

MAIZE

MAIZE is of special importance in hilly and sub-mountainous regions of Jammu Division where it forms staple diet of the people. It occupies highest area under cultivation in the state. In spite of the fact that maize occupies of major area during Kharif season, the yield is low. The low yield is because of local seeds and traditional agronomical practices. Hybrids and composites are the high yielding varieties of maize, which have the potential of out yielding the local varieties by many folds.

We can boost maize production by adopting the following practices.

CLIMATIC REQUIREMENTS:- Maize requires considerable moisture and warmth from the beginning of sowing to the end of flowering. Extremely high temperature and low humidity during the flowering period desiccate the pollen and interfere with proper pollination, which results in poor grain formation.

Rainfall varying from 50 cm to 75 cm during vegetative growth period is conducive to the proper development of maize plant. Maize is very sensitive to water particularly during the early growth and at flowering stages. Maximum reduction in yield occurs when crop remains under moisture stress at flowering stage.

SELECTION OF LAND:- Maize can be grown on a variety of soils but it performs well on well drained fertile loams and silt loams.

Select fertile, well drained and levelled fields for growing of hybrid/composite varieties of Maize.

PREPARATION OF LAND:- To achieve the desired tilth, plough the land with Tawi plough (soil turning plough) and subsequently with disc harrow or traphali or soil stirring plough 3 to 4 times. Each ploughing should be followed by planking to ensure fine tilth and conservation of moisture.

VARIETIES:

HYBRID MAIZE:

GANGA SAFED 2 (GS-2):- This variety is suitable for sub-tropical areas of Jammu Division where white maize is preferred. It matures in 95-100 days. This variety is best under the following crop rotation.

1. Maize - Wheat
2. Maize - Toria local----- Wheat HD-1553 (Irrigated areas)
3. Maize - Potato----- Wheat
4. Maize - Sarson----- Moong/Mash
5. Maize - Potato----- Fodder/Moong or Mash

HIM-123:- This variety is suitable for temperate and warm temperate areas.

COMPOSITE MAIZE:-

1. **VIJAY:**- This variety has semiflint yellow grains and is suitable for the areas, which fall between 600m to 1350m height. This variety can be rotated with other crops depending upon the altitude.
2. **C-6 (SHALIMAR):**- Orange yellow flint variety, suitable for hilly areas which fall between 1050m to 1800m height. This variety can be rotated with early crop of oilseeds, barley or vegetable pea upto 1500m height.
3. **C-2:**- This is a yellow grained variety and is suitable for the hilly areas which fall between 1050m to 1800m height.
4. **SUPER COMPOSITE (MANSAR):**- It has orange flint grains with a yield potential of 50-60 q/ha. It is also recommended for mid elevation and plains of Jammu.
5. **COMPOSITE (TRIKUTA):**- It has orange flint grains with a yield potential of 50-60 q/ha. It is also recommended for mid elevation & plains of Jammu.

The above two composites have out yielded local varieties by 50% and are more resistant to diseases than local varieties.

6. **COMPOSITE C-8:**- This variety has creamy white, bold, semiflint to samident grains variety having a yield potential of 55-60

a/ha. It is recommended for mid elevation and plains of Jammu. It can fit into different crop rotations similar to hybrid maize GS-2 under sub-tropical areas of Jammu.

7. **COMPOSITE C-15 (REHMAT):-** It is an early maturing composite suitable for higher elevations upto an altitude of 2250 m. It has yellow dent, semident grains and a yield potential of 50-60 q/ha. It is also suited for hilly regions of Jammu.

NOTE:-

1. Always sow fresh and certified seed of hybrid / composite maize.
2. Purchase hybrid maize seed every year.
3. Seeds of composite varieties can be used for 2-3 years. If the seed is selected from the previous crop carefully select 3000 to 5000 cobs from the central portion of the field leaving 9m all-round and keep desired quantity of seed for next year sowing obtained from the mixed lot or the selected cobs.

SEED RATE

1. **FOR PLAIN AREAS:-** Use 20 kg of seed/ha for line sown crop. In case of broadcast sowing, use 30 kg of seed/ha.
2. **HILLY AREAS:-** Use 35-40 kg seed/ha.

SEED TREATMENT:- To avoid diseases ensure seed treatment before sowing. Seed treatment also helps in better germination. Before sowing, treat the seed with Captan or Thiram @ 3g per kg of seed. Where head smut is a problem, treat the seed with carboxin W.P. at 2.5 g per kg of seed or carbendazim 2 g / kg seed.

TIME OF SOWING:-

S. No.	Variety	Area of adoption	Date of sowing
1.	GS-2	Irrigated plains	1 st fortnight of June.
	C-8, C-5 Mansar	Unirrigated plains	With the onset of monsoon, but in no case the sowing should be extended beyond 10 th July.
2.	GS-2 Mansar Vijay C-5 C-8	Intermediate	With the onset of monsoon but in no case sowing should be extended beyond 30 th June. GS-2 can be sown upto 600 m altitude only.
3.	Mansar C-2 C-6 Vijay Local tall Him-123 C-15	Temperate	Upto 1500 m, sowing can be done from April to 15 th May. And above 1500 m it should be done in the month of April only. Vijay is recommended upto 1350m. Sowing with local tall maize should be done in the month of April. C-15 is recommended upto an altitude of 2250 m.

METHOD OF SOWING:- Maize being a rainy season crop, there is every chance of more weeds and therefore to facilitate weeding and inter culture operations, it should be sown in lines 75 cm apart in case of hybrid maize and at 60 cm apart in case of composite maize. The distance 20 cm from plant to plant may be kept, which will provide the desired plant population for higher production. Use of weedicide like atrazine can also be made @ 1 kg a.i./ ha.

Sowing may be done with a seed drill (Tractor driven or Bullock drawn or manually operated or behind the plough) to a depth of 3-5 cm.

In case of broadcasting, broadcast the seed uniformly in the entire area so that uniform plant population may be achieved.

Maize can also be grown mixed with Rajmash in zone No. IV (8.1) and with cowpeas in Zone No, I, II and III (8.1) and with Mash in Zone No. 1 (1:1).

Following maize +pulse intercropping systems with one row of pulse in between two rows of maize are recommended for zone I and zone II.

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| <ol style="list-style-type: none"> 1. Maize + Moong 2. Maize + Mash 3. Maize + Cowpea | } | <p>Use recommended seed rate for maize and 1/3rd of the recommended seed rate for pulses</p> |
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MANURES AND FERTILIZERS:-

1. Apply 150 quintals well rotten FYM or Compost/ha & incorporate into the soil thoroughly with the first plough.
2. In addition to FYM/Compost application, balanced application of chemical fertilizers is also necessary. For balanced fertilizer, application the soil should be got tested prior to sowing of the crops.
3. However, in general, for average fertility conditions, the following dose of chemical fertilizers is recommended. If 150 quintals of FYM/Compost is added, reduce the quantity of below noted nutrients by 25%.

S.No.	Nutrients requirement (kg/ha)				
	Area	N	P	K	Zinc sulphate
1.	Irrigated plain areas	90	60	30	25
2.	Unirrigated plain areas and hilly areas	60	40	20	10

The above mentioned plant nutrients can be obtained from the following fertilizer combination:

S.No.	Fertilizer (kg/ha)				
	Area	Urea	DAP	MOP	Zinc sulphate
1.	Irrigated plain areas	145	132	50	25
2.	Un irrigated plain areas	100	90	33	10

NOTE: Zinc sulphate should at least be applied once in three years.

METHOD OF FERTILIZER APPLICATION

- a) Drill entire quantity of P and K along with zinc sulphate and 2/3rd N at the time of sowing with pona as basal dose.
- b) Remaining quantity of nitrogen may be applied as top dressing in two equal splits – 1st when the plants are knee high stage i.e. a month after sowing and 2nd before tassel formation i.e., about two months after sowing.

NOTE: Top dressing of urea should always be done in the after noon hours when foliage is dry otherwise urea will burn the foliage.

WEED CONTROL

- (i) **CULTURAL PRACTICES:-** Maize crop should be kept free of weeds upto 40 days after sowing, otherwise yield is considerably reduced.

Two hoeings to the crop should be given, one at 15 days and other at 30 days after sowing. Weeds within the rows can be effectively controlled by using traphali or 5 tinned hoes. This can be done with khurpa or hand blade hoe too.

The crop should also be earthened up with bullock drawn ridger or with a spade when the crop is at knee high stage (after one month of sowing)

NOTE: No inter culture should be done after 6 weeks of sowing since this would lead to pruning of fine roots and finally reduce the production.

- (ii) **CHEMICAL METHOD:-** Atrazine herbicide @ 1.0 kg a. i./ha in 800-1000 L of water should be sprayed on soil surface just after sowing as pre-emergence application to control weeds in the sole crop of maize. Herbicides recommended for maize + pulse intercrops are as follow;

1. Pendimethalin @ 1kg a.i./ha (Pre-emergence)
2. Fluchloralin @0.75 kg a.i./ha (Preplant incorporation)

IRRIGATION AND WATER MANAGEMENT:- Maize is a rainy season crop and does not withstand water logging, hence arrangements for drainage of excess water from the maize field should

always be made at the time of sowing. This can be done by providing shallow surface drains at suitable intervals and main drainage channel.

For irrigated crop, irrigate the field 5 to 7 days earlier to sowing and when soil comes to proper "Vatter" conditions sow the seed.

Irrigate the crop as and when necessary never allow the crop to suffer from water stress condition. Moisture stress at flowering and at grain formation stages reduces the yield, tremendously. Hence irrigate the crop at these stages if there is no rain water available.

Never allow water to stand in the field for more than 3 hours.

PLANT PROTECTION:-

INSECT PEST AND THEIR CONTROL

S. No.	Name of insect and symptoms of attack	Control measures
1.	MAIZE CUT WORM (<i>Agrotis</i> spp.) This is dark brown, a serious pest of maize in hilly areas. Caterpillars after emergence of crop are external feeders for few days but there after they get entry into the soil and assume the habit of cutting. Losses to the crop are caused by cutting the plants in the initial stage at the surface level. Caterpillar cuts more number of plants than it actually consumes and thus losses are very heavy. Adults are black in colour with grey spots on the wings.	Prophylactic measures as indicated below, should be under taken to control maize cut worm before sowing. Mix Chlorpyrifos 1.5 % D or Lindane 1.3% D @ 25 kg /ha in the soil with the last ploughing. Where soil application could not be given spray the crop with Endosulfan 35 E.C. @ 3 L in 1000 L of water per hectare Spraying should be direct on the soil surface.
2.	MAIZE STEM BORER:- (<i>Chiloptellus</i>) This is also a very serious post of maize crop. The larvae first scrape the leaves and then bore into stem through the leaf whorl or leaf sheath. Central shoots of the attacked plants get perforated. In young plants, the growing point is killed and a dead heart is caused. The adults are yellowish brown in colour.	1. Uproot the stubbles of previous years crop and burn. Spray the crop with methy demeton 25 E.C. @ 1.125 L/ha in 750 L of water or endosulfan 35 E.C. @ 1.5 L/ha in 750 L of water. 2. Apply granular insecticides to control stem borer, viz phorate 10 G @ 10 kg/ha or carbofuran 3 G @ 20 kg/ha.

		The granules can be applied with small perforated tins directly into the whorls.
3.	ARMY WORMS:- This pest is prevalent in hilly region of the Jammu division. The caterpillar feed on the leaves at night and rest in whorls during day. In case of severe infestation feeding may be observed during day also.	<p>i) Collection and destruction of moths by using any light device (Lantern, electric bulb etc.) by placing trays containing kerosine + water (1:3) below light source.</p> <p>ii) By digging 6"x9" deep trench around the infested field and killing there in morning hours mechanically. or By placing grss on the bunds and hidden caterpillar be killed as mentioned above.</p> <p>iii) Spray the crop with endosulfan 35 EC @ 1.5 L/ha or carbaryl 50% WP @ 1.5 kg/ha in 750 L of water.</p>
4.	BLISTER BEETLE: The adults feed on the silk of the cobs and affect the pollination. In initial stage the beetle feeds on the leaves also. As many as 8-10 beetles have been observed per plant. These are most destructive in temperate region of the division but have also been observed causing damage in sub-tropical areas.	<p>i) Spray the crop with carbaryl 50% WP @ 2 kg/ha in 1000 L of water at tasselling stage. or Endosulfan 35 EC @ 2 L/ha in 1000L of water. Since plant height at this stage is maximum, spray should preferably be done with foot or rocking spray pumps.</p> <p>ii) Raising 1 to 2 rows of trap crop like bhindi, sunkukera or Arhar around the field and destruction of beetles be done mechanically.</p>
5.	APHIDS: Aphids attack is serious on all high-yielding varieties of maize. It appears at the tasselling stage and sucks the sap from the tassels. In case of high build up of population, whole pollen grains are covered or plant loses its vitality.	Spray the crop with Dimethoate 30EC @ or methyl demeton 25 EC @ 1 L/ha in 1000L of water.

6.	HAIRY CATERPILLARS:- Caterpillars feed on the leaves or in case of severe infestation whole leaf blade is consumed and plant is reduced to mere skeleton. It also feeds on silk and milky grains.	Spray the crop with Carbaryl 50% WP @ 2 kg/ha in 1000 L of water and use foot or rocking spray pump. or Endosulfan 35 EC @ 1.5 L in 750 L of water per hectare.
7.	MAIZE JASSIDS:- It is a serious pest of maize in temperate region particularly in Doda district. The nymphs and adults suck the cell sap from the leaves as result the leaves turn papery and finally dry up.	Spray with Dimethoate 30 EC 2 L/ha or Endosulfan 35 EC @ 1.5 L/ha in 750 L of water.
8.	WHITE GRUB:- Adults feed on leaves. Grubs feed on roots, thus up-take of nutrients is reduced.	Use Chlorpyrifos 1.5% D or Lindane 1.3% D @ 25 kg/ha. or Phorate 10G @ 25 kg/ha. Spray the surrounding area with 0.2% Carbaryl 50% WP @ 4 g in one L of water.

DISEASES AND THEIR CONTROL

1.	HEAD SMUT: - The whole cob is replaced with a black spore mass and there is complete grain loss.	(i) Sanitation (ii) Crop rotation for 2-3 years (iii) Uproot the affected plants and destroy.
2.	COMMON SMUT: - (<i>U.maydis</i>) Produces galls on the ears, axillary buds, tassels, stalks and more rarely on leaves, galls are dull white in colour and on rupturing expose the black powdery mass of spores.	Treat the seed with Captan @ 3 g/kg of seed or carbendazim @ 2 g/kg of seed
3.	STALK ROT:- The fields affected with the disease emit a typical vinegar (sirka) smell. The diseased plants topple down from the affected spots.	Uproot the affected plants. If need arises drenching near the collar region with mancozeb 2.5 kg + 50g Streptocycline in 1000 L of water.
4.	LEAF BLIGHT:- Long elliptical greenish brown lesions on leaves. Affected leaves are thin and semi-transparent. Diseased plants look burnt or frost bitten.	1. Clean cultivation always helps to reduce the disease attack. 2. Spray the crop with Zineb @ 0.2% at the appearance of disease.

HARVESTING:- The hybrid and composite maize plants remain green even when the crop is ready for harvest. When husk cover over the cobs dries and turns brown and grain hardens, the crop should be harvested.

The grains from dried cobs should be shelled with traditional methods or with hand corn-sheller and dried in sun for safe storage.

IMPORTANT HINTS FOR MAXIMIZING YIELD

1. Always purchase fresh certified seed of Hybrid Maize.
2. Provide proper water drainage system in maize.
3. Sow maize in lines for efficient weeding, interculture operations and provide a weed free environment in maize fields.
4. Apply recommended doses of fertilizers at proper time and in proper splits.
5. Save the crop from insect pest and diseases by adopting timely plant protection measures.
6. Under dry land conditions special measures can be taken for increasing the yield.
 - (i) For achieving the optimum plant population in crust prone areas, amendments like Branker leaves, FYM, Cowpea straw of 1 cm thick layers may be used on the sown rows.
 - (ii) Conserve soil moisture by laying mulches.
 - (iii) Use foliar application of urea (3%) during dry spells.