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Yellowing or scattered chlorotic spots and necrosis on the leaves are symptoms of potassium deficiency. This deficiency will have an impact on crop yield and quality if symptoms appear early.

Boron deficiency can occur in acidic (below pH 6.0) or alkaline (above pH 7.0) soil. It is caused by poor soil and usually occurs in soil containing sand or little organic matter. Low humidity can cause boron deficiency. Excessive rainfall can cause boron to leach from sand or soil roots.

Signs of seedlings are brittle, discolored and deformed immature tissues. Boron deficiency causes hollow stems in broccoli and cauliflower.

Calcium deficiency can occur in acidic soils that receive little or no rainfall and in situations where the weather supports rapid growth. High content of other cations (e.g. Na⁺, K⁺, NH₄⁺, Mg²⁺), high salinity, low temperature and humidity can slow calcium transport. Symptoms of calcium deficiency include burning heads, broken broccoli sprouts, broken cauliflower heads, and burnt leaves (see photo).

Manganese or Magnesium Deficiency Intravascular chlorosis may result from manganese or magnesium deficiency. Manganese deficiency can cause olive green to yellow veins, while magnesium deficiency can cause yellow veins.

Manganese deficiency usually occurs in mineral and clay soils with a pH above 6.5

and in sandy soils with a pH above 6.0. Magnesium deficiency usually occurs in older leaves and can occur in acidic, sandy soils (pH less than 5.8).

Molybdenum deficiency is common in cauliflower and in severe cases can cause whiplash, which can cause leaves to shrivel. When the condition is less severe, leaf growth is somewhat inhibited.

Sulfur deficiency can cause yellowing of leaves and usually occurs in sandy soils with low organic content.

An extension technology insect management

❖ Tobacco caterpillar (*Spodoptera litura* and *S. exigua*)

It has many hosts and is a commercial pest of oilseed rape crops, but is generally controlled by targeting lepidopteran pests of oilseed rape crops. Its population increases in spring along with the harvest of other vegetable crops in Uttar Pradesh. Many herbs such as batua, chole and partheni also work. The larvae eat indiscriminately and scrape the leaves, eventually causing the leaves to fall off completely. Because adults can easily enter the field through surrounding crops or plants, it is important to monitor crops for *Spodoptera litura* damage and these checks are carried out twice a week.

Management

- Summer ploughing is beneficial because it exposes the pupae that are hibernating to natural enemies.
- Hand plucking and mechanical removal of egg masses, caterpillars, and early stage spraying of NSKE 5% may be effective.

- Installation of pheromone traps at a cost of \$25 to \$30 per acre may be a beneficial instrument for early identification as well as mass catching and elimination of insect pests.
- Spraying Splt NPV @ 250 LE with gur or jaggary (10 g/lit) and sticker during the evening hours may be effective in controlling Spodoptera caterpillars.
- Foliar spray of Bt formulations at 500 g/ha is effective for caterpillar control.
- In the event of a severe infestation, a need-based application of cypermethrin at 1 mL per lit or malathion at 2 mL per lit of water can be employed.

❖ **Diamondback moth** (*Plutella xylostella*)

The diamondback moth has become the most common and widespread pest of rapeseed and is now one of the biggest problems in areas where rapeseed is grown.

These insects can damage plants at any stage of growth. Diamondback moth is present from February to April-May on seasonal oilseed rape crops and cruciferous crops in Jammu state.

Management

- Use of pheromone traps is useful in monitoring and detection of the DBM pest population in early stages.
- Practice of trap or intercropping of mustard, coriander and marigold with cole crops may reduce the DBM pest infestation.
- Release of *Cotesia plutellae*, natural bio-agent of DBM larvae is effective to suppress its population in field condition (1000 adults per release every 2 week interval up to harvest).

- Use of resistant varieties is also effective against DBM.
- Some safer insecticides and neem products are recorded to be effective against DBM.
- Spray cypermethrin @ 1ml, cartap hydrochloride @ 2ml, spinosad @ 1ml and Bt formulation @ 500 g/ha may be promising in controlling the DBM pest population.

❖ **Cabbage leaf miner** (*Liriomyza spp.*)

It is a polyphagous disease that causes serious damage to many crops, especially rapeseed. Larvae settle on leaves and stems and cause damage. Due to the loss of chlorophyll-containing cells, the photosynthetic activity of the plant decreases.

Management

- In pest endemic areas, avoid hybrids and use nitrogenous fertilizers sparingly.
- After removing and destroying affected leaves, apply NSKE 5% with sticker (0.5 ml per lit of water).
- During the early stages of crop growth, spray with imidacloprid at 0.3 mL per lit of water.
- In severe infestations, DDVP (Dichlorovos/nuvon) application is also effective.

❖ **Cabbage aphids** (*Brassicorhynchus brassicae*, *Myzus persicae* and *Aphis gossypii*)

Aphids are little, soft-bodied insects that move slowly. They are frequently found in big colonies on the underside of plants. They are the most common pests of cole crops, and

if not handled in a timely manner, they can cause considerable crop loss. It appears in November and lasts until April. This pest multiplies quickly in cloudy and wet conditions.

- ❖ Both nymphs and adults have identical features and constantly sucking sap from the leaves, causing wilting, stunting, and leaf deformation in the plants.

❖

Management

- *Crysoperla carnea*, *Coccinella septempunctata*, *Coccinella transversalis*, syrphid fly maggots, and hymenopteran parasitoids have all been observed decreasing aphid populations on crops.
- Manual removal of infested shoots and leaves with pest appearances.
- The following foliar sprays are efficient at controlling aphid attacks 1 mL *Metasystox* or 1 mL *Cypermethrin* per lit of water

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