

Major Pests of Maize under Agro-climatic Condition of Tripura

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ABSTRACT

Maize or corn (*Zea mays* L.) belongs to the family poaceae is one of the most important food, fodder and biofuel crops in India. In Tripura, the crop is very commonly found in farmers' fields though large-scale cultivation is not in place. Like other crops maize is also associated with some limiting factors which are responsible for yield losses. A field study of two years duration in the year 2019-20 and 2020-21 at experimental farm of the College of Agriculture, Tripura was carried out to find out the limiting factors for successful cultivation of this crop in this state. Survey result revealed that among various biotic and abiotic stress shoot bug (*Peregrinus maidis*), aphid (*Rhopalo siphummaidis*), corn earworm (*Helicoverpa armigera*), termites (*Microtermes* sp., *Odontotermes* sp.), fall armyworm (*Spodoptera frugiperda*), grass hopper (*Hieroglyphusnigrorepletus* Bol.), rose-ringed parakeet (*Psittacula kramera*), birds, stalk rot of maize (*Pythium aphanidermatum*), banded leaf and sheath blight (*Rhizoctonia solani*), foliar blights, charcoal rot, cob rot, *Cynodon dactylon*, *Eleusine indica*, *Cyperus rotundus*, *Amaranthus viridis* and phosphorous deficiency were prevalent.

Keyword : Maize, Tripura, Major pests, diseases, weeds, Biotic and abiotic stress

Introduction

Maize or corn (*Zea mays* L.) belongs to the family poaceae is one of the most important food, fodder and biofuel crops in India. It is also known as “queen of cereals” because of very high yield potential. Over 85% of maize produced in the country is consumed as human food. Green cobs are roasted and consumed by people with great interest. Maize seed contains 10% protein, 4% oil and 2-3%

crude fibre. Maize is low in calcium and fairly high in phosphorus and potassium. Several food dishes including “chapaties” are prepared out of maize flours and grains. Green maize plants are used as succulent fodder. Popping the corn is a method of starch cookery. Maize is a raw material for a number of products viz., starch, glucose, dextrose, sorbitol, dextrine, high fructose syrup, maltodextrine, germ oil, germ meal, fibre and gluten products which have application in industries such as alcohol,

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textile, paper, pharmaceuticals, organic chemicals, cosmetics and edible oil.

In Tripura the crop is very commonly found in farmers' fields though large-scale cultivation is not in place. Like other crops maize is also associated with some limiting factors which are responsible for yield losses. A field study of two years duration in the experimental farm of the College of Agriculture, Tripura was carried out to find out the limiting factors for successful cultivation of this crop in this state.

Material and methods

Survey was conducted during the year 2019-20 and 2020-21. Samples were collected in a random basis during the entire crop growth of maize plants. Insect pest, diseases samples, weeds etc were collected from the fields and were brought into the laboratory for confirmation of their identification. Standard textbooks were referred for identification of insect pest, diseases and weeds.

Results and discussion

A) Insect pests identified during the survey :

1. Shoot Bug, *Peregrinus maidis* (Ashmead) (Hemiptera: Delphacidae)

Groups of both nymphs and adults remain inside the leaf whorls and on the inner side of leaf sheaths and suck the plant sap from the leaf whorls, leaf sheath and stem. The damaged plants become stunted in growth, top leaves get twisted and panicle emergence is inhibited. Severe infestation leads to drying up of leaves and if the infestation is unchecked the entire plant may die eventually. They secrete honeydew which favours the development

of sooty moulds and as a result of which the photosynthetic activity is hampered (Figure :1)

2. Aphid, *Rhopalosiphum maidis* (Fitch) (Hemiptera: Aphididae)

Both nymphs and adults suck the plant sap mainly from the leaves and panicles. It also produces honeydew on which sooty moulds are developed leading to reduced photosynthetic activity. It has also been reported as a vector of maize mosaic virus. Though it is a minor pest but occasionally some plants in the field are severely infested which results in yellowing and drying up of leaves. Sometimes the infestation of ears affects the seed setting.

3. Corn earworm, *Helicoverpa armigera* (Hubner) (Lepidoptera : Noctuidae)

This polyphagous pest has been recorded to attack the maize crop but to a very little extent during the present study. The larvae feed on the kernels inside the ear and fill with excreta. Only 2% of green cobs have been recorded to be infested by this pest.

4. Termites, *Microtermes* sp. and *Odontotermes* sp. (Isoptera : Termitidae)

This underground pest infests the roots and the lower part of the stem which result in wilting, lodging and drying of the plant.

5. Fall Armyworm : *Spodoptera frugiperda* (J. E. Smith) (Lepidoptera: Noctuidae)

Fall armyworm (FAW) is one of the recent invasive pests in India which has been now causing serious damage to maize crop almost all throughout the country. In the present study also, it has been recorded as the most serious insect pest of maize in

Tripura. The young larvae feed inside the leaf whorls by scraping the green tissues leading to appearance of papery patches on the leaves. When the damaged leaf gets unfurled; pinhole spots appear on it which increases in size with the growth of the leaf. Older larvae remain inside the whorl and feed voraciously producing large amounts of excreta. During reproductive stage of the crop the older larvae have also been recorded to feed on the kernels by boring inside the ears.

Pink borer (*Sesamia inferens*), spotted stem borer (*Chilo partellus*), **Army worm** (*Mythimna separate*) and Corn earworm (*Helicoverpa armigera*) are the previously reported major lepidopteran pests of maize. But the recent introduction of the invasive pest, fall army worm (*Spodoptera frugiperda*) has becoming the key pest species due to its higher competitiveness and survival fitness.

6. Grass Hopper (*Hieroglyphus nigrorepletus* Bol.) (Orthoptera : Acrididae)

The grasshoppers have been noticed to cause insignificant damage to maize crop by defoliation. Both nymphs and adults feed on the leaves from the margin inwards.

7. Rose-ringed Parakeet : *Psittacula krameri* (Psittaciformes : Psittaculidae)

During the present study the most serious damage in maize crop has been recorded to be caused by the parrots which feed on the developing cobs. This bird species has been recorded as the most important limiting factor for successful growing of maize crop in this state (Figure 2). The maturing crop is heavily infested by flocks of this bird as they destroy much more than they feed. If unchecked near

about 50% of the maturing cobs may be damaged by this notorious bird pest species which is really a matter of concern to the maize growers of this state.

Sarup *et al.* (1987) listed 130 insect pests of maize (Buddemeyer *et al.*, 2004; Reddy and Kumar, 2021). According to Mathur (1991) more than 250 species of insect and mite pests attack maize (Mathur, 1994; Singh and Jaglan, 2018). However, around a dozen pest species cause serious damage to maize (Mathur, 1992). Large scale cultivation of maize as sole crop and widespread use of pesticides for pest control are responsible for increased pest problems in India (Mathur, 1987). Moreover, due to climate change and introduction of alien invasive pest species the pest complex associated with host plants are gradually being changed.

B) Diseases identified during the survey :

Maize is attacked by numbers of foliar as well as floral diseases caused by different biotic agents like fungi, bacteria, viruses, nematodes etc. Among above mentioned diseases few diseases namely, Pythium stalk rot (*Pythium aphanidermatum*), Banded leaf and sheath blight (*Rhizoctonia solani* sp. *sasakii*) are reported to cause significant damage of Maize crop under Agro-climatic condition of Tripura. Report of Maydis leaf blight (*Drechslera maydis*) and Turicum leaf blight were also recorded.

1. Stalk rot of Maize caused by *Pythium aphanidermatum* : It is common disease of maize occurring during rainy season, rotting is mainly confined to a single basal internode leading to destruction of pith parenchyma and consequent weakening of the stalk followed by toppling down of infected plant (Figure 3).

2. Banded leaf and sheath blight caused by *Rhizoctonia solani* : It appear at pre-flowering stage, the disease is more common on leaf sheaths producing alternate irregular bleached areas or zones which are initially water soaked and later turns to light brown to dark brown bands. During advance stage sclerotia are found to be present in different parts of plant like leaf sheaths, leaf lamina, husks etc (Figure 4).

Many researchers have also observed these diseases like symptom of banded leaf and sheath blight on all aerial parts of maize plants were observed except tassel (Sarup *et al.*, 1987; Di *et al.*, 2023). Round to elliptical yellow to tan or black lesions on seminal crown brace roots were also observed (Saxena, 1997).

Incidence and severity of foliar blights was also reported and needs to be

monitored to assess the damage, apart from that incidence of Charcoal rot (*Macrophominaphaseolina*), Common Smut (*Ustilago maydis*), Head smut (*Sphacelothecareilina*) are also seen. Another disease namely, Cob rot are now a day's emerging as a new problem in maize cultivation where numbers of fungi namely, *Aspergillus flavus*, *Fusarium* sp., *Gibberellazeae*, *Penicillium* sp., etc. are found to be associated.

C) Weeds identified during the survey :

The predominant weed flora associated with crop were *Cynodon dactylon*, *Eleusine indica*, *Amaranthus viridis*, *Cyperus rotundus* etc. (Figure 5-8). Some weed population parameters like absolute density, abundance, absolute dominance and relative dominance have been collected and calculated as presented in Table - 1.

Table 1 : Weed Population parameters in Maize

MAJOR WEED	ABSOLUTE DENSITY (A.D) (No of weed sp./No of Quadrant)	ABUNDANCE (No of Weed sp../No of Quadrant in which it is present)	ABSOLUTE DOMINANCE (A.Do) (A.Dx100/No of Quadrant in which the sp. occurred)	RELATIVE DOMINANCE (A.Do of a sp.x100/Sum of A.Do of all sp.)
<i>Cyperus rotundus</i>	3	2	38	14.12
<i>Amaranthus viridis</i>	1.4	2.2	35	12.35
<i>Cyanodon dactylon</i>	1.6	2	46.6	16.2
<i>Eleusine indica</i>	2	3.3	66.4	23.55

It has been found from the calculation of weed population parameters (Table - 1) that the *Eleusine indica* was the major weed in maize field

followed by *Cyanodon dactylon*. So, weed control methods for these weeds to be followed in maize field under Tripura agro-climatic condition.

D) Abiotic stress identified during the survey :

Phosphorous deficiencies were observed during the survey. First signs of its deficiency appear on the older leaves. Purple discolouration of the leaf edges which advances to whole leaves are its symptoms. Plant leaves turn intense green under very severe condition leaves may become denatured and turn necrotic. Plants are thin, erect and spindly with sparse and restricted foliage. Developments of lateral buds are also suppressed, leaves become narrow, making an acute angle with the stem-axis and the foliage turns bluish-green.

Conclusion

It is evident from the present investigation that a wide array of limiting factors including insects, birds, weeds, disease causing organisms and nutritional deficiencies are limiting factors for yield of this important crop in Tripura. Therefore, in contrary to the scheduled application of chemical pesticides or fungicides a need based Integrated Crop Management strategy has to be formulated for making the maize cultivation more profitable to the farmers of Tripura.

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Figure 1 : *Perigrinus maidis* Ashmead



Figure 2 : Bird damage

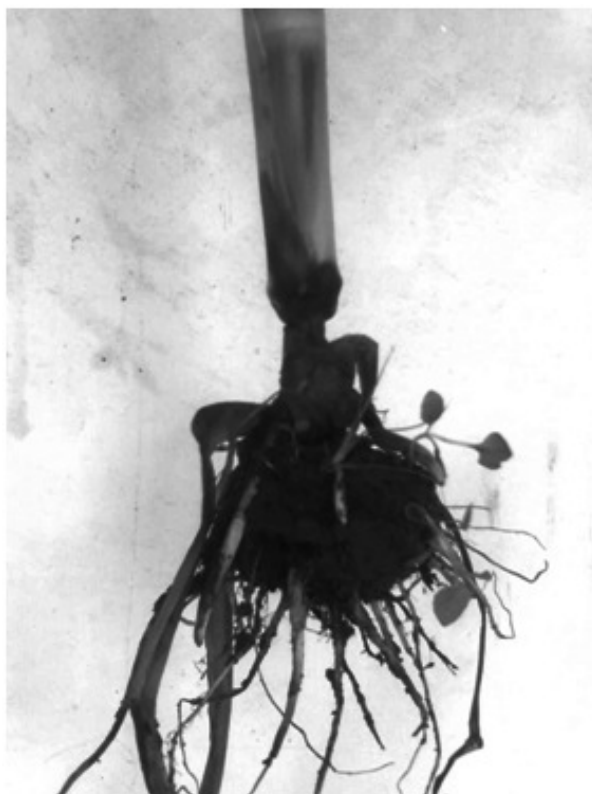


Figure 3 : *Pythium* stalk rot



Figure 4 : Banded leaf and sheath blight



Figure 5 : Bermuda grass
Cynodon dactylon



Figure 6 : Goose grass
Eleusine indica

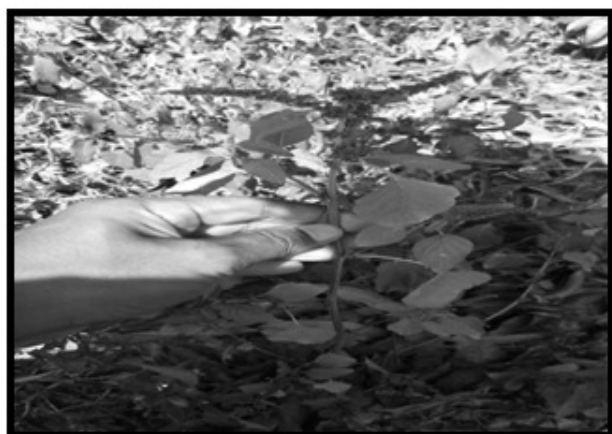


Figure 7 : Slender amaranth
(Amaranthus viridis)

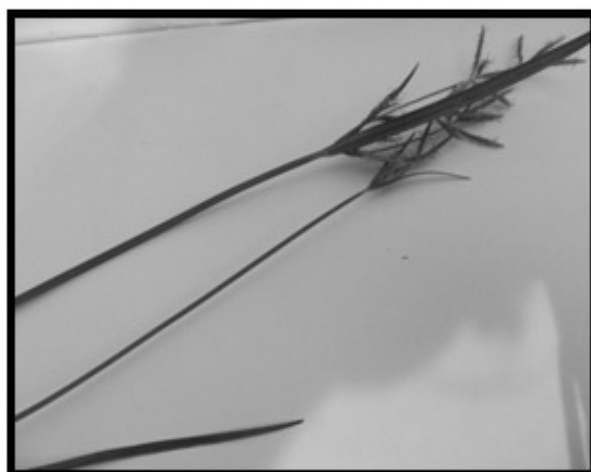


Figure 8 : Purple nutsedge
(Cyperus rotundus)