



MAIZ (CORN) CULTIVATION IN PAKISTAN
MAIZE: ZEA MAYS L.
FAMILY: POACEAE



1. INTRODUCTION

Maize being the highest yielding cereal crop in the world is a significant importance for countries like Pakistan, where rapidly increasing population has already out stripped the available food supplies. Maize ranks third most grown crop in the world with an area of more than 118 million hectares with an annual production of about 600 million metric tons. In Pakistan, maize is the fourth largest grown crop after wheat, cotton and rice. The area under maize here is over one million hectares and production 3.5 million metric tons. Punjab contributes 39 per cent of the total area under maize and 30 per cent of total production; KPK contributes 56 per cent of the total area and 63 per cent of the production while five per cent of the total area and three per cent of the total production is contributed by Sindh and Baluchistan.

2. NUTRICIOUS VALUE AND USES OF MAIZE

Maize has a variety of uses. Its grain is a rich source of starch 72%, vitamins A & B 3 – 5%, proteins 10%, 4.8% oil, 5.8 % fiber, 3.0% sugar and 1.7% ash. One hundred gram of fresh grain contains 361 calories of energy, 9.4g protein; 4.3g



fat, 74.4g carbohydrate, 1.8g fiber, 1.3g ash, 10.6 per cent water, 140mg vitamins, 9mg calcium, 290mg, phosphorus and 2.5mg iron. It is a source of raw material for industry, where it is being extensively used for the preparation of corn starch, corn oil, dextrose, corn syrup, corn flakes, cosmetics, wax, alcohol and tanning material for leather industry.

Ethanol obtained from maize can be used as a biomass fuel. Stigmas from female corn flowers, known as corn silk, can be used as herbal supplements. Maize can be used as forage, feed for livestock and making silage after fermentation of corn stocks. Maize is used extensively as the main source of calories in animal feeding and feed formulation. Maize gives the highest conversion of dry substance to meat, milk and eggs compared to other cereal grains. Maize is a valuable feed grain, because it is among the highest in net energy content and lowest in protein and fiber content. Animals like and eat it readily.

3. GROWTH HABITS

It is annual cross-pollinated crop having erect, thick and strong culms or stalk with nodes and internodes. The corn leaf consists of the blade, sheath and collar like ligule. It is normally monoecious with staminate and pistillate flowers produce on the tassel and ear. Typical corn plant develops 20 to 21 total leaves, silk about 65 days after emergence, and mature around 100 – 125 days after emergence. The specific time interval, however, can vary among hybrids, environments, planting date and location.

4. GROWTH STAGES

A growing plant of maize passes through many growth stages as described below.

i. Seedling Stage

This is the sprouting stage which comes about one week after sowing and plants have about 2 – 4 leaves at this stage.

ii. Grand Growth Stage

This is knee height stage of the plant which arrives about 35 to 45 days after sowing. Plants need first nitrogenous fertilizer and final mechanical or manual inter-cultivation at this stage. If this operation is delayed for some days, the leaves will be damaged.

iii. Tasseling Stage

This stage is more technically called as flowering initiation stage. At this stage, the tassels (male flowers) are formed at the apex of the plant after 14 to 15



leaves have come out. Final application of nitrogenous fertilizers is done at this stage. Fertilizer application after this stage does not give any response.

iv. Silting Stage

This stage of maize plant is also known as comb initiation stage. At this stage the female flowers or cobs are formed in the axis of the 13th of leaf.

v. Soft Dough Stage

This may also be called as milky stage. It commences after pollination and fertilization are over. At this stage, grains start developing but they do not become hard. This stage may be guessed by seeing the silks on the top of the cob which remain partially green and the covering of the cobs also remain green at this stage. This is the best stage for using the green cob for table purposes.

vi. Hard Dough Stage

This is the maturity stage at which the leaves get dried, silks vanish or they get dried completely and become very brittle. Harvesting should be done at this stage.

5. HYBRID VARIETIES

Genetically modified (GM) corn is being adopted across the globe and Pakistani farmers can also benefit a lot by using GM corn as it can significantly reduce the losses caused by various insect pests, weeds and thus cost of production would come down. After the introduction of hybrid maize during the 1990s, farmers have gradually shifted to hybrid maize from traditional/Open Pollinated Varieties (OPVs) as hybrid maize has increased production from a mere 30 maund/acre to 80-120 maund/acre. The gap between the realized and potential yields can be bridged up by adopting suitable agronomic practices and minimizing the biotic and abiotic stresses on the crop.

There are two main companies have a good quality hybrid seeds i.e. Pioneer, Monsanto. The maize hybrids possess capability of producing more than 12 tones grains per hectare which is very high as compared with 3.48 tons per hectare, the average yield of maize in Pakistan.

6. SOIL

Maize is adapted to wide variety of soil but to get more yields it requires fertile deep and well-drained soils. Soils with a pH range of 6.5 – 7.5 are most favorable. Well drained, heavy soils with high organic matter content and good water holding capacity give high production. Waterlogged soil is most harmful for its cultivation.



7. CLIMATE

Maize is a warm weather plant and it grows from sea level to 3000 meters altitude. It can be grown under diverse climatic conditions also. It is grown in many parts of the country throughout the year. Kharif (monsoon) season is the main growing season. However, maize may be sown any time from March to October, as climate is warm even in the winter season. Maize requires considerable moisture and warmth from germination to flowering. The most suitable temperature for germination is 21°C and for growth 32°C. Extremely high temperature and low humidity during flowering damage the foliage desiccate the pollen and interfere with proper pollination, resulting in poor grain formation. Maize is very sensitive to stagnant water, particularly during its early stages of growth.

8. SEED BED PREPARATION

Favorable conditions for germination and seedling establishment are the important objectives of seed bed preparation. The field should be given 3 – 4 times intercrossing harrowings followed by planking with each plough.

In the case of drilling the field should be pre irrigated with 1 – 1.5 acre inch to fill the soil profile. After field capacity or field condition the light harrowing with planking should be done to preserve the soil moisture. Normal fine soil with small clods and compact bed is needed for maize.

9. SOWING TIME

In Pakistan maize crop is mainly grown in two seasons i.e. spring and autumn. Spring maize can be planted in the first week of February to first week of March or from mid-December to mid-March and for autumn maize sowing time from mid-May to August.

10. SEED RATE

Seed rate for hybrid maize is 8 – 10 kg per acre in the case of ridges sowing. Seed is dressed with some systemic insecticide, for example imidacloprid at the rate of 1g per kg of seed. Seed rate for fodder crop or for broadcasting is 40 – 50 kg per acre.

11. SOWING METHODS

Maize can be sown on both flat soils as well as on the ridges. Ridge sowing is better for water saving on flood irrigation. Ridges are made 75 cm apart with a



tractor drawn ridger. Choka method or manual sowing is practiced for ridge sowing.

In case of flat sowing, maize is sown with automatic tractor drawn drill or manual/hand drill with 75 cm distance between the rows. Thinning is done after 10 – 15 days of emergence, consisting pulling out or cutting the weak plants and maintaining a plant to plant distance of 20 – 25cm or 8 – 10 inches. A plant population of 30,000 to 33,000 per acre is unavoidable to harvest optimal yields.

12.FERTILIZER

To obtain higher yields maintaining soil fertility is necessary to add manures or fertilizers to the soil. 300 – 400 maunds of farm yard manures, three to four weeks before sowing should be applied and mixed with soil. If FYM is not available then green manuring is recommended.

Per acre recommended fertilizer dose for maize is 2 bags of DAP, 3.5 bags of Urea, 2 bags of SOP and one bag of Zinc sulphate of 10 kg. All phosphorus and potassium are side dressed at the time of drilling or incorporated at the time of land preparation and Zinc Sulphate is applied with 2nd irrigation. Urea should be applied through fertigation system, 1st application half bag 15 – 20 days after emergence, 2nd application one bag 30 – 40 DAE, 3rd application one bag 50 – 55 DAE and 4th application 60 – 65 DAE.

13.IRRIGATION

Maize is drought sensitive crop and requires frequent irrigations for successful vegetative and reproductive growth. Drought will restrict many physiological processes leading to reduced yields.

There are two major benefits of a Center Pivot System. The first is simply that plants receive water on a regular and consistent basis. Pivot irrigation systems allow plants to receive water every 3 days, on average. This allows the water to soak into the ground, promoting deep root growth which in turn encourages healthy plants.

The second benefit to a center pivot is that water loss because of evaporation and drifting in the breeze is minimized. Pivots allow the sprinkler heads to be lowered to just inches above the tops of the plants, thus ensuring that most of the water reaches the crop and doesn't blow away in the wind. Maize crop water requirement is 22 – 27 inches or 550 – 700 mm.



Typical Maize Irrigation Scheduling for Thal Desert Punjab Pakistan

Month	May	June	July	August	September
ETo	6.55	7.20	6.08	5.55	4.90
Kc	0.70	0.9	1.20	0.60	0.35
ET	4.58	6.48	7.29	3.33	1.71
Days	31	30	31	31	30
ET for the Period	142	194	226	103	51
Precipitation for the Period	15	15	61	44	16
Net Water Requirement in mm	127	179	165	59	35

Drought/Moisture Stress

Under normal condition the maize crop yield may be affected up to 10 – 13%, but during the severe years of drought the loss may increase many folds. The problem is more severe under barani conditions covering an area of 25 – 30% of major crop planted in the country.

14. INSECT PEST AND DISEASE

a. Stem Borer

Immediately after emergence, maize crop faces a serious threat of shoot fly and stem borer attack. Stem borer bores into the stem and makes a hole in the stem. Maize stem borer is a single major insect problem which will reduce the average and yield by about 10-30% under normal conditions. The loss may reach as high as 50% if the crop is planted earlier and environment is favorable. Furadon powder should be dropped into the shoots or broadcast at the rate of 20 kg ha⁻¹ followed by irrigation. This practice should be repeated twice at 1 – 2 week interval.

A considerable success has been achieved and germplasm MBR-25 has been identified through series of observation under natural and artificial stresses. The new material has shown a considerable tolerance for the maize stem borer.

b. Stalk Rot Disease and Leaf Blight Disease

Maize stalk rot disease is a serious problem causing economic losses to maize crop. The continuous selection & introgression (hybridization) of tropical brood (reduction in the temperature) in the improved major varieties have proved extremely helpful. With these research efforts the presently all of the improved varieties can be grown without occurring any economic damage by the stalk of disease which has been eliminated to a level of non-significant existence. Similarly selection and breeding for leaf blight tolerance is a regular feature of research activities.



15. WEED MANAGEMENT

Weeds reduce maize yield by 29 – 43 per cent or even more. Competition of weeds with maize plants is maximum 2 – 5 weeks after crop emergence. The most common weeds of maize in Pakistan include purple nutsedge (deela), horsepurslane (itsit), slender amaranth (jangli chulai, kurand), digera (tandla), jungle rice (jangli swank), burclover (maina) and swine cress (jangli haloon).

For the control of common Broad leaf weeds & sedges Primextra Gold 720SC herbicide at 400 – 800 ml per acre after 1st irrigation in moist field is effective to control these weeds. Dual Gold at 800 ml per acre is used as pre-emergence herbicide. A hand hoeing about 25 days after sowing provides satisfactory weed control at small scale.

16. HARVESTING

Maize crop is harvested when the moisture content of the grains are 20 – 25 per cent. The cob sheath dries completely at this stage, some drying may occur on the stalk. Cobs are removed from standing crop and dried under sunlight until the moisture content of the grains is below 15 per cent.

17. SHELLING

Hand operated or powered maize shellers are better than manual or hand shelling for safe exclusion of dried maize grains from cobs. Shelled maize grains after cleaning are stored in jute sacks in a cool, dry and airy place, either on a cement floor or on wooden planks; it should not be stored on earthen floors. The temperature of store room is kept 20 – 25 °C while relative humidity is maintained at 30 – 50 percent.

18. YIELD

The maize hybrids possess capability of producing more than 120 maunds grains per acre. The yield of local varieties is 40 – 50 maunds per acre.



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