



MAIZE PRODUCTION TECHNOLOGIES FOR HIGHER YIELDS IN BIHAR

Mohammad Hashim^{1*}, Kumar Kant Singh¹ and Shiva Dhar²

¹Indian Agricultural Research Institute, Regional Station, Pusa, Bihar 848125

²Indian Agricultural Research Institute New Delhi 110012

*Corresponding author email: hashim.agronomy@gmail.com

ABSTRACT

Maize (Zea mays L) is one of the utmost vital and multipurpose crops of Bihar, having widespread adaptability under diverse agro-climatic conditions. The climate of Bihar is best suitable for cultivating maize crop grown all through the year for numerous purposes. Most parts of Bihar are prone to waterlogging. There is a gap between existing productivity and production to expected or potential levels in the area. There is a need to provide proper knowledge and suitable variety to the farmers of Bihar for the high potential of this crop in the future. There is also a need for a suitable high yielding variety for both flood and drought stress conditions in the area. Adopting suitable production technologies can increase food availability and nutritional security.

INTRODUCTION

Maize (*Zea mays* L) is one of the utmost vital and multipurpose crop of Bihar, having widespread adaptability under diverse agro-climatic conditions. It is grown for feed, fodder and industrial purposes. Maize acts as primary raw material for thousands of industries producing starch, protein, oil, cosmetics, pharmaceutical, gum, alcoholic beverages, textile, and paper industries. The climate of Bihar is best suitable for cultivating maize crop grown all through the year for numerous purposes. Globally, 35% of the total maize production is done by the United States of America (U.S.A.) and made as leading producer.

PRODUCTION TECHNOLOGIES

1. SOIL: Maize is a sensitive crop to moisture and salinity stresses. Maize can be successfully grown in various soils ranging from loamy sand to clay loam except for low lying fields with poor drainage and higher salinity. However, for higher productivity of maize should be grown on soils with good fertility with high water holding capacity and neutral pH.

2. TILLAGE AND CROP PLANTING TECHNIQUES: For different situations and conditions, different sowing methods are required for achieving a higher yield:

Flat planting: Crop can be sown on flat beds by employing seed-cum-fertilizer planters in areas where crop survives on conserved soil moisture and water logging is not a problem.

Furrow planting: In the areas with high evaporation for growth and higher productivity, furrow planting is more economical than flat and raised bed planting.



Fig.1 A view standing maize crop in the field

Raised bed (ridge) planting: In most Bihar, water logging is a major problem during *Kharif* season. Many districts of Bihar, including Patna, Begusarai, Khagaria, Bhagalpur, Katihar, Saharsa, Purnia, Khagaria, Madhepura, Kishanganj, Araria and Supoul, are flood-prone. To escape the crop from waterlogging, excess moisture, and under rainfed conditions, raised bed planting preferred. This method of planting can save 20-30 % irrigation water resulting in higher yields.

Zero-till planting: A zero-tillage system has advantages like less production cost, better resource use efficiency, and higher profitability and crop can be sown with the help of zero-till seed-cum-fertilizer planter with a furrow opener.

3. **SOWING TIME:** Maize can be grown in *Kharif* (monsoon), post-monsoon, *Rabi* (winter) and spring in Bihar. Assured irrigation and good drainage facilities must to achieve higher yield during *Rabi* and spring seasons. For the sowing of *Kharif* maize, the last week of June to the 1st fortnight of July is the optimum time. However, *rabi* maize can also be sown from the last week of October to the 15th of November. The 1st week of February is the optimum time for sowing of spring maize.
4. **SEED RATE, SEED TREATMENT AND SPACING:** The appropriate seed rate given in Table 1 can be adopted to achieve a good yield. Seed treatment should be done before sowing with fungicides and insecticides. To control leaf blight, mixture of Bavistin + Captan in a 1:1 ratio @ 2.0 g kg⁻¹ seed can be employed. To control termite and shoot fly, Imidachlorpid should be applied @ 4.0 g kg⁻¹ seed and protect the crop from B.S.M.D. seed should be treated with Apran 35 SD @ 4.0 g kg⁻¹ seed.

Table 1. Showing the type of maize along with seed rate

S. No.	Type of maize	Seed rate (kg ha ⁻¹)
1.	Hybrids	20-25
2.	Composite	18-20
3.	<i>Kharif</i> maize	15-20
4.	<i>Rabi</i> maize	25-30
5.	Sweet corn	8
6.	Baby corn	25
7.	Fodder	50

5. **NUTRITIONAL REQUIREMENT AND NUTRIENT MANAGEMENT:** Maize is a nutrient responsive crop among all the cereals. To achieve high yields, nutrient management is most important. Well, rotten F.Y.M. @ 10-12 t ha⁻¹ should be incorporated into the field 10-15 days before sowing. Application of 150 kg N, 75 kg P₂O₅, 75 kg K₂O and 25 kg ZnSO₄ ha⁻¹ is recommended for a higher yield of maize. The full P, K and Zn dose should be applied as basal application. Nitrogen should be applied in 3 splits. In both seasons, 25 kg ZnSO₄ ha⁻¹ may be applied if soils are known to be deficient in available zinc. If symptoms appear later, the crop can be sprayed with a 2 g l⁻¹ solution of zinc sulphate.
6. **WATER MANAGEMENT:** In Bihar, maize is grown throughout the year, and the irrigation requirement depends on the season, rainfall and moisture-holding capacity of the soil. However, first irrigation should be applied very carefully in areas with assured irrigation facilities wherein water should not overflow on the ridges/beds. When the crop is in the initial stages, provide proper drainage facilities to drain excess water in heavy rain. In maize crops most sensitive stages for water stress are young seedlings, knee-high stage, flowering and grain filling stages. Hence, irrigation should be applied

at these stages. As a general rule, irrigation should be applied in furrows up to 2/3rd height of the ridges and beds to avoid the harmful effect of water logging to the maize crop.

- 7. WEED MANAGEMENT:** Timely and effective weed management is needed for achieving higher yields. Pre-emergence application of Atrazine (selective and broad-spectrum herbicide) @ 1.0-1.5 kg a.i ha⁻¹ in 600 litre water, Alachlor @ 1.5-2.0 kg a.i ha⁻¹, Pendamethalin (Stomp) @ 1-1.5 kg a.i. ha⁻¹ checks the emergence of a wide spectrum of weeds, and it is an effective way to control many annual and broad-leaved weeds. If human resources are available, one to two hoeing is recommended for aeration and uprooting the weeds. In case of zero tillage sowing, pre-plant application of non-selective herbicides such as Glyphosate @ 1.0 kg a.i. ha⁻¹ or Paraquat @ 0.5 kg a.i. ha⁻¹ in 500-600 litre water should be applied 10-15 days before sowing.



Fig. 2 Application of Carbofuran in leaf whorls

- 8. INSECT-PEST MANAGEMENT:** These are the following significant insects-pests of maize which causes severe loss to the maize crop:

- a. Stem Borer (*Chilo partellus*):** This is the major pest of maize crop, also known as stalk borer. It affects the maize crop throughout the country. Three eggs found on the lower side of the plant leaves. The larva enters the whorl and causes damage to the leaves, and finally, plants die in severe cases.

Control measures: Spray the crop with Monocrotophos 36 SC @ 1.6 ml/l or Coragen 0.3 ml/l when the crop is 10-12 days old, and or apply Carbofuran 3 G in leaf whorls @ 4 kg/ha is recommended when the crop is 25-30 days old.

- b. Termites:** Termite is also a significant pest in many parts of India and damages the crop at any stage.

Control measures: For termite control, apply fipronil granules @ 20 kg ha⁻¹ followed by a light irrigation. If the termite incidence is not in the entire field and infestation in patches, application of fipronil @ 2-3 granules plant⁻¹ are beneficial.

PLANT DISEASE AND MANAGEMENT: In India, particularly in Bihar, several diseases occur during different seasons which may be managed following ways:

a. Turcicum leaf blight

Symptoms: The main indicators of this disease are long, elliptical, greyish-green lesions on the leaves.

Control: To control turcicum leaf blight disease 2- 4 spray of fungicide viz; Zineb or Mancozeb @ 2.5-4.0 g l⁻¹ of water at 8-10 days interval should be done. Grow resistant varieties of maize to escape the crop from disease.

b. Banded leaf and sheath blight

Symptoms: The primary indications of this disease are white lesions on leaves and sheath. The charctarstic purplish or brown horizontal bands on white lesions.

Control: Soil application @ 7g l⁻¹ of water (soil drenching), foliar spray of validamycin @ 2.7 ml l⁻¹ water, seed treatment with peat-based formulation (*Pseudomonas fluorescence*) @ 16 g kg⁻¹ of seed provides effective control of the disease.

9. IMPORTANT VARIETIES

Following are the most important varieties of maize for Bihar:

a. For Kharif Season:

Hybrids: Parkash, Vivek 27, X 3342, HM 9, Malviya hybrid makka 2, Pro 311, Bio 9681, Seed Tech 2324, 30 V 92, 900 M

Composites: D 994, Dewaki, Birsa Vikas Makka 2, Hemant, Suwan & Lakshmi

b. For rabi season:

Hybrids: Rajendra Hybrid Makka1, Rajendra Hybrid Makka 2, Bio 9681, Pro 311, Seed Tech 2324, 900 M, 30 V 92

Composites: Hemant, Suwan & Lakshmi

c. For spring season:

Hybrids: Parkash, Vivek 27, X 3342,

Composites: Dewaki, Birsa Vikas Makka 2, D 994, Gujarat Makai 6

HARVESTING

Maize is ready for harvesting when husk cover has dried and turned brown, even when the stacks and leaves are green.

CONCLUSION

Most parts of Bihar are prone to waterlogging. There is a gap between existing productivity and production to expected or potential levels in the area. There is a need to provide proper knowledge and suitable variety to the farmers of Bihar for the high potential of this crop in the future. There is also a need for a suitable high yielding variety for both flood and drought stress conditions in the area. Adopting suitable production technologies can increase food availability and nutritional security.

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