

Diseases and insect pest management in *kharif* maize

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Maize is one of the most important cereal crop after wheat and rice in India as well as in Punjab also. It is grown in almost all states of India. It covers an area of about 116 thousand hectares in production and its productivity is nearly about 38.5 q/ha during 2016-17 in Punjab. Maize is mainly a short duration crop. In India, Maize is traditionally grown during *Kharif* season, but now days the farmers are growing Maize throughout the year especially in North Indian states Punjab, Haryana. Out of total Maize production 50-60% is used in poultry and dairy, 15-20 in processing industry, 8% in human consumption and rest in seed purposes etc. Being as an important cereal crop it is also an important fodder crop in different regions of India, as it conveniently fits into various crop rotations. Maize crop is profitable crop for farmers, but 30-78% loss of Maize yield is due to effect on insects, pest and diseases in various agro climatic regions of India. Major diseases attacking Maize crop are leaf blight and bacterial stalk rot. So, to prevent losses from these insects pests and diseases, integrated disease management and integrated pest management should be followed.

DISEASES

Seed Rot and Seedling Blight

General symptoms of these diseases are poor emergence or patchy growth, rotting of seed in the collar region of mesocotyle, presence of redbrown lesion on radicles or mesocotyle and wilting of seedling. To control them treat the 3g of Bavistin or Thiram per kg of seed.

Maydis Leaf Blight

This disease starts appearing from the first week of July, throughout the state. Symptoms appear as spindle shaped water soaked chlorotic lesions on the leaves, which later coalesce to give blighted appearance to the leaf. In extreme cases, the symptoms also appear on leaf sheaths, cob husk and ears. Though the hybrids recommended cultivation in the state as it possesses resistance to maydis leaf blight, yet it has due significance in inbred lines, breeders seed plots and hybrid seed production plots. The disease is caused by fungus *Drechslera maydis*. The secondary inoculum is transmitted by air. It is mainly found in waterlogged conditions as well as in late sown conditions.

It can be controlled by two to four Mancozeb 75 WP (2.5 kg in 1000 litres of water per hectare)

Bacterial Stalk Rot

This bacterial disease occurs at pre-flowering stage of the crop and becomes severe in heavy soils under high temperature and humidity conditions. It is caused by bacterium *Erwinia carotovora* var *Zea*. Frequent rains and waterlogged conditions in the month of August and September aggravate this problem. The basal internodes develop soft rots and emit characteristic fermenting odour. The rind loses its natural green colour and becomes pale straw coloured as if boiled in water. Basal internodes become soft, discoloured and give a bad fermenting smell. Ear shoots and cobs occasionally get infected directly, but these droop down and hang limply on the infected plant. Ultimately, the stalk breaks and the plant collapses.

To minimize the yield losses, farmers are advised to keep their fields well drained and must not allow water to stagnate. Dense planting should be avoided. Ridge sowing should be preferred than flat sowing in disease prone areas of Punjab. Use of improved varieties along with destruction of diseased debris in affected fields helps to reduce the incidence of this disease.

Control Measures:

1. Select well drained field or arrange proper drainage to avoid water logging.
2. Bleaching powder should be applied along the rows at the rate of 20-25 kg per hectare.

Black Bundle Disease

Blackening of vascular bundles appears as black dots on the cut ends of the stalk. In severe cases, leaves dry and plants wilt. Ears may rot or may not form at all. To control this disease treat the seed with systematic fungicides like Bavistin or Benlate at the rate of 3g per kg seed.

Post-flowering Stalk Rot

Post flowering stalk rot is a complex caused by number of fungi, out of which, charcoal rot caused by *Macrophomina phaseolina* and Fusarium stalk rot caused by *Fusarium moniliforme* cause economic damage to maize crop under Punjab conditions. The symptoms of the disease become more conspicuous, when plants show premature drying. The pathogen commonly attacks the roots, collar region and lower internodes. The affected internodes become pale, pith become soft and spongy, resulting in deterioration of the vascular system. The disease includes rapid wilting and premature drying at or after flowering. The infected stalk show reddish browning of parenchymatous tissues.

The most economical and efficient method of disease control is the cultivation of resistant hybrid-PMH 1. Its 'stay green' character imparts resistance to stalk rot pathogens. Water stress at flowering predisposes the plant to infection. Crop sanitation, adequate balanced fertilizers and recommended plant density are required to reduce the incidence of disease. Healthy and vigorous plants are more tolerant to post flowering stalk rot disease and thus, able to produce comparatively higher yields.

Banded Leaf and sheath blight

Apart from the above mentioned diseases, yield losses due to banded leaf and sheath blight have increased in the past with cultivation of susceptible cultivars of maize. This disease starts appearing after 35-40 days old plant. The infected leaves show blotched or blighted appearance with alternating light and dark bands. The pathogen is generally identified by characteristics of mycelium and sclerotia as it lacks spore formation. Maximum damage is caused when ears are infected. Severe infection produces blotching on

sheaths and cob husks, and later sclerotia develop on sheaths, husk leaves, silks and kernel rows. Crop rotation and removal of lower leaves touching the soil is very effective in reducing the disease spread.

Insect Pests

Maize Stem Borer

Maize stem borer is active from March to September in Punjab. It is more serious at the end of May to mid-June sown crop, afterwards the incidence reduces with the onset of rains. The moths lay egg clusters (25-50eggs) on the under surface of leaves of 10 to 15 days old maize plants. Thus, that control measures should be started at early crop growth stages. Moreover, the young larvae scraping on leaf surface are easily exposed to the spray chemicals, while, the grown up larvae enter deep into the stem and are difficult to control. A single female lays upto 300 oval, light yellow eggs.

The newly hatched larvae of maize stem borer feed by scrapping and cause pinhole injury and grown up larvae tunnel down into the stem. In younger plants, due to boring by larvae, the central shoot dries up to from 'dead heart'. The larvae per plant may vary from 1 to 15 or even more under severe infestation and migrate to neighbouring plants by wind with the help of silken thread. So, damage in field is sometimes observed in patches. In advanced stages of plant growth (>45 days), the infestation of borer rarely causes complete loss of plant i.e. dead formation.

Management

- The management of any pest should be based on environment friendly pest management approaches. In maize, two releases of *Trichogramma chilonis* parasitized *Corcyra cephalonica* eggs @ 40,000 per acre recommended at 10 and 17 days old crop. The trichocards with these eggs are available at PAU, Ludhiana. Cut them into 40 strips, each having approximately 1,000 parasitized eggs. These strips should be stapled on the underside of the central whorl leaves (as the eggs are laid on underside) during evening hours.
- Also follow the cultural practices like:

- (1.) Since borer hibernates in plant remnants like stubbles, stalks, left over cobs, to reduce them, plough up the fields after harvesting, collect and destroy the stubbles.
- (2.) Use maize stalks, cobs and cores kept for fuel purpose by the end of Feb. Chop the remaining stalks, if any, for subsequent use. These practices will reduce the carryover of the hibernating borer larvae.
- (3.) To reduce further spread of borer in the standing crop, minimize larval dispersal by removal and destroying of the plants showing severe borer injury.
 - Alternatively, spray on the crop should be done 2-3 weeks after sowing on the appearance of first leaf injury using 60 litres of water with Decis 2.8 EC (deltamethrin) @ 80 ml or Coragen 18.5 SC (chlorantraniliprole) @ 30 ml per acre.

Maize Leaf Roller

Damage is caused by the caterpillar which is glossy green in color and becomes pink when fully grown up. The larvae after emergence wander on the tender leaves. They fold the leaves by silking threads and hide themselves inside the rolled leaves. The surface becomes white and papery in appearance.

Control Measures:

Spray Endosulphan (0.1%) or 0.2% Carbaryl (4g of Savin 50 WP in one litre of water) at the rate of 500-700 litres per hectare.

Kharif Grass Hopper

Kharif Grass Hopper generally does not cause much damage to maize crop. However, in a favourable season, it may prove very harmful and leaves nothing on the plant except stem and midribs of leaves. Both adult and nymph stages of this pest are responsible for the damage. Adults are green or dry grass coloured.

Control Measures: Grass hopper can be controlled by dusting 2% Methyl parathion dust at the rate of 20 kg per hectare. For well grown nymphs and adults, spraying with 0.04% Carbaryl (Sevin) at the rate of 500-800 litres of water per ha is effective.

Armyworm:

Its attack is relatively more on the border rows. It feeds on the leaves of the central whorl but it does not make pinholes/shot holes like maize borer. It feeds from the outer margins of the leaves towards midrib. The damage of this pest can be detected from its faecal pellets on the leaves or in the whorl. The insecticides used against the maize borer are effective in controlling this pest also.

Silk Cutter

A number of lepidopteran insect pests like hairy caterpillars, armyworm and semi loopers feed on the silk of green cobs but American bollworm is more damaging as it occurs in large number sporadically. The young larvae feed silks and may tunnel in ears damaging the grains in the milky stage. However, only a few grains are damaged in the mature cobs but the presence of masses of excreta on the attacked ears lowers its market value of green cobs. The insecticides used against the maize borer are effective in controlling this pest also.