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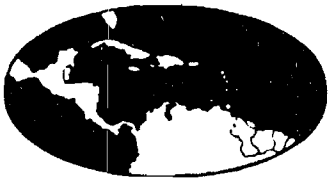
PROCEEDINGS

OF THE

CARIBBEAN FOOD CROPS SOCIETY



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CORN IMPROVEMENT PROGRAMME - MINISTRY OF AGRICULTURE AND LANDS, JAMAICA

E. R. H. Martin

ABSTRACT

Corn seed improvement in Jamaica by modern methods was initiated in the early 1940's by L. N. H. Larter who isolated a yellow segment from the widely grown Jamaica Red Corn. This yellow strain is the JSY, still the prevailing variety in the island.

After the war, work was virtually suspended until 1957 when the writer studied improvement methods with I.C.A. assistance in the U.S.A. and later in Mexico with the Rockefeller foundation Mission.

In 1963, government appointed a part-time Consultant, Mr. F. Poey, who is associated with a Company producing tropical corn hybrids.

This Division has also drawn freely on assistance willingly given by the Pioneer Hi-Bred Corn Company, now operating a station in Jamaica.

1. Variety Testing - Following the usual pattern in which promising commercial and experimental material is tested against local standards.

2. Controlled Mass Selection - Recommended by the Rockefeller Foundation for application to specially prepared Composite Material with a high level of initial performance and considerable additive genetic variance for further improvement in yield and adaptation.

3. Inbreeding of available material - Inbreds from a wide variety of material to be used in a Hybrid programme, for Top Crosses and for preparing Synthetics. Early testing of Top-Cross performance.

4. Making of Twin-Eared Composite - To be used as a commercial variety if of sufficiently high performance after selection, or for crossing with other material.

5. Exploratory work with Sweet Corn - (a) Using crosses between selected tropical strains of field corn and the DR-50 Sweet Corn. (b) Selection within a Sweet Corn Composite supplied to us by Pioneer Hi-Bred Corn Company.

6. Spacing and Plant-Population Trials - Following on earlier work by R. F. Innes and also recent trends abroad in which higher populations are giving promising results.

INTRODUCTION

Corn improvement in Jamaica by modern methods was initiated in the early 1940's when L. N. H. Larter isolated a yellow segment from the widely grown and very variable local Jamaica Red Corn.

Urgency was lent to this project because of W.W2 when Jamaica had virtually to depend on local supplies of grain for making cornmeal for human consumption. It was found that the Red Corn made an unattractive meal not acceptable to the housewife.

Selection of this yellow segment was a relatively simple and rapid one, and the variety thus isolated was named Jamaica Selected Yellow or "JSY". It is still popular in the island, but although producing high quality grain, the plants have many agronomic defects including great height and tendency to lodge, which limits yield potential. (It is well to note however that "JSY" was selected on an unirrigated area at an elevation of approximately 1,600 ft. and that its limitations are more evident when grown on the irrigated lowlands).

Immediately after the war, work on seed improvement was unfortunately suspended. Work was resumed in 1956 by Dr. Aston Taylor, but continuity was soon broken by this officer's transfer out of the island. In addition, no proper storage facilities were provided until 1964, so that material with which he had been working was lost, together with quite a lot collected and bred by the writer from 1957 to 1963. (Field and other facilities still remain a limiting factor, but these are gradually being overcome).

In 1957, the writer, assisted by an I.C.A. grant, studied corn improvement methods in the U. S. A. and Cuba for 4 months. Later, in 1962, he visited the Rockefeller Foundation Mission in Mexico and as a result initiated important modifications in the local programme. This led to considerable intensification of the work.

In 1963, Government secured the part-time services of Mr. Federico Poey Snr. as a Consultant, and this arrangement continues to the present time. Mr. Poey has been associated with corn breeding in Cuba and Mexico and his Company is responsible for many well-known tropical hybrids including the Corneli 54 and the Poey-T-66. (The latter is currently recommended for planting over a wide area in Jamaica and is particularly suited to the irrigated low-lands.

We are also fortunate in obtaining much valuable assistance from Dr. William Brown, Director of Research of the Pioneer Hi-Bred Company, and his staff. This Company is currently engaged in breeding of tropical hybrids on their station at Caymanas Estate in this Island.

<u>Ecological Areas</u>:

These are as yet not clarly defined, particularly as regards the relative performance of varieties.

For the present the following very broad groups are recognized:

(a) The irrigated lowlands
(b) The unirrigated middle-elevation lands, often red or brown bauxite soils.

Area (a) is represented by Bodles Agricultural Station and Area (b) by Grove Place Agricultural Station. Most of our breeding, selection and testing work is done at these stations.

Planting Seasons:

Two annual planting seasons are recognized in Jamaica. They are based largely on rainfall patterns and are in consequence of particular significance in unirrigated areas.

Broadly speaking, "spring" corn is planted in March-April when, for most areas, it is reasonable to expect sufficient moisture for germination and early growth, with optimum moisture present at the critical period of flowering. Reaping of this crop is expected to be in the drier months of July and early August.

"Fall" corn is planted in August-September with peak moisture in October and with drier reaping conditions in December-January.

Where irrigation is available, more flexibility may of course be permitted, but irrigation may be expensive and there is danger that reaping may occur in a rainy period.

Lines of Investigation:

Facilities at the present time do not permit of a comprehensive programme of investigation in the many agronomic aspects of corn production which we know to exist in this or any crop. Work with soils, fertilizers, herbicides, insecticides, plant populations and many other factors needs further investigation, but; sufficient information is already available in many instances to permit reasonable recommendations, not overlooking costs, in relation to reasonable returns.

Present lines of investigation are therefore directed to matters of the highest priority, and by far the most pressing is provision of seed with high yield potential, produced by plants with good agronomic characters.

Some work is also being done on plant populations and spacing, and the urgency of work to be done on insect control is appreciated, but this latter calls for far more specialized direction and supervision than can at this time be attempted.

CURRENT PROGRAMME

Breeding

1. Variety Testing
2. Controlled Mass Selections on specially prepared Composite Material
3. Evaluation of the different generations of (2) above
4. Inbreeding of available material
5. Testing of Inbred Material by Top-Cross Performance
6. Making of a Twin-Eared Composite
7. Making of Experimental Sweet Corn Crosses and subsequent selection
8. Selection within Sweet Corn Composite supplied by Pioneer Hi-Bred Corn Company.

Cultural

1. Spacing and Population Trials.

1. Variety Testing

This follows the usual pattern of such work and requires no further explanation. Material is currently being tested from commercial and experimental hybrids from Semillas Mejoradas de Mexico, and the Rockefeller Foundation in Mexico the Pioneer Hi-Bred Corn Company, using the local open-pollinated variety "JSY" and the Poey-T-66 as checks on the unirrigated middle-elevation lands and Poey-T-66 on the irrigated lowlands. Recent trials have also included a wide selection of tropical material supplied by the Rockefeller Foundation in Mexico.

Pending the results of current and future trials, the Ministry of Agriculture recommends the PT-66 Hybrid for planting on the irrigated lowlands and either PT-66 or JSY for the higher and unirrigated areas. If reaping is by machine, JSY is not recommended because of its great height and variability, and it also has a strong tendency to lodge.

Note 1. The term "Variety is used here in the broad sense and may include Open-Pollinated Varieties, Single, Three-Way or Double-Cross Hybrids, Synthetics or Composites.

2. Controlled Mass Selection

This method of seed selection and improvement is recommended by the Rockefeller Foundation in Mexico as being of particular value in situations, where use of a hybrid may offer no special advantage.

Dr. E. J. Wellhausen writes as follows:

"The first step in the plan involves the isolation of basic materials which could be mixed and blended to form basic intra-breeding germ plasm pools with a high level of initial performance and considerable additive genetic variance for further improvement in yield and adaptation to specific environments through mass selection orother recurrent selection techniques."

In Jamaica, 5 cycles of selection have been completed with a general Caribbean Composite and 2 cycles of selection with four special composites based on actual performance of the parent material under local conditions. (The selection technique was also applied to local JSY but was discontinued this year because a rather undesirable change in the character of the grain was not accompanied with increase in yield potential).

Selection is mainly on the basis of yield of grain and is on a precisely executed field plan in which the best material is taken from each of 60 plots of 50 plants each.

3. Evaluation of the Selection Cycles of (2) above

Yield testing of the Selection Cycles of five basic populations or Composites is now a routine seasonal procedure. It is as yet too soon to venture at any conclusions, but the grain types are becoming better defined and in one instance a substantial increase in yield was recorded. Unfortunately there is some lodging in this material which may minimize its value.

4. Inbreeding of available material

Selected plants of a large variety of material have been inbred and some carried to the S3 generation.

5. Testing of Inbred Material by Top-Cross Performance

Top Crosses of most of this material have been made onto a commercial Single Cross and those showing superior combining ability are being increased and may be further inbred if this is considered desirable.

Selected inbreds will be held for use in any hybrid programme which may be undertaken or for more immediate use in a commercial top-cross or perhaps for combining into one or more Synthetics. They may also be crossed with any available and proven tropical inbred lines. Present indications are that some of our Top Crosses may prove of immediate value after an appropriate period of testing.

6. Making of a Twin-Eared Composite

Twin or Multiple-Eared Corn would seem to offer some advantage in yield potential over Single-Eared types although, as far as is known, critical comparisons have not been made. There is also some evidence that Twin and Single-Eared types may be crossed to advantage.

A multiple variety collection was made in 1964-65 plants bearing two ears of approximately the same size. Seed of these were planted together for two generations and selections repeated. Inbreeding of selected plants is being done on the third generation followed by re-combining, although inbreeding may be replaced subsequently by sibbing if this would seem to offer advantages.

7. Making of Experimental Sweet Corn Crosses and subsequent selection

DR 50, Pajimaca and U.S.D.A. 34 are all grown with some success in Jamaica.

The writer was, however, impressed with the uniformity of certain field corn material among our collections. An attempt is therefore being made to introduce the sweet gene DR 50 by cross pollination and selection.

It is as yet too early to assess the value of this work, but six (6) populations are involved, and are currently being grown for observation.

8. Selection within Sweet Corn Composite supplied by Pioneer Hi-Bred Corn Company

This composite consists of inbred material from Pajimaca and DR 50. As a variety, it shows great promise, even without further selection, but selection work is being carried out with the hope of increasing uniformity, and fixing a type.

9. Spacing and Population Trials

R. F. Innes in 1941 showed that yields of JSY when grown on manured terra rossa soils increased with increased plant population up to at least a seeding rate of 21,780 plants per acre. Based on this work, planting single seed at 1 ft. intervals or two seeds at 2 ft. intervals along rows 2 ft. apart was recommended.

With the increased use of mechanical field equipment, there has been a tendency for row width to be increased without a corresponding reduction in the within-row spacing to maintain area population. There is some recent experimental evidence to show that populations should be by all means maintained.

Two precise trials are currently being run at Grove Place and Bodles in which row spaings are varied between 24" and 48" and within row spacings between 22" and 5" resulting in populations varying between 11,890 and 26,140 plants per acre. (Multiple seed were planted and later thinned so as to ensure a uniform stand). The seed used is the hybrid PT-66.

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