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FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES

CULTIVATION OF MAIZE

BOTANICALNAME	*Zea mays*
FAMILY	Poaceace
CHROMOSOME NO.	2n=20
COMMON NAME	Makka, Bhutta

INTRODUCTION:-

Maize (Zea Mays, referred to as corn in North America) originated in central Mexico in around 5,000 BC.

The crop was introduced to Europe in the sixteenth century, from where it spread to Africa and Asia. It is now one of the most widely-grown crops around the world in both temperate and tropical regions.

It is among the 10 most important world crops by value.

According to the FAO, world production in 2012 was over 870 million tons, grown on 158 million hectares of land.

Maize is grown both (as sweet corn) for human consumption and (as field corn) for other uses such as animal feed and bio-fuels.

Worldwide, only around 15% of maize production is used for food consumption with most production going to animal feed. However, the proportion of maize production for food production in developing countries is higher at 25% and even higher in regions such as South East Asia where it is an estimated 30-40%, whilst in parts of Sub-Saharan Africa it can be as high as 70-80%.

The crop is a staple food for an estimated 1 billion people across sub-Saharan Africa, South Asia and Latin America.

ECONOMIC IMPORTANCE:-

It is staple human food, feed for livestock, for fermentation and many industrial uses.

It is having abundant starch (65%).

There are two types of milling. Wet milling produces industrial starch like sweeteners, also produces various modified maize starch for paper lamination, textile wrap, sizing and laundry finishing.

Dry milled products are animal feed, brewing, breakfast cereals, other food. In India, dry milling is the predominant process for flour and animal feed, fermentation and distilling industries and composite flours.

In the new millennium, it is an alternate crop to rice and wheat.

About 35% production is consumed by human, 25% poultry and cattle feed, 15% food processing.

ORIGIN AND HISTORY:-

The primary centre of origin of maize is considered by most authorities to be the Central America and Mexico, where many diverse types of maize are found.

The discovery of fossil maize pollen with other archaeological evidence in Mexico indicates Mexico to be the native of maize.

American Indians grew and selectivity improved maize from 3400 B.C. to 1500 A.D.

AREA AND DISTRIBUTION:-

Maize is cultivated throughout the world. From 58°N latitude to 40°S latitude, the crop spreads and cultivated over 139 million ha of area and around 600 million tonnes of maize is produced.

Crop occupies the third position next to rice and wheat in area and production. USA, China, Brazil, Mexico, India, Romania, Philippines, Indonesia are some of important countries cultivate maize crop.

In India, Rajasthan, UP, MP, Bihar, Karnataka, Gujarat, AP, J&K, HP and Maharashtra are important states produce maize.

CLASSIFICATION:-

MAIZE GRAIN TYPE:-

Flint corn (Zea mays indurata):-

Entire outer portion of kernel is hard starch. Flint comes in many colours such as white, yellow, red-blue or their variable.

Dent corn (Zea mays indentata):-

About 95% of production in USA is dent corn. Hard starch is confined to kernel only. The amylose of soft starch in the core contracts when the grain is dried producing characteristic dent in the top of the kernel. May be yellow, white and red colour of kernel.

Sweet corn (Zea mays saccharata):-

Grown for food and harvested at 70% moisture content. It is good source of energy. About 20% of dry matter is sugar compared to 3% in dent corn. It is also a good source of vitamin C & A.

Flour corn (Zea mays amylacea):-

Kernel is largely composed of soft starch with little or no hard starch. Kernels are easy to grind. Primarily used by natives of Andean Highlands of South America.

Pop corn (Zea mays everta):-

Its kernel is small and extreme form of flint corn. When heated to 170°C, the grain swells and burst and turning inside out. At this temperature, the water held in the starch turns to steam and the pressure causes the explosion.

Waxy corn (Zea mays ceretina):-

Due to waxy appearance of the kernel, it is called as waxy corn. The starch is entirely amylopectin whereas dent has 78% and 22% amylose. Hybrids of waxy are raw materials for wet milling starch industry for textile and paper sizing and corn oil.

Pod corn (Zea mays tunicata):-

The pod corns are characterized by having each kernel enclosed with in a pod or husk. It is a primitive type of corn and hence of no importance.

SOIL AND CLIMATIC REQUIREMENT:-

Soil requirement:-

Deep, fertile, rich in organic matter and well drained soils are the most preferred ones for the crop; however, maize can be grown on a variety of soil types.

The soil should be medium textured with good water holding capacity.

The crop is very sensitive to water logging and since it is mainly grown during rainy season, care should be taken to assure that water does not stagnate on the soil surface for more than 4-5 hours.

Loamy or silty loam soil or silty clay loam soil having fairly permeable sub soil is ideal soil types.

Thus, the ideal soil is neither clayey or sandy and has a pH between 6.5 and 7.5 along with an exchangeable capacity of around 20 milli-equivalent/100g, base saturation of 70-90%, bulk density of about 1.3 g/cc and water-holding capacity of about 16cm/m depth.

Climatic requirement:-

Maize requires 9 to 30°C from planting to emergence.

Emergence to silking, leaf number increases with temperature and photoperiod. Increase in time to tassel as the diurnal variation increase from 0-17°C.

Maximum rate of maize growth is at 30°C. Longer the grain filling period, higher the grain yield provided no freezing temperature.

Higher the solar radiation, higher will be the photosynthesis in maize.

VARIETIES:-

Variety (Composit)	Days taken to maturity	Yield (q/ha)
D-765	72-75	30-35
Navin	80-85	35-40
Surya	72-75	30-35
Gaurav	80-85	40-45
Mani kanchan	80-85	40-45
Megha	80-83	30-32
Kiran	82-83	30-35
VL-88	85-90	35-40
Arun	95-100	35-40
Amar	80-85	35-40
Sweta	80-85	35-40
Navjot	80-85	40-45
Prabhat	100-110	40-45
Variety (Hybrid)	**Days taken to maturity**	**Yield (q/ha)**

Ganga-2	100-105	40-45
Ganga-11	100-110	45-50
Deccan-103	105-110	50-55
Deccan-105	100-110	50-55
Deccan-107	85-90	45-50
Deccan-109	85-90	41-45
VI-42	85-90	40-45

CULTURAL PRACTICES:-

IRRIGATED MAIZE:-

Application of FYM or compost:-

Spread 12.5 t/ha of FYM or compost or composted coir pith evenly on the un-ploughed field along with 10 packets of Azospirillum (2000 g/ha) and incorporate in the soil.

Field preparation:-

Plough the field with disc plough once followed by cultivator ploughing twice, after spreading FYM or compost till a fine tilth is obtained.

Forming ridges and furrows or beds:-

Form ridges and furrows providing sufficient irrigation channels. The ridges should be 6 m long and 60 cm apart.

If ridges and furrows are not made, form beds of size 10 m2 or 20 m2 depending on the availability of water.

Use a bund former or ridge plough to economies cost of production.

Application of fertilizers:-

Apply NPK fertilizers as per soil test recommendation as far as possible.

If soil test recommendation is not available adopt a blanket recommendation of 135:62.5:50 NPK kg/ha.

Apply quarter of the dose of N; full dose of P2O5 and K2O basally before sowing.

In the case of ridge planted crop, open a furrow 6 cm deep on the side of the ridge, at two thirds the distance from the top of the ridge.

Apply the fertilizer mixture along the furrows evenly and cover to a depth of 4 cm with soil.

If bed system of planting is followed, open furrows 6 cm deep at a distance of 60 cm apart.

Place the fertilizer mixture along the furrows evenly and cover to a depth of 4 cm with soil.

When Azospirillum is used as seed and soil application, apply 100 kg of N/ha (25% reduction on the total N recommended by soil test).

Application of micronutrient:-

12.5 kg of micronutrient mixture formulated by the Department of Agriculture, Tamil Nadu, mixed with sand to make a total quantity of 50 kg/ha is to be applied.

Apply the mixture over the furrows and two thirds in the top of ridges, if ridge planting is followed.

If bed system of sowing is followed, apply the micronutrient mixture over the furrows.

Do not incorporate the micronutrient mixture in the soil.

Seed rate:-

Select good quality seeds and adopt the seed rate of 20 kg/ha for grain maize and 25 kg /ha for baby corn.

Spacing:-

Adopt a spacing of 25 cm between plants in the rows which are 60 cm apart.

Seed treatment:-

Use pelleted seeds with insecticides (treat one kg of seeds with Chlorpyriphos 20EC or Monocrotophos 36 WSC or Phosalone 35 EC @ 4 ml + 0.5 gram gum in 20 ml of water) for the control of stem borer or seed treatment with Imidacloprid 70 WSC 10 g/kg of seeds.

Seed treatment with Metalaxyl or Thiram @ 2 g/kg of seed for the control of downy mildew and crazy top

Seeds treated with fungicides may be treated with three packets (600 g/ha) of Azospirillum before sowing.

Sowing:-

Dibble the seeds at a depth of 4 cm along the furrow in which fertilizers are placed and cover with soil.

Put one seed per hole if the germination is assured otherwise put two seeds per hole.

Weed management:-

Apply the pre-emergence herbicide, Atrazine 50 WP @ 500 g/ha (900 lit of water) at 3 days after sowing as spray on the soil surface followed by one hand weeding on 40-45 days after sowing.

Apply herbicide when there is sufficient moisture in the soil.

Do not disturb the soil after herbicide application.

Hoe and hand weed on the 17th or 18th day of sowing, if herbicide is not applied.

NOTE: If pulse crop is to be raised as intercrop, do not use Atrazine.

Thinning and gap filling:-

If two seeds were sown, leave only one healthy and vigorous seedling per hole and remove the other on the 12-15 days after sowing.

Where seedlings have not germinated, dibble pre-soaked seeds at the rate of 2 seeds per hole and immediately irrigate.

Hoeing, hand-weeding and ear thing-up:-

Hoe and hand-weed on the 30th day of sowing

Earth up and form new ridges so that the plants come directly on the top of the ridges.

This will provide additional anchorage to the plants.

Top dressing with N:-

Place half of the dose of N on the 25th day of sowing along the furrows evenly and cover it with soil.

Place the remaining quarter of N on the 45th day of sowing.

Water management:-

Maize crop is sensitive to both moisture stress and excessive moisture, hence regulate irrigation according to the requirement.

Ensure optimum moisture availability during the most critical phase (45 to 65 days after sowing); otherwise yield will be reduced by a considerable extent.

Regulate irrigation according to the following growth phase of the crop.

Critical stages are, 6th leaf, late knee high, tasselling, 50% silking and dough stages. Of which, tasseling and silking are most criticalstages and water stress during these stages reduces the maize yields considerably.

About 600-700 mm is needed for 100 days crop.

Harvesting:-

Stage of harvest:-

Observe the following symptoms, taking into consideration the average duration of the crop. The sheath covering the cob will turn yellow and dry at maturity. The seeds become fairly hard and dry. At this stage the crop is ready for harvest.

Harvesting:-

Tear-off the cob sheath by using the gunny needle and remove the cobs from the plant. Carry out harvest operations at a single stage for easy transportation.

Threshing cobs:-

Dry the cobs under the sun till the grains are dry. Use mechanical threshers or by running the tractor over dried cobs to separate the grains from the shank. Clean the seeds by winnowing. Collect and store the dry grains in gunnies.

Stalk for cattle feed:-

Maize straw can also be used as a good cattle feed when it is green. Harvest the crop and cut the green straw into bits with a chaff cutter or chopping knife and feed the cattle.

Yield:-

5 tonnes of grain yield and 10 tonnes/ha of straw yield can be obtained.

In case of Baby corn, about 6 tonnes/ha of cob yield with 25 tonnes/ha of green fodder yield is possible.