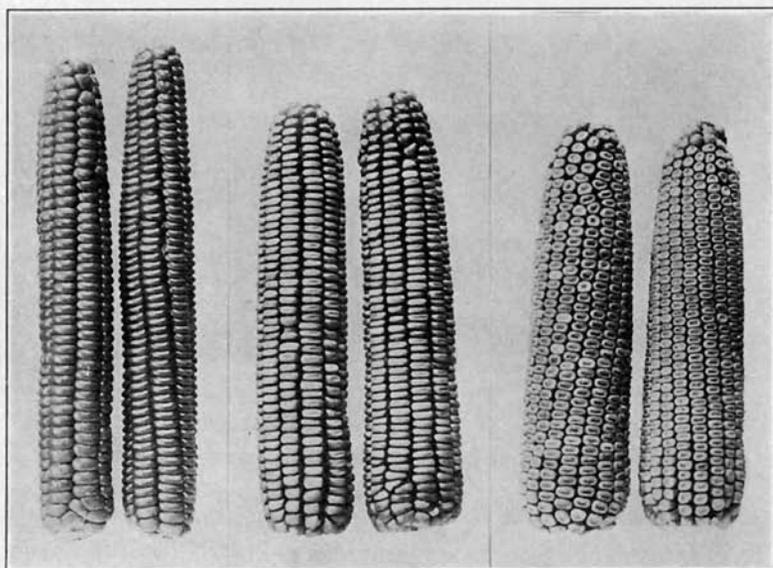
YIELD OF GRAIN

In two years trials at Mt. Carmel Canada-Leaming has yielded more dry shelled grain than any variety of flint or dent ripening

within two weeks of the same time. These yields in bushels to the acre are as follows:

	1927	1928
Canada-Leaming	60.5	56.3
Canada Yellow Flint	44.8	39.6
Sanford White Flint	45.8	46.4
Gold Nugget	47.7
Century Dent	55.4

1928 Canada-Leaming was grown in the experiment station trials at Storrs, Connecticut, and yielded 3,430 pounds of ear corn in comparison with 2,853 pounds for Pride of the North, based on an average of six plots each.



Canada Flint

Canada-Leaming

Leaming Dent

FIG. 3. Canada-Leaming is the result of crossing, each year, Canada Yellow flint and Leaming dent.

In New York, Canada-Leaming was included in all of the regional tests in 1928. A report from R. D. Lewis states that, "as in 1927 it was outstanding in its performance in its maturity class. It is approximately the same maturity as, possibly a very little later than Hall's Gold Nugget, but decidedly superior to it. This is quite evident from an inspection of the summary table." The table follows:

Silage Corn Variety Test in Ten Counties in New York in 1928

	Dry weight tons per acre	Shelled grain pounds per acre
Eureka	4.30	251
Canada-Leaming	3.98	2721
West Branch Sweepstakes	3.90	2020
Cornell No. 12	3.77	2106
Cornell No. 11 (Morse)	3.63	2752
Golden Glow (Wis. No. 12)	3.63	2565
Luce's Favorite	3.31	1527
Leaming	3.30	1352
Golden Glow	3.27	2273
Alvord's White Cap	3.16	2521
Minnesota No. 13	2.77	2319

Reports have been received from 20 farms where Canada-Leaming was grown in 1928 and 1929 in Vermont, New Hampshire, Maine, Massachusetts and Connecticut, usually in comparison with other varieties. In all but two of these trials this crossed corn was considered to be superior in one or more respects to the corn grown in comparison with it. A few of the comments are as follows:

- R. A. Burroughs, Vergennes, Vermont, 1928.—“Planted Eureka, Sweepstakes, Mammoth Yellow Flint, Burr-Leaming, Lancaster Sure Crop and Canada-Leaming this year on heavy clay with light coat of manure and 100 pounds of acid phosphate broadcast. We checked it up before harvesting about September 15 and decided that the Canada-Leaming was the best of all, well matured and eared and glazed, even though we were unable to plant it until late.”
- G. W. Wilder, Timber Top Farm, East Rindge, New Hampshire, 1929.—“Owing to rains, etc., we did not get the Canada-Leaming into the ground until around June 1. We got by far the best ensilage corn we have had in three years, though the season was not a good growing one. The stalks grew 10 to 12 feet high; the ears were, many of them, mature and all were in milk, though we began cutting around September 15. No one had ever seen better ensilage corn growing around here.”
- E. M. Brown, Waterville, Maine, 1929.—“I tried Canada-Leaming by the side of Mammoth flint. It had about 90 days to grow. Canada-Leaming had about the same fodder, more ears and was eight days earlier.”
- J. H. Putnam, Greenfield, Massachusetts, 1929.—“We tried out the Canada-Leaming for the second year in 1929 and found it very satisfactory. We are very much impressed with it, especially on our lower hill soils, due to the fact that it carries so large a percentage of grain.”

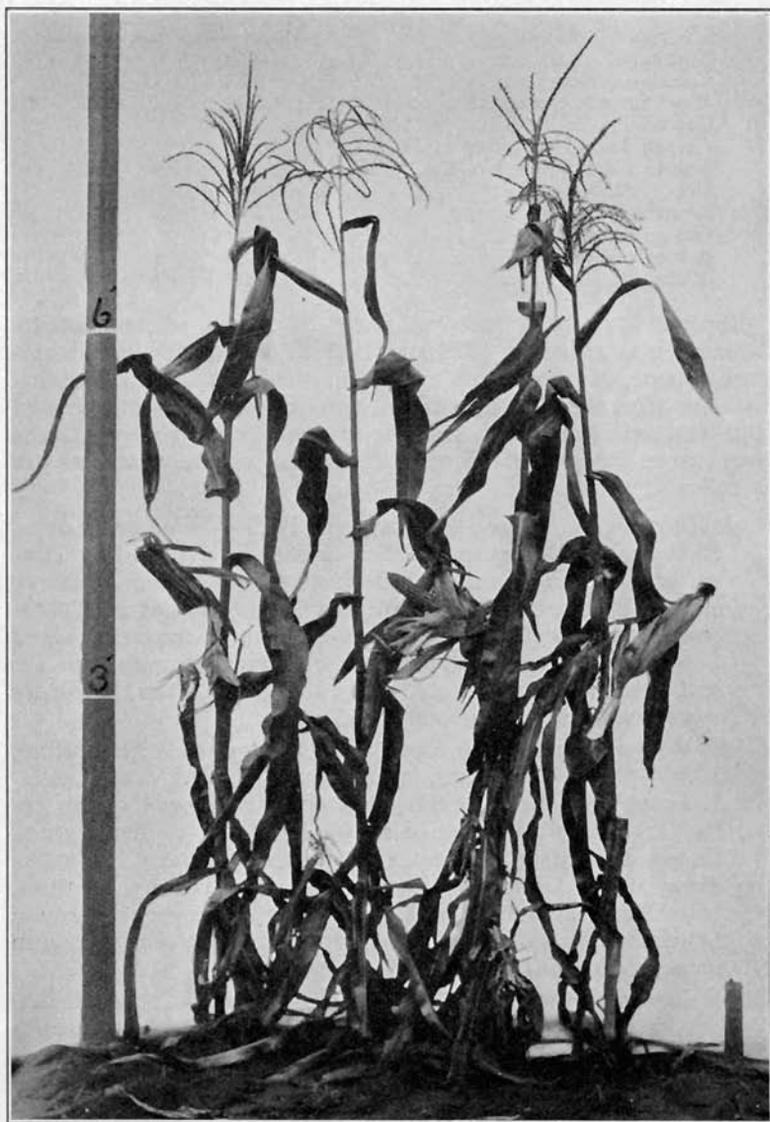


FIG. 4. Canada-Leaming has strong, sturdy stalks from 8 to 9 feet tall.

Based upon its behavior in 1927, 1928 and 1929, it seems that Canada-Leaming has a useful place where an early maturing, high yielding corn of good grain quality is desired. In northern New England and northern New York, it can be grown advantageously wherever Gold Nugget, Mammoth Flint, Luce's Favorite and some of the early dents are now grown. In southern New England and in many places in New York State it can be ripened for grain and can be expected to give a larger yield and better maturity than Pride of the North, Century Dent, Canada Yellow Flint, Sanford White Flint or other varieties of a similar season.

While the production of crossed corn seed involves more care and attention to details and additional labor the process is relatively simple. It can be grown for seed only in those parts of the country where the flint type can be thoroughly matured and dried every year before cold weather. Any one interested in producing seed of Canada-Leaming corn should write to the Connecticut Agricultural Experiment Station at New Haven. Names of growers of seed will also be sent on request.