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MAIZE - The Miracle Crop

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Introduction

Maize, the queen of cereals, with the biggest genetic yield potential. In terms of area (9.9 million ha), production (33.62 million t), and productivity (5.99 t/ha), India ranks 4th in area and 7th in production, representing around 4% of the world maize area and 2% of total production. Maize is used for many different things, including human consumption (24%), animal and poultry feed (52%), human and animal feed (11%), raw materials for many different industries (11%), seeds (1%), and brewing (1%). Although maize may be cultivated throughout the entire year due to the favourable climatic conditions, it is mostly grown as a major Kharif crop in most Indian States and as a rabi crop in Andhra Pradesh and Tamil Nadu.

Today, there are over 900 people worldwide who depend on maize as their main source of nutrition. Maize is an important source of many micronutrients and phytochemicals in addition to calories. The raw, yellow and sweet corn kernels contain 76% of water, 19% carbohydrates, 3 % protein and 1 % fat. In a 100-gram serving, maize kernels provide 86 calories and are a good source (10–19% of the Daily Value) of the B vitamins, thiamine, and folate. In moderate amounts, they also supply dietary fiber and the essential minerals, magnesium and phosphorus whereas other nutrients are in low amounts.

The maize has low levels of essential amino acid tryptophan and lysine, which are the reason why it is not considered a protein source. However, a diet that is dependent on maize may lack protein and adequate essential nutrients such as zinc, amino acids A and E or some of them.

Maize is preferred because it requires less water than rice, has a low incidence of pests and diseases, has a strong demand for its by-products, and has the potential to export. The development of specialty maize, such as sweet corn, popcorn, baby corn, and quality maize protein, among others, also provides farmers with additional income, and the future is promising for value-added products that can do the same.

Soil

Maize can be cultivated on a wide type of soil ranging from heavy clays to light sandy. It can be grown in soil, with the optimal pH range is 6.5 -7.5 and fertile, rich in organic matter, and well-drained medium textured soils with good water holding capacity.

Alkaline, Saline and waterlogged soils (low-lying areas) should be avoided since the crop suffers adversely just after germination.

Climate

Maizes may be successfully grown in a wide range of agricultural conditions. It is not grown in areas where the daily temperature is less than 19°C because it is a warm weather loving crop. It will be faster and less variable at a soil temperature of 16-18° C At 20° C, it takes 5-6 days to emerge. The critical temperature is 32°C, which adversely affects the yield. The maize cannot tolerate frost at any stage and can be damaged during all stages of growth.It can be successfully grown in areas with an annual rainfall of 60 cm, well distributed throughout the growing stages.

Varieties

Maize varieties may be grouped into dent, flint, floury, waxy, amylose, pop and sweet. In India mostly cream yellow to orange early mature varieties are commonly grown. In areas receiving high rainfall, long and medium maturity hybrids can be chosen, whereas in areas of erratic rainfall districts, short duration hybrids can be sown in light soils. High yielding hybrids and composites maize varieties Ganga-1, 3, 4, 5, 101, Ganga Safed-2, Ranjit, Vijay, Himalayan 123, Amber, Sona, Kisan, Jawahar and Vikram have been released for cultivation in the various regions. Some maize varieties of different maturity time for various season are listed below-

Timely maturity	Late maturity
JH 3459, Malviya hybrid makka 2, Prakash, Pusa composite 4, Bio 9637, DK 701, Vivek, etc.	Buland, Pro agro 4212, Trishulata, Seed tech 2324, PMH3, NK 61, HM 8, Pro 311, etc.

Sowing

Maize can be grown in jayad, kharif and rabi season. In the case of rabi and jayad maize, those former, which have available irrigation facilities, are achive higher yield. In order to avoid damage caused by water logging, and in order to give appropriate moisture into the root zone, crops should be sown on ridges. To avoid lodging, sowing may also be carried out on a flat surface in lighter soils, followed by earthing up as soon as the weather permits.

Season	Optimum time for sowing
Kharif	Second fortnight of June to first fortnight of July
Rabi	Last week of October to 15th November
Jayad	Second week of February to last week of February

Seed rates & Spacing

The seed rate and spacing of crop are differ depend upon the purpose of utilization, seed type, season, sowing methods, etc. The following table are showing different type of

maize crop seed rate and spacing to achieve optimal plant density.

Sr. No.	Purpose	Seed rate(kg/ha)	Plant spacing (cm)	Plant population
1.	Grain	20	60 × 20	83333
2.	Sweet corn	8	75 × 25	53333
3.	Baby corn	25	60 × 20	83333
4.	Pop corn	12	60 × 20	83333
5.	Fodder	50	30 × 10	333333

Fig. Sowing Method and Spacing

Weed Control

The critical period of weed competition in maize is generally up to 30-35 days from the date of sowing. The crop should be kept free up to 50 days. Yield reduction of 50% can be expected when weeds are allowed to remain during first 30days after sowing.

Chemical control of weeds with pre-emergence of weedicide Atrazine 50% WP @ 2kg/ha in case of light soils and 3kg/ha in case of heavy soils is to be mixed in 500 liters of water and sprayed uniformly 2-3 days after sowing on moist condition of the soil. Followed by Inter-cultivation should be done at35-40 days (knee high stage). Inter-cultivation should not be more than 3-5 cms deep to avoid root damage.

Water Management

Maize is one of the most efficient grain crops in terms of water utilization as 10-16 kg grain is produced for each mm of water consumed. Maize is a sturdy, tall and fast growing plant with broad leaves, its water requirement is more. A total of 400 -500 mm of water would be enough for kharif maize and 450-600 mm water is required in rabi season.

1. Monsoon rain, which is generally erratic, may cause either prolonged drought or waterlogged conditions both of which are highly detrimental to maize. Certain periods during crop growth are more sensitive to soil moisture stress and are called moisture sensitive periods.

2. The Critical stages for moisture stress in maize are flowering, grain filling and dough stages. Yield reduction of 40-50% was noticed due to moisture stress during flowering to milky stage. More than 50% of its total water requirement is needed in about 30-35 days after tasseling and inadequate soil moisture at grain filling results in poor yield of shriveled grains.

3. Efficient water management is the key to increasing the productivity of maize.

4. For Pre-sowing irrigation to field capacity is very important, as maize seed will not germinate unless it absorbs moisture to double its weight.

Nutrient management

Maize, being an efficient harvester of solar energy and monocarpic nature, is an exhaustive crop. Sufficient fertilization will ensure the quality and quantity of the crop. Fertilization should be based on the soil tests. Each ton of gain produced removes 15-18 kg of N, 2.5-3 kg of P_2O_5 and 3-4 kg of K_2O from the soil. Nutrient requirement differs with soil type, farming method (rainfed/irrigated) and season. A crop producing grain yield of 6.27 t/ha is estimated to consume 168 kg N, 57 kg P_2O_5 and 135 kg K_2O and 30 kg $ZnSo_4$. To maintain soil productivity on a sustainable basis, an integrated nutrient management approach, using both organic and inorganic sources of nutrient should be adopted.

Crop	Nitrogen (N) (kg/acre)	Phosphorus (P_2O_5) (kg/acre)	Potash (K_2O) (kg/acre)	
Kharif Maize	72-80	24	20	
Rabi Maize	80-100	32	32	
Fodder Maize (rabi & kharif)	35-75		16	16

Harvesting

To avoid unnecessary losses in the field due to birds, insects, fungi, rodents, wild animals etc. harvesting should be done when the crop attains physiological maturity. Usually, it I harvested when the dry matter content is maximum or 7-8 weeks after flowering or when the grain moisture is 25-30 %. The right time for harvesting of fodder maize is the flowering stage.

Fig. Silk, Tarsal and Cobs

Yield

Average yields are dependent on many parameters, such as the maize varieties, the region in which it is grown and the timing of planting. Under irrigated conditions and recommended cultural practices, in the Indo-Gangetic Plains average yield of 4-5 tonnes per hectare, while 5-7 tonnes per hectare yield has been obtain in peninsular India and at higher elevations. Where soil fertility are low and rained condition have poor, the grain yield are obtain very low about on to 2 tonnes per hectare.

Fig. Grains