

MAIZE



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MAIZE

The miracle crop. It is the queen of cereals that has the highest genetic yield potential. In India, Maize ranks fifth in area (8.55 m ha) fourth in production (21.3 m.t) and third in productivity (2.54 t/ha) among Cereals. Maize has diverse uses i.e., for human consumption (24%), as poultry feed (52%), as animal feed (11%), as raw material in many Industries (11%), as seed (1%) and for brewery (1%). Though maize can be grown in all seasons because of the favorable climatic conditions, it is mainly grown as a major Kharif crop in most States in India and rabi crop in Andhra Pradesh and Tamil Nadu. In the Telugu states 7.5 lakh hectares are grown with Maize and produce 40 lakh tons with a productivity of 5317 kg/ha. Maize is preferred over other cereals because it has less water requirement compared to rice, the least pest and disease problems, and high demand for its byproducts and export potential. Specialty corn like sweet corn, popcorn, baby corn, and Quality Protein Maize, etc. cultivation also ensures additional income to the farmers and there lies a bright future for value-added products, which can ensure additional income to the farmers

Soil

Maize can be grown on a wide variety of soils ranging from heavy clays to light sandy ones. It grows best on deep fertile, organic matter rich, friable, well drained medium textured soils with good water holding capacity. The optimal pH range is 6.5 to 7.5. Alkaline, Saline and waterlogged soils (low lying areas) should be

avoided since the crop suffers adversely just after germination. Climate Maize can be successfully grown in a wide range of agro-climatic conditions. Being a warm weather loving crop, It is not grown in areas where the daily temperature is less than 19° C. It will be faster and less variable at a soil temperature of 16 to 18° C At 20° C, it takes 56 days to emerge. The critical temperature detrimentally affecting the yield is 32°C. Maize cannot withstand frost at any stage, frost can damage the plant at all growth stages. It can be successfully grown in areas with an annual rainfall of 60 cm, well distributed throughout the growing stages.

Season Kharif :

Wherever irrigation facility exists optimum time for kharif sowing is a fortnight before the monsoon so that the crop can establish well, overcoming initial weed competition. This practice has given a 15% higher yield than those sown with or after the onset of monsoon. The most suitable date of sowing is between June 15th to and July 15th. Rabi: For rabi maize, the most suitable date of sowing is between 15th October to 15th November in Telangana state and up to the first week of January in the Coastal area of AP State. Wide variation in day and night temperatures during rabi helps in higher production. Pest and disease are less because daylight is more. Varieties 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. Sowing It is desirable to sow the crop on ridges to avoid damage due to waterlogging and to provide adequate moisture in the root zone. Sowing can also be done on a flat surface in lighter soils followed by earthing up as soon as the weather permits, to avoid lodging. For obtaining optimum plant density, it is desirable to use a seed rate of 810 kgs/acre. Spacing & Planting Under the drip irrigation system two rows of maize on one lateral i.e., 1522 cm from drip lateral on either side, as shown in the picture. Plant to plant spacing is 15 to 20 cm

depending on the soil condition. Desired planting density to achieve maximal yield: 33,333 plants/acre. For silage, plant density may be increased to as high as 48000 plants/acre. Drip System Details Lateral to lateral spacing 1.2 mts of 16mm: Dripper discharge 4 lph: Dripper spacing 0.60 mts (in black soils) & 0.40 to 0.50 mts in lighter soils. 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 the first 30 days after sowing. Chemical control of weeds with preemergence 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 23 days after sowing on moist condition of the soil. Followed by Inter cultivation should be done at 35-40 days (knee-high stage). Intercultivation should not be more than 35 cm 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 of 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 of water is required in rabi season. 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.

The Critical stages for moisture stress in maize are flowering, grain filling, and dough stages. A yield reduction of 40-50% was noticed due to and inorganic sources of nutrients should be adopted.

moisture stress during the flowering to the 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.

Efficient water management is the key to increasing the productivity of maize. Pre-sowing irrigation to field capacity is very important, as maize seed will not germinate unless it absorbs moisture to double its weight.

Drip irrigation can save 25-30% of water, increase water use efficiency to 75-90%, and result in 20-50% higher yields.

The monthwise daily irrigation schedules for Kharif & Rabi maize are given below.

If the rainfall is 10 cms stop irrigation for 23 days depending on the soil

The daily irrigation schedule has to be followed after reaching the field capacity

The daily irrigation schedule varies from location to location and the time of plating

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 grain produced removes 15-18 kg of N, 2.53 kg of P₂O₅, and 34 kg of K₂O from the soil. The 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 P₂O₅ 135 kg K₂O and 30 kg ZnSO₄. To maintain soil productivity on a sustainable basis, an integrated nutrient management approach, using both organic

Maize Crop protection

Insects in Maize

- ✚ Stem fly: *Atherigona orientalis*
- ✚ Web worm: *Cryptoblabes gnidiella*
- ✚ Stem borer: *Chilo partellus*
- ✚ Ash weevil: *Mylocerus* sp
- ✚ Pink stem borer: *Sesamia inferens*

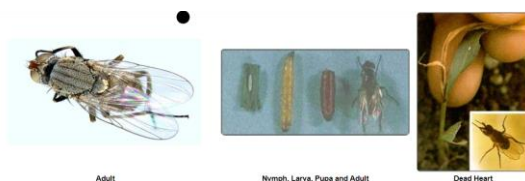
- ✚ Leafhopper: *Pyrilla perpusilla*

- ✚ Corn worm: *Helicoverpa armigera*
- ✚ Aphid or Plant lice: *Rhopalosiphum maidis*
- ✚ Ear head bug: *Calocoris angustatus*

- ✚ Shoot bug: *Peregrinus maidis*

1. Stem fly: *Atherigona orientalis*

The maggot feeds on the young growing shoots results in “**dead hearts**”.



Identification of the pest

Egg - Bead like laid in rows within the leaf sheath

Larva - Pinkish brown with dark head

Adult - Straw-coloured moth with white wings

Stem borer: *Chilo partellus*



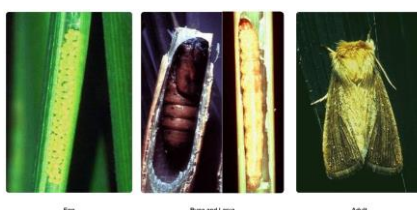
Identification of the pest

Larva - Yellowish brown with a brown head

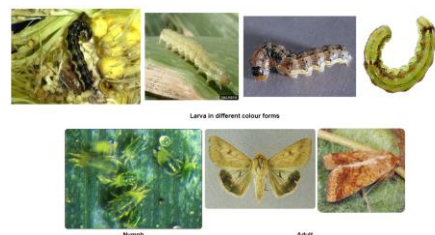
Adult - Moth is medium size, straw-colored

Pink stem borer: *Sesamia inferens*

Pink larva enters into the stem causing dead heart symptoms.



Corn worm/Earworm: *Helicoverpa armigera*



Symptom of damage

- Nymphs and adult suck the juice from within the grains when they are in the milky stage.
- Grains shrink and turn black in colour and ill filled (or) chaffy.
- Orange and pale green nymphs and adults are seen on the ear head.

Identification of the pest

Egg - Blue cigar-shaped, laid under the glumes or into the middle of the florets

Nymphs - Slender, green in color

Adults - Male is green in color. The female is green with a brown margin

2. Ear head bug: *Calocoris angustatus*

symptom of damage

Nymphs and adults suck the juice from within the grains when they are in the milky stage. Grains shrink and turn black in color and ill-filled (or) chaffy.

Orange and pale green nymphs and adults are seen on the ear head.

Identification of the pest

Egg - Blue cigar shaped, laid under the glumes or into the middle of the florets

Nymphs - Slender, green in colour

Adults - Male is green in colour. Female is green with a brown margin



3. Ash weevil: *Myndocerus* sp.



Symptom of damage

larva feeds on the secondary roots and adults on the leaves.

Identification of the pest: Adult - Grey-colored weevil.

4. Leafhopper: *Pyrilla perpusilla*

Symptoms of damaged

leaves become yellow

Covered with black sooty mould

Top leaves get dried up and lateral buds germinate

Identification of the pest

Nymph - Soft, pale brown dorsally and pale orange ventrally

Adult - Straw-coloured, head pointing forward as a snow



Aphids



Winged Adult



Colony of aphids



Nymph



Nymph

Symptom of damage

Plants become unhealthy stunted and yellow. The leaves wither from the top downwards. Panicle formation is inhibited and the plants die if the attack is severe. Honeydew secreted by the bug causes growth of sooty mould on leaves. The midribs of the leaves turn red due to egg-laying and may dry up subsequently.

Identification of the pest

Egg: Laid inside the leaf tissue and covered with a white waxy substance.

Adult: Yellowish brown to dark brown with translucent wings.



Nymph



Adult



Diseases in Maize

1. Downy mildew:

Symptoms:

Systemic infection as chlorosis which appears 10-14 days.

Leaves tend to be narrower and more erect.

Plants infected early usually die at four weeks after infection.

Chlorosis is noticeable on the lower half of the leaf: Half-leaf symptom

Chlorosis gradually covers the entire leaf surface at a later stage

A white downy growth is seen on the lower leaf surface under humid warm conditions

Systemically infected plants do not form cob and if it form they are small and poorly filled



Sorghum Downy Mildew in maize :

Leaf Symptoms and conidiophore & conidia

Symptoms

Leaves are narrow, strap-like and leathery.

Stunting and chlorotic striping of leaves.

Excessive tillering rolling and twisting of upper leaves

Partial or complete changes from normal floral parts to small leaves: crazy top

Plants may produce numerous ear shoots and phyllodies of ears.

Pathogen :

Mycelium - non-septate, inter-cellular, systemic and obligate

Conidiophores are erect, fragile, hyaline usually dichotomously branched Sporangia germinate directly and infect the plants

Oospores are spherical, thick-walled and deep brown

Leaf Blight:

Symptoms:

Long cigar-shaped grey-green to tan-colored lesions on lower leaves.

Tan lesions are slender and oblong tapering at the ends and ranging in size from 1 to 6 inches.



Chlorotic streaks on leaves

Lesions run parallel to leaf margins and they coalesce and cover entire leaf.

Spores are produced on the underside of the leaf.

Below the lesions, fungus gives the dusty black/green fuzz appearance

Leaves become greyish-green and brittle, resembling leaves killed by frost.

Pathogen :

Mycelium septate, branched and brownish.

Conidiophores are simple, cylindrical, and septate.

Conidia are olive grey and spindle-shaped, curved, and elongated with one to nine septa.



Blighting of leaves

Charcoal rot: *Macrophomina phaseolina*

Symptoms:

- Plants exhibit wilting symptoms
- Plants mature, the fungus spreads into the lower internodes of the stalk
- Causing premature ripening, shredding, and breaking at the crown region
- Stalk of infected plants with greyish streak
- The pith becomes shredded and greyish-black minute sclerotia develop on the vascular bundles Shredding of the interior

Common Rust: *Puccinia sorghi*

Symptoms:

Minute flecks appear on both sides of the leaves.
Circular to elongate cinnamon brown, powdery, erumpent pustules on both leaf surfaces
As the crop matures brownish black pustules develop
In severe cases, infection spreads to the sheath and other parts

Pathogen:

Puccinia sorghi is a heteroecious rust.
Uredospores single-celled, echinulate, yellowish brown, pedicellate, elliptical
Teliospores are reddish or brown in colour, two-celled, rounded at the apex
Alternate hosts - *Oxalis europaea*, *O. corniculata* and *O. stricta*
Basidiospores infect *Oxalis corniculata*, where pycnial and aecial stages occur
Aeciospores carried by wind and infect maize



Aspergillus rot / Aflatoxin contamination rot: *Aspergillus flavus* and *A. parasiticus*

Symptoms: Appears as an olive-green mould on the kernels from the tip of the ear
Fungal spores appear as powdery and may disperse like dust when you pull back the husk
Fungus produces a mycotoxin known as aflatoxin (B1, B2, G1 and G2)
Aflatoxin affects grain quality and marketability, as well as livestock health if the grain is consumed
Aflatoxin is extremely carcinogenic and most countries have regulations (20 ppb)

Favorable condition:

During hot, dry years stressed plants
Feeding damage from ear-invading insects and injury by birds or hail



Maize Crop production details

Maize Crop Details

Crop	Maize
Soil	Medium black
Area	1 Acres
Sowing Time	May- June- July - Kharif Oct Nov- Rabi
Planting distance	30cm X 20cms
Variety	Advanta 751 Syngenta Pioneer.

Cost of Cultivation per Acre

Cost of cultivation Maize (1 acre)	
Seed	3000
Input	7733
Manpower	4000
Land preparation	3500
Harvesting	4000
Land rent	5000
Total	27233

Income per acre

Details	Calculations
The total cost of cultivation per acre	27233
Total Production per acre	30 QTLS
Rupiya offered Rate per QTL	1900
Total income per acre	57000
Net Profit	29767
Cost-benefit ratio	1:2.24

Definition of quality parameter :

1. Moisture content : Less than 13.5%
2. Grain Size : Less than 350 grains for every 100 grams
3. Damages : Less than 2%
4. Fungus : less than 2%
5. Discoloured Grain : Less than 2% above 2% & below 5% penalty will be applicable.
6. Weight at the time of unloading will be final and will be considered Invoice date of transaction.

Note: The above given figures are for educational purposes only actual figures may vary depending upon the climate, soil, variety of seed, season & agronomical practices.

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