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Major Diseases of Commercial Vegetable Crops: Diagnosis and Management

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Solanaceous, leguminous, and cruciferous vegetables are the most profitable vegetable crops, and they have helped farmers in Uttar Pradesh improve their economic situations. Year after year, intense cultivation of these crops enables the survival and accumulation of inocula of numerous diseases that pose a threat to effective farming. Because management methods change depending on the form and origin of each disease, an accurate diagnosis is necessary to avoid wasting time and resources. Furthermore, information on the kinds of illnesses that arise at various phases of a crop's life cycle is required for constructing an integrated disease management program for a specific geographical area. As a result, along with other inputs for crop sustenance and realisation crops to the degree of genetic potential, the adoption of a schedule that is crop protection oriented, efficient, and cost-effective is almost required. This chapter discusses the most common illnesses that impact tomato, capsicum, peas, and cole crops, as well as how to control them effectively.

Solanaceous crop diseases and their management (Tomato, Capsicum, and Chillies):

Diseases of Tomato & their Management:

1. **DAMPING-OFF**

It is a serious disease that affects tomato and other vegetable crops such as bell peppers, chilies, brinjal, cabbage, cauliflower, and broccoli, among others, for which a nursery is built for transplantation. In poorly maintained nursery beds, the illness is rather widespread, and it is frequently caused by seed and soil-borne pathogens. It is to blame not only for poor seed germination and seedling stand but also for disease spread to the field where transplantation takes place.

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Symptoms:

The disease manifests in two phases:

- i) Pre-emergence damping-off
- ii) Post-emergence damping-off

Pre-emergence damping-off:

Seedling emergence failure, either caused to seed rots or mortality of immature seedlings before emerging from the soil, results in patchy seedling stands in the nursery during the early phases.

Post-emergence damping-off:

Post-emergence damping-off is characterized by fast cortical tissue shrinkage and darkening results in the topping down of infected seedlings.

Pathogen (s):

The most typically linked diseases are Pythium, Phytophthora, Fusarium, and Rhizoctonia solani Kuhn. Disease growth is encouraged by high soil moisture, pH 6.0, and thick soils. Pre-emergence damping-off is greatest around 20-25°C, whereas post-emergence damping-off is maximum at 30-40°C. In ill-aerated soils with poor drainage and a heavy stand of seedlings, the disease is increased**.**

Management:

- During the summer months, either solarize the soil of the bed with a clear polyethylene (25 m) sheet for 40-45 days, or treat the soil with Formalin (5%) at least 20 days before planting, or apply bioagents such as Trichoderma harzianum or T. viride (40 g/m2).
- Drench the bed with a mixture of mancozeb (0.25 percent) and carbendazim (0.1 percent) once seedlings emerge from the soil, and repeat every 7-10 days.
- Every year, relocate the nursery.
- Apply captan to the seed (0.3 percent).
- Irrigate lightly yet frequently.

2. LATE BLIGHT:

The fungus Phytophthora infestans causes late blight, a potentially fatal disease of potatoes and tomatoes. During cool, damp conditions, late blight is most devastating. The fungus can infect any section of the plant. The lesions on young leaves are tiny and look like dark, wet patches. These leaf spots will swiftly develop, and a white mold will emerge on the bottom

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surface of the leaves near the edges of the afflicted region. Within 14 days of the first signs, complete defoliation (browning and shriveling of leaves and stems) might develop. Shiny, black or olive-colored lesions appear on infected tomato fruits, which can cover considerable regions.

Management:

- To provide a barrier between the host and soil-borne inoculum, spread pine needle/grass mulch over the field floor With the onset of monsoon rains, spray the crop with metalaxyl + mancozeb (0.25%) followed by sprays of either mancozeb (0.25%) or copper oxychloride (0.3%) or Bordeaux mixture (4:4:50) and repeat at 7-10 days interval.
- To minimize damp and stagnant air conditions, stake the plants upright and remove leaves and fruit up to a height of 15-20 cm.
- Collect and destroy the affected fruits regularly.

3. EARLY BLIGHT:

The fungus Alternaria solani causes this disease, which appears on the plants as tiny, black lesions on the older leaf. Spots increase, and in the center of the sick region, concentric rings in a bull's eye pattern can be visible. It's possible that the tissue around the spots will become yellow. When the temperature and humidity are high at this time, a lot of the vegetation dies. Lesions on the stems are similar to those on the leaves, and if they develop near the soil line, they can girdle the plant (collar rot). Lesions on the fruits can grow to be quite large, covering virtually the whole fruit. On the fruit, there are also concentric circles. Fruit that has been infected is prone to dropping. The fungus may be found on infected soil debris, seed, and volunteer tomato plants, as well as other solanaceous hosts such as Irish potato, eggplant, and black nightshade.

Management:

- Chlorothalonil (0.2 percent) or mancozeb (0.25 percent) should be sprayed on the crop every 10 to 14 days.
- Collect and remove the plant detritus that has been contaminated. Crop rotation should be done for at least two years.
- To minimize wet and stagnant air conditions, remove the leaves, especially in indeterminate hybrids, up to 15-20 cm.

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- Select a healthy seed and treat it with captan (0.3%).

4. BUCKEYE ROT:

Buckeye rot is a fungus-induced fruit disease caused by Phytophthora nicotianae var. parasitica. Immature fruits (green in colour) are vulnerable at all phases of growth. Water-soaked light brown discoloured patches emerge, quickly expanding to reveal concentric dark brown rings that resemble buckeye marks. The lesions grow quickly, and within 3-4 days, the entire fruit surface has become dark brown and is mushy to the touch. On the sick fruits, white flocculent surface fungal growth consisting of sporangia and sporangiophores grows in warm and humid conditions. These fruits may fall off the plant later. The fungus has little effect on the leaves. The disease thrives in warm, rainy weather for long periods of time and in soils that are poorly drained. The fungus lives in the soil and is spread by rain and surface water. This disease can also be seen in peppers.

Management:

- Spray the crop with metalaxyl + mancozeb (0.25 percent) at the start of the monsoon rains, followed by sprays of either mancozeb (0.25 percent) or copper oxychloride (0.3 percent) or Bordeaux combination (4:4:50) at 7-10 day intervals.
- To minimize humid and stagnant air conditions, stake the plants upright and remove leaves and fruit up to a height of 15-20 cm.
- To provide a barrier between the host and soil-borne inoculum, spread pine needle/grass mulch over the field floor.
- Collect and destroy the affected fruits regularly.

5. BACTERIAL WILT:

Ralstonia solanacearum causes bacterial wilt, also known as Southern bacterial blight (formerly Pseudomonas solanacearum). This bacteria may live for long periods in the soil and enter the roots via wounds caused by transplanting, cultivation, or insects, as well as natural wounds where additional roots grow. Excessive temperatures and high dampness are conducive to disease growth. The bacteria quickly spread inside the plant's water-conducting tissue, filling it with slime. The plant wilts quickly as a result

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of this, yet the leaves remain green. When a cross-section of an infected stem is sliced, small drips of yellowish oozing may be observed.

Management:

- Bleaching powder (15 kg/ha) has also been proven to be useful in the fight against this disease.
- If dazomet is used in conjunction with soil solarization, the disease can be effectively managed.
- To some extent, dipping seedlings in Streptocycline (100 ppm) for 30 minutes is also beneficial.
- Bacterial antagonists such as Pseudomonas fluorescens, Pseudomonas glumae, Pseudomonas cepacia, and Bacillus spp. have also been shown to minimize the occurrence of disease.
- The bacterial inoculum in the soil can be reduced by green manuring or biofumigation with Brassica spp.
- Shifting the transplanting date to avoid a time of extreme heat, severe rain, or both.
- Avoid the movement of water from an infected plant to healthy plants.
- Controlling bacterial wilt in contaminated soil is challenging due to the vulnerability of all commercial cultivars and the lack of chemical control.
- Follow long crop rotation with non-solanaceous crops.