

Canker disease a new threat to tomato cultivation in Sri Lanka

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Abstract:

Tomato production of some locations in central and southern areas in Sri Lanka has suffered in the recent past, due to emergence of canker disease caused by *Clavibacter michiganensis* Subsp. *michiganensis* (Cmm). Recently, leaf and fruit symptoms of Cmm has observed in some exotic tomato cultivars grown in hot (35°C - 40°C) and humid areas. Now it has become a problem constraining production of healthy seeds, nursery seedlings at commercial scale and profitable tomato cultivation. Earlier it was suspected that the symptoms of leaves resemble damage caused by fungal pathogens and attempts have been made to control this problem by foliar spraying of fungicides. However, it was failed and at present this disease has limited to some of the locations in tomato cultivations of the country. Canker disease has been first identified in year 2015 in tomato cultivation of exotic varieties in central province with the technical collaboration of JAICA, Sri Lanka. It was noted that symptoms of tomato canker disease initiate warm and moist condition and the main symptoms observed in the effected plants were leaf yellowing and necrosis around leaf margins. Fruit symptoms were occasionally observed as small dark spots on the fruit surrounded by a white halo. Tomato cultivars with some tolerance to canker have been introduced, but there is little significant tolerance in commercial tomato varieties.

In bacterial canker disease, both primary (systemic) and secondary (foliar) infections result in significant reductions in yield and fruit quality. Primary infections start from infected seed or young seedlings. The pathogen enters the vascular tissue, which results in systemic wilting of the plant. Wilting starts on the lower leaves and progresses upward in the canopy, sometimes showing wilting on one side of the plant. This infectious disease is capable of spreading rapidly, resulting in devastating losses. It is a particularly difficult disease to manage because the pathogen can be hard to eradicate once it has been introduced into a greenhouse, garden, or field. This organism is introduced into plantings primarily via infected seed or transplants. Cmm are often present in low levels on symptomless plants, multiplying rapidly when favorable weather are present. Once the bacterium enters through the leaf stomata and/or small wounds, systemic infection occurs. The pathogen is spread within plantings by splashing rain and by act . Warm temperatures (24 °C to 32 °C) along with high moisture or

relative humidity favor for the disease development. Once established, Cmm can survive on plant residues for as long as 3 years, and can persist on stakes and equipment for up to 7 months. Controls of bacterial canker are often difficult once symptoms are observed. A preventive disease management program is the best defense. It can be used certified pathogen-free seeds and transplants. Seed can be hot-water treated or soaked in a solution of bleach (1 part bleach to 3 or 4 parts water). It has also reported that applications of fixed copper plus Mancozeb may reduce epiphytic (superficial) populations of Cmm before symptoms appear, but they generally have little impact on disease control. Yield losses vary with weather, location, cultivar, and phenological stage of host infection. The most critical strategy is the use of disease-free seeds and transplants. With bacterial canker, one infected seed in 10,000 is enough to initiate an epidemic. Seed should be disinfested with hot water, rather than with chlorine or acid treatments because the pathogen can be present under the seed coat where chlorine and acid cannot reach.

Forty samples of showing canker symptoms of different varieties of tomato were collected from major tomato growing areas of central and southern areas of Sri Lanka. Each sample immediately after collection was subjected to serological assay through immuno strip test. Immuno strip test for each sample was done on the instructions given by catalog number STX 44001, Agdia Inc, USA. Leaves samples were ground in buffer at a 1:20 w/v ratio as the instruction describes by the use of Agdia mesh sample bags. Fruit samples were tested in-situ from the infected area of the fruit by cutting a wedge just deep enough to get past rotten material and the tip of the fruit wedge was ground in buffer at a 1: 10 w/v ratio as above. Seeds of canker infected plants and fruits were extracted and tested for occurrence of pathogen in seeds.

Major external symptoms of each sample were recorded at the time of collection using the symptomology given by Centre for Agriculture and Bioscience International (CABI). Most of imported varieties such as Abiman, Implex, Cerus, Platinum, Padma and local varieties were also susceptible for this disease. Out of 40 tested samples, 11 samples were Canker disease positive. Canker disease infected seeds were collected and they were treated by 52°C hot water for 3 min, 55°C hot water for 3 min, and 52°C hot water for 3min + 55°C hot air for 5 min, 55°C hot water for 3min + 55°C hot air for 5 min and

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control treatment and allowed to germinate under in vitro conditions. Treatments had no effect on germination and failed to control Cmm. The seedlings were tested for tomato canker disease by using immune strips 1 week after seed germination and disease transmission rate from seeds to seedlings was ranged 0-100%. However, both symptoms present and non-present plants were produced Cmm positive seeds as well as negative seeds. According to the research findings, we have to introduce resistant or tolerant varieties of tomato and further action to prevent disease spreading.

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