Alternaria blight (*Alternaria solani*) of tomato and its management

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Tomatoes are one of the most popular and widely cultivated vegetables worldwide. Tomato (*Solanum lycopersicum* L.) has secured the first position among processing crops in India, and it is the world's second most important consumed vegetable crop after potato (Kumar, 2015). In India, the tomato crop is mainly cultivated in Odisha, Andhra Pradesh, Madhya Pradesh, Karnataka, West Bengal, Chhattisgarh, Telangana, Bihar, Gujarat, Rajasthan and Uttar Pradesh. However, like any other crop, they are susceptible to various diseases, (Mark and Brooke, 2006 and Abada *et al*., 2008).

Among fungal diseases, Alternaria blight (*Alternaria* sp.), late blight (*Phytophthora infestans*), Septoria leaf blight (*Septoria lycopersici*), powdery mildew (*Oidiopsis taurica*), Fusarium wilt (*Fusarium oxysporum* f.sp. *lycopersici*), collar rot *(Sclerotium rolfsii*) and damping-off (*Pythium* sp.) are a significant bottle eneck in the production of tomato and responsible for heavy economic losses. One of the most significant threats to tomato plants is Alternaria blight caused by *Alternaria solani*. It causes up to 46–90per cent blight disease intensity with huge fruit yield losses (Bessadat *et al*., 2014).

Management of Alternaria blight is complex because the pathogen has a wide host range, pathogenic variability and prolonged active phase of the disease cycle.Available methods for managing Alternaria blight prevent long periods of wetness on the leaf surface, cultural practices, and host plant resistance with fungicides (Namanda *et al*.,2004 Kirk *et al*., 2005 and Kumar and Srivastava, 2013). This article aims to shed light on the causes, symptoms, and management strategies applied against Alternaria blight to help farmers and gardeners to protect their tomato crops.

Causes

Most species of Alternaria causes necrotrophic diseases on crops. Depending on the species Alternaria produce unique club-shaped conidia, often beaked with horizontal and often vertical septa that may be produced either individually or in a chain. Hyphal cells are darkly pigmented with melanin, which guards hyphae and spores against environmental stress and allows spores to survive in soil for long periods of time (Rotem *et al*., 1994). Alternaria blight is primarily caused by the fungus *Alternaria solani*. The pathogen can survive in plant debris, infected seeds, or on other host plants.

Disease Cycle

A. solani reproduces asexually. The fungus overwinters in soil, plant debris, seed and alternate hosts in the form of either conidia or mycelia, which may serve as primary sources of inoculum (Figure 1). Infection occurs during warm and humid conditions. Conidia germinates at temperature of 8–32°C in cool and humid conditions in the presence of moisture to form germ tubes (Jones *et al*., 1991 and Kemmitt *et al*., 2002). Germ tubes penetrate host tissue directly or enter through stomata or wounds, thereby causing infection. Lesions appear after 2–3 days of infection depending on environmental conditions, leaf age and cultivar susceptibility, and spores are produced

3–5 days after the appearance of lesions (Jones*et al*., 1991 and Sherf *et al*.,1986).

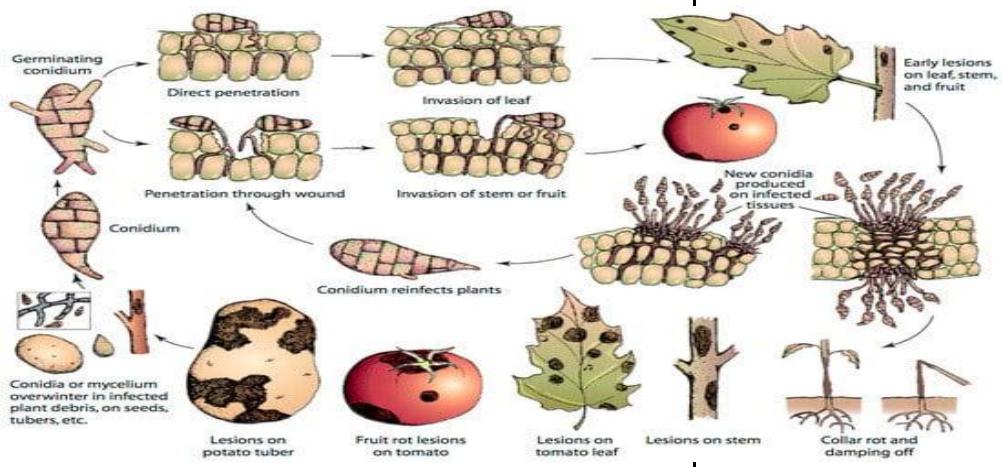

Fig 1: Disease cycle of Alternaria blight of tomato
Source: Agrios G.N. 2005

Symptoms

The symptoms of *A. solani* appear in leaf (leaf blight or early blight), stem (collar rot or stem lesions) and fruit (fruit rot) of tomato plant (Sherf *et al*.,1986 & Barksdale and stoner, 1977).

Leaf Lesions

It is characterized by dark, small, necrotic, coalescing and concentric lesions giving a target-board like appearance on the leaf surface. The lesions are surrounded by yellow rings (Sherf *et al*., 1986). The disease first appears on lower older leaves and moves upward as the plant becomes mature (Rotem *et al*., 1994). Older leaves are more susceptible than younger leaves.

Stem and Fruit Lesions

Stem lesions appear as dark, sunken areas, leading to stem girdling and breakage. Fruit lesions initially appear as small, circular, sunken spots with dark margins. Over time, the lesions enlarge, become concentric, and may develop dark spore-bearing structures called conidia.

Defoliation

As the disease progresses, infected leaves may start to yellow, wither, and eventually drop prematurely, resulting in defoliation eventually drop prematurely, resulting in defoliation

Management Strategies

The disease can be management by three measures: cultural practices, the use of resistant varieties and fungicide treatment. Cultural practices and fungicidal treatment are more common practices (Foolad *et al*., 2008).

Cultural Practices

Cultural practices include maintenance of a healthy field and crop vigor, sanitation, removing infected vines and fruits, plant debris and volunteer weeds from the vicinity of the field, crop rotation and reducing the leaf wetness by soil-directed irrigation systems (Foolad *et al*., 2008 and Chaerani *et al*., 2006).

Resistant Varieties

Planting tomato varieties with resistance against Alternaria blight can significantly reduce the impact of the disease. Consult local agricultural extension services or seed suppliers to identify suitable resistant varieties for your region. Pusa Ruby and Arka Rakshak are resistant varieties recommended

Fungicides

Several types of fungicides have been developed for the control of alternaria blight of tomato, but fungicide treatment is not economically feasible, nor environmentally sound. Fungicides are first applied 1–2 days after transplantation and then require routine application at the interval of 7–10

days for effective control, thereby increasing production cost and environment pollution (Foolad *et al.*, 2008 and Kemmitt *et al.*, 2002).

In addition, the role of fungi such as *Trichoderma viride* (Sarkar *et al.*, 2016) and *T. harzianum* (Chowdappa *et al.*, 2013) for the management of alternaria blight has also been reported. A new approach at the holobiont level is one in which microbial communities are also considered in the plant selection process (Wei and Jousset, 2017). This will ultimately help to improve the overall performance of plants under field conditions. One of the most effective methods for disease control is the use of fungicides and botanicals. However, the most important means of protecting plants against phytopathogenic fungi synthetic fungicides (Saha *et al.* ,2013 Abdel-Megeed *et al.*,2015). In India, Kumar *et al*. (2007) have tried many fungicides of triazoles and strobilurins groups and found them effective in managing Alternaria blight of tomato. Follow the recommended dosage and application instructions provided by the manufacturer.

Timely Pruning

Pruning the lower branches of tomato plants can improve air circulation, reduce humidity, and minimize the risk of infection.

Regular Monitoring

Prompt detection and action can prevent the disease from spreading to healthy plants. Remove and destroy infected plant material to limit further contamination.

Conclusion

Alternaria blight poses a significant threat to tomato crops, but with proper understanding and management strategies, its impact can be minimized. Implementing cultural practices, growing resistant varieties, and using appropriate fungicides can help control the disease. Timely monitoring and vigilance are crucial in preventing the spread of Alternaria blight and safeguarding tomato plants, ensuring a successful and bountiful harvest.

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