

Research Note

## Fungal Diseases of Tomato in Kathmandu Valley

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### Abstract

The infected parts of the tomato plant were collected from Jitpurphedi of Kathmandu, Nepal. The isolated fungi from the infected parts were *Septoria lycopersici*, *Cladosporium oxysporum* responsible for leaf spot, *Phytophthora infestans* and *Rhizoctonia solani* responsible for leaf blight, *Cladosporium cladosporioides* responsible for fruit rot, *Leveillula taurica* responsible for powdery mildew and *Plasmopara viticola* responsible for Downey mildew disease. In the survey period, the highest incidence was found at leaf blight (30.08%) and the lowest at stem rot (4.64%). In the case of severity, the maximum severity was found at Downey mildew (77%) and the minimum was recorded at fruit rot (5.25%).

**Keywords:** Disease incidence, Disease severity, Fungal diseases, *Lycopersicon esculentum*

## Main Body

Tomato (*Lycopersicon esculentum* Mill.), a flowering plant of the nightshade family (Solanaceae), is extensively cultivated for vegetables (Chapagain et al., 2011) with an average national consumption of 11.97 kg/person/year (Ghimire et al., 2017). It is cultivated in about 20,000 hectares in Nepal and around 0.3 million metric tons of tomato is produced annually (MoAD, 2014). Tomato is consumed in diverse ways, including raw, as an ingredient in many dishes, sauces, salads and drinks (de Souza, 2012). Tomato is a good source of energy (Borguini & Ferraz da Silva Torres, 2009). Carbohydrates, fats, proteins, vitamins, trace elements like magnesium,

potassium, phosphorus, flavonoids, carotenoids and other constituents like lycopene are present in tomato fruit (Rosati, 2000).

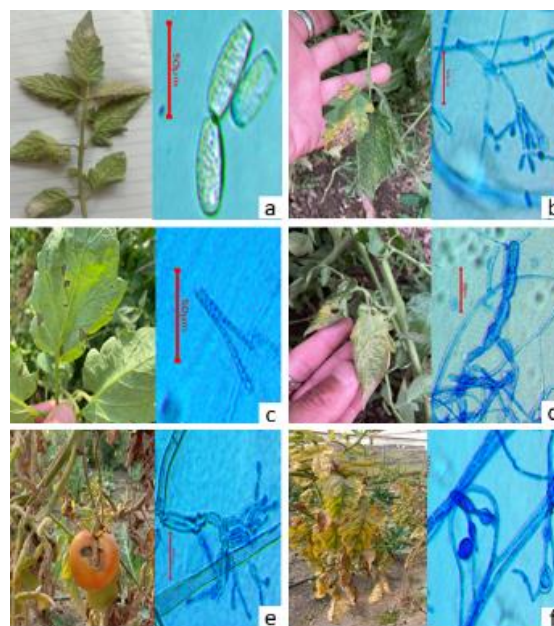
Tomatoes are affected by many fungal, bacterial and pest pathogens. Fungi are responsible for various diseases of plants and cause a considerable loss in yield. Some species of fungus produce mycotoxins that are very toxic to humans. For example, Sphinganine-analog mycotoxins (SAM's) produced by *Fusarium moniliforme* of tomato inhibit *de novo* sphingo lipid (ceramide) biosynthesis which leads to a variety of cellular responses including accumulation of sphingoid bases in animal cells (Merrill Jr et al., 1997). Tomato diseases caused by fungi are leaf blights, leaf spots, mildews, rots of (root, stem, fruit) and wilt diseases, and cause severe

damage to crop (Fajola, 1979). Different groups of fungi like *Alternaria*, *Septoria*, *Phytophthora* are responsible to cause leaf disease in tomato. Disease on the leaf causes degradation of the photosynthetic area and loss of crop production. Species of *Fusarium* and *Verticillium* cause wilting disease. *Colletotrichum*, *Stemphylium* causes fruit rot diseases. Since 2010 more than 40 tomato diseases have been studied in Nepal. The report shows that the disease in tomatoes is caused by infectious and non-infectious agents. It also reports that most of a disease-causing agent is fungal pathogens infecting different plant parts.

Fungal diseases of tomato plants were collected from the Jitpurphedi (27.78°N 85.28°E), Tarakeshwar Municipality of Kathmandu. Tomato plants were observed in five different tunnels inside the area to calculate disease incidence and severity as well as to collect the diseased parts of plants. A fungal part from the infected leaf, stem and fruit was aseptically transferred on a PDA medium and it was incubated at 25±2°C for one week. Fungal colonies were identified by observing the macroscopic characteristics. *Plasmopara viticola*, *Septoria lycopersici*, *Phytophthora infestans*, *Cladosporium* sp., *Leveilulla taurica*, *Rhizoctonia solani*, *Chaetomium* sp. was isolated in PDA medium as a pure culture (Figure 1). Inoculum from the pure culture was transferred to the healthy leaves and fruits. After incubation at 25±2°C for 7 days, the characteristics symptoms were produced, which were found to be like the previously collected symptoms on fruit and leaves. The size of the conidia was measured by using optica software. Disease incidence and disease severity were calculated.

The prevalence of disease incidence and severity of fungal disease in tomato plants so far are categorized as leaf spot (LS), leaf blight (LB), downy mildew (DM), powdery mildew (PM), stem rot (SR) and fruit rot (FR). The development of black-brown lesions on the young stem and leaf petioles as well as green ring spots developing on leaves was common. Yellowing of the leaf and distortion of fruits were observed in association with other symptoms. Seven fungal isolates were obtained from tomatoes showing leaf blight (*Phytophthora* sp. and *Rhizoctonia solani*), leaf spot (*Cladosporium oxysporum* and *Septoria lycopersici*), downy mildew (*Plasmopara viticola* and *Septoria*

*lycopersici*) and leaf blight (*Phytophthora infestans* and *Rhizoctonia solani*).



**Figure 1:** Identified fungal species in different tomato diseases. (a) *Leveilulla taurica*; (b) *Cladosporium*; (c) *Rhizoctonia solani*; (d) *Septoria lycopersici*; (e) *Plasmopara viticola*; (f) *Phytophthora infestans*.

The disease incidence ranged from 4.64-30.08%. The highest disease incidence showed Leaf blight (30.08%) followed by Downy mildew (24.24%), Leaf spot (22.8%), Powdery mildew (5.24%) and the lowest incidence (4.64%) was found in stem rot.

The disease severity ranged from 5.25-77%. The highest disease severity was downy mildew (77%) followed by leaf spot (58%), leaf blight (14.25%), powdery mildew (9%) and stem rot (7%). The lowest disease severity (5.25%) was fruit rot. Tomato production was decreased due to fungal pathogens. The highest fungal disease incidence was found as leaf blight (30.08%) whereas the maximum severity was found as downy mildew (77%).

**Table 1:** Disease incidence and severity of tomato diseases.

Tomato disease	Disease incidence (%)	Disease severity (%)
Leaf spot	22.8	58
Leaf blight	30.08	14.25
Downy mildew	24.24	77
Powdery mildew	5.12	9
Stem rot	4.64	7
Fruit rot	5.2	5.25

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