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Management of Tomato Early Blight: By Formal Unravelling Practices

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Abstract

Tomato (*Solanum lycopersicum* M.) is an important vegetable crop in the global level for its nutrient sources and easily available in the markets also. In spite of the current situation the production strategy went down due to biotic stress of early blight disease on field conditions. This caused the most tragic issues on tomato farmers and vegetable marketing's also. It is caused by a pathogen Alternaria solani and produces symptoms on leaves and fruits with concentric rings with yellow halo. The pathogen produces a muri-form airborne conidia and it spread through plant debris and mostly associated with unusual rainfall with moderate weather at 25-30°C. So, control measures are initiated from field by avoiding mono-cropping use disease free seeds, adjust the time of sowing, avoid excess usage of N-fertilizers and using chemical fungicides chlorothalonil 0.1% spraying from vegetative to flowering stage can control this foliar disease at better level.

Key words: Alternaria, Blight, Concentric rings, Muriform, Plant debris.

Introduction:

Tomato (*Solanum lycopersicum* M.) is one of the most important vegetable crops in the world. It native as Peruvian region but is widely cultivated around the world for its delicious taste, presence of nutrients, edible fibres and used as multi-culinary proposals at homes. Despite this tomato production and distribution has stagnated due to biotic, abiotic and manual problematic issues. Among them, biotic stress of early blight disease is worldwide distributed and causes a noticeable amount of economic loss from field to marketing.

Alternaria leaf blight of tomato caused by *Alternaria solani*, which is a soil inhabiting air-borne pathogen responsible for leaf blight, collar and fruit rot of tomato disseminated by viable fungal spores. *Alternaria* spp., are widespread in nature and that occurs diseases on several crops like, cereals, vegetables, pulses and oilseeds. Early blight can affect seedlings but is generally observed on older plants and is especially severe on plants of poor seedling vigor and vegetative growth. Infected plants may be visible with collar rust of the stems, older leaves, and fruits that crack at the stems during vegetative to fruit setting stage. Mostly leaves are affected and severe defoliation has occurred with drying prematurely. This is due to secretion of pectinolytic enzymes such as cellulases and pectin methyl galacturonase. These enzymes facilitate host infection by virulence, survival

and colonization of *A. solani*. Severely affected plants show defoliation around the crop rhizosphere, prematurely drop-off of fruits and yield reduction through quality and quantity (Tomar *et al*., 2020).

Symptoms

Foliar symptoms generally occur on the oldest leaves and start as small, brownish to black lesions. These leaf spots enlarge up to ½ inch (1.3 cm) in diameter in a characteristically concentric fashion. The area around the spot may become yellow. Under favorable conditions, significant defoliation of lower leaves may occur, leading to sunscald of fruit. On fruits during pre-ripening or ripened stage the pathogen invades at the point of attachment between the stem and fruit, and through growth cracks and wounds made by insects. Dark lesions enlarge in a concentric lesion and extend large areas of the fruit. Mature lesions in fruit are typically covered by a black velvety mass of fungal spores. Stem lesions are dark, slightly sunken and enlarge concentrically (Fig 1.).

Figure 1: Symptoms of tomato early blight and morphological characters of *A. solani*

a. Early blight

b. Concentric lesions on leaves

c. Bulls eye symptom on fruits

d. Muriform airborne conidia

Pathogen

Mycelium is septate, branched, light brown and becomes darker at a later stage. Conidiophores- 50 to 90µm in length and dark coloured. Conidia - beaked, muri form, dark coloured and borne singly. In general, development of the pathogen can be aggravated by an increase in inoculum from alternative hosts such as weeds or the Solanaceous species. Disease severity and prevalence are highest when plants are mature. The conidia and the mycelium in the soil or in the debris of the affected plants can remain viable for more than 17 months. A primary and secondary spread through airborne conidia and infected plant debris (Fig 1.).

Epidemiology

- Dry warm weather with intermittent drizzling of rainfall.
- Failure of equal distribution.
- Atmospheric temperature 25-30°C.
- Poorly manured crop and mono-cropping with same varieties.

Disease cycle

Alternaria solani is a Dothidiomycetes fungus with a polycyclic life cycle, which reproduces asexually by conidia. It is generally considered to be a necrotrophic pathogen, *i.e.*, it kills the host tissue using cell wall degrading enzymes and toxins and feeds on the dead plant cell material. The life cycle starts with the fungus overwintering in crop residues or wild members of the family Solanaceae, such as black nightshade. In the spring, conidia are produced. Multicellular conidia are splashed by water or by wind onto an uninfected plant. The conidia infect the plant by entering through small wounds, stomata, or direct penetration. Infections usually start on older leaves close to the ground. The fungus takes time to grow and eventually forms a lesion associated with leaf wetness and atmospheric humidity. From this lesion, more conidia are created and released. These conidia infect other plants or other parts of the same plant within the same growing season. Every part of the plant can be infected and form lesions. This is especially important when fruit or tubers are infected as they can be used to spread the disease (Vloutoglou *et al*., 2000).

Management

Use pathogen-free seeds, or collect seed only from disease-free plants. Rotate out of tomatoes and related crops for at least two years. Control susceptible weeds such as black nightshade and hairy nightshade, and volunteer tomato plants throughout the rotation. Fertilize properly to maintain vigorous plant growth.

Particularly, do not over-fertilize with potassium and maintain adequate levels of both nitrogen and phosphorus. Use drip irrigation instead of overhead irrigation to keep foliage dry. Stake the plants to increase airflow around the plant and facilitate drying. Staking will also reduce contact between the leaves and spore-contaminated soil. Apply plastic or organic mulch to reduce humidity and provide a barrier between contaminated soil and leaves Very early (seedling to ramification stage) spraying with Zineb or Captan 0.2% and repeating it for every 15 – 20 days gives effective control (Garg *et al*., 2020).

Conclusion

Tomato is locally consumed and used by people in daily food. It is mostly one of the important vegetable crops due to its high nutritive value and good source of vitamins and antioxidants. But the production of tomatoes is getting affected by various diseases. *Alternaria solani* is majorly damaging in tomato crops among all the fungal pathogens and their diseases. Hence there is need to control this disease with effective control strategies *viz*., resistant cultivars, hygienic field preparation, time of sowing, optimized usage of irrigation and fertilizers, weed management, early application of chemicals and crop rotation were given the better outcome for tomato farmers in future.

References

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