

MAIZE
Zea mays (2n = 20)

Place of origin : Mexico.

Origin of cultivated maize

The genus *Zea* was previously considered as monotypic. Later on *teosinte* has been included *Euchlaena mexicana* has been changed as *Zea mexicana*

Another wild relative is *Tripsacum* (gamma grass). All the three are inter crossable.

Three views about origin

1. From *Teosinte* it arose. Teosinte is having cob and tassel and easily crossable. This theory was not accepted based on cytological studies.
2. Maize arose from pod corn *Zea mays* var. *tunicata* thro' natural mutation. This view is the most accepted one. But origin of pod corn is not known.
3. All the three came from common ancestor but this common ancestor lost during evolution.

Ideal plant type in maize

- Plant with up right leaves which will increase photosynthesis.
- Extended grain filling period to have uniform well matured grains.
- Cob with increased row no. > 15.
- Multi cob plant

Breeding objectives :

1. Yield :

Complex character controlled by polygenes. Attention is to be paid to have ideal plant type. Varietal hybridization as a maize breeding method did not gain popularity. The main reason for this is difficulty in getting superior segregants.

2. Breeding for pest and disease resistance :

Shoot fly, Stem borer, Heliothis are major pests. Mexican varieties are resistant. Downy mildews, leaf blight and helminthosporium are major diseases. Co1, CoH 2 are resistant. Taiwan lines are resistant to downy mildew.

3. Breeding for high protein :

Composed of two fractions. a) Protein in endosperm known as *Zein* which is nutritionally not balanced since it is lesser in lysine and tryptophan. 80% protein found in endosperm.

b) Protein in germ (embryo) 20% balanced one. By increasing the embryo size we can increase protein content.

4. Breeding for increased oil content.

12-15% in germ. By increasing the embryo size we can increase oil content.

5. Alternate sources of cytoplasm

CMS - T. susceptible to helminthosporium

C and S Resistant.

6. High yielding baby corn.

Z.m. var. *sachharata*, Sweet corn. The green cobs can be eaten as salad. The cobs can be harvested 45 days after sowing. CoBc 1 is latest variety of baby corn.

Breeding methods:

1. Introduction :

Initially the varieties were all introduced one.

Sikkim primitive 1

Sikkim primitive 2.

Mexican line were first introduced during 16th century by portuguese

2. Mass Selection : Prior to 1945 mass selection was the only method used for maize improvement.

KT 1 - U. P.

RAS 1 - Rajasthan.

By adopting mass selection technique it is possible to get yield increase by 19% per cycle.

3. Ear to Row Selection :

First proposed by Hopkins for improving oil and protein content of maize. This method involves selection of a number of phenotypically desirable ears out of a population grown in isolation. The selected cobs are harvested on single plant basis and keeping part of the seeds & remaining sown in rows. Based on the best performing rows during next season the reserve seeds are sown.

This method is suitable for characters having high heritability like oil content and protein content. But it was not helpful to get increased yield.

4. Modified Ear to Row method :

Proposed by Lonquist.

I. Best ear heads from population selected (100 No.) and harvested on single plant basis. And threshed individually.

II. The single heads harvested are raised in progeny rows in more than one location representing different environment with local checks.

III. In the main station the progeny rows are used as crossing block. Pollen from best plants are collected, mixed and used for crossing the rows. Select best five plants from each rows and harvest them separately record the yield. On the basis of performance of over all locations only top 20% progenies are selected. These 20% will include the five plants selected.

IV. The seeds from 5 plants selected are sown in progeny rows and cycle is repeated.

5. Hybridization and Selection

Not popular since isolation of superior recombinants was not made.

6. Heterosis breeding :

Instead of using CGMS lines, detasseling the female inbred line is followed in India. Since use of CGMS line is costlier compared to detasseling it is not followed.

Crossing the inbreds of indigenous x exotic origin resulted in release of best hybrids.

Indian x Indian - 24 to 43% yield increase.

Indian x U.S. dent 58 %

Indian dent x Caribbean Flint 47 to 54 %

1. Single cross hybrid - CoH 1, CoH 2.
2. Three way cross hybrids - Ganga -5
3. Double cross hybrids - CoH 3
4. Double top crop hybrid - White kernel hybrids - Ganga safed 2, Histarch, Ganga 4.

7. Population Improvement :

Recurrent selection technique was initiated by Dhawan in 1963. The initial synthesis of composites were done from high yielding inter varietal crosses which exhibited minimum inbreeding depression.

Kisan, Jawahar, Vikram, Sona, Vijay, Amber.

Co 1 K. 1

Future thrust

1. Development of broad based, genetically diverse gene pool of populations.
2. Evaluation of the performance of these base populations thro' recurrent selection procedure.
3. Development of superior inbreds.
4. Development of superior hybrids.