



An emerging threat of *Phytophthora infestans* causing late blight of tomato in Uttar Pradesh, India

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Tomato (*Solanum lycopersicum*) cultivation in India has expanded to 0.91 million ha in 2015-2016. Farmers originally cultivated this crop for self-consumption but now are adopting it as a cash crop for commercial production. Recently, the occurrence of late blight on tomato, caused by *Phytophthora infestans*, in Uttar Pradesh, India has appeared to increase but average late blight incidence on tomato has not been well documented for this region. In early 2016, a severe outbreak of late blight was observed in tomato with a disease incidence up to 60% in farmers' fields in eastern Uttar Pradesh and at the IIVR Research Farm in Varanasi, also in eastern Uttar Pradesh. Initial disease symptoms appeared on leaves as irregular, water-soaked and light-brown lesions usually covered with white, cottony mycelial growth on the underside of the leaf (Fig. 1). Water-soaked brown lesions expanded rapidly on stem and green fruits. Infected green fruits often developed olivaceous, brown-coloured, leathery, hard structures (Fig. 2). All infected fruits eventually fell off the plants and could not be marketed or used for human consumption.

Isolation of the causal agent was done by a modified method described by Tumwine *et al.* (2000). Infected tomato leaves were collected and surface sterilised for 30 seconds in 90% ethanol. A 25-mm² section was cut from a leading edge of a lesion on the sterilised leaf. The sections were aseptically transferred to 5-mm-thick potato slices which had been sterilised with 96% ethanol for one minute and placed in 90-mm-diameter sterilised glass Petri plates. After incubation at 18 ±1°C for five days, colonisation by the pathogen was observed in the form of white mycelial growth (Fig. 3). Microscopic studies of the colonised pathogen on potato slices revealed hyaline, coenocytic, branched hyphae and aseptate sporangiophores with lemon-shaped, papillate sporangia. Sporangia (n=100) dimensions were 32 ±6.3 × 20 ±4.9 µm, with a length to width ratio of 1.6. On the basis of morphological characteristics and sporangia size, the pathogen was confirmed as *P. infestans* (Drenth & Sendall, 2001).

To fulfill Koch's postulates, 5-mm sections from seven-day-old colonised potato slices were placed on detached leaves from 3-week-old tomato plants (variety 'Kashi Aman'). Control leaves were inoculated with sterile potato sections. Inoculated tomato leaves developed water-soaked lesions similar to those originally observed in the field within two days incubated at 18 ±1°C. *Phytophthora infestans* was re-isolated from the infected detached leaves of tomato and identified morphologically. Control leaves did not

develop symptoms and the pathogen was not recovered.

This report highlights the emergence of this pathogen in eastern Uttar Pradesh. The occurrence and impact of late blight in potato is well documented. Regional and seasonal incidence of late blight on potato showed highest average annual crop losses in South-East Asia (35%), including India (40-75%) and Bangladesh (25-57%) (International Potato Center, 1997; Rahman *et al.*, 2008; Arora, 2015). *Phytophthora infestans* is one of the most important pathogens on solanaceous vegetables worldwide threatening food security (Fisher *et al.*, 2012). Its management is dependent on chemical control but pathogen resistance is known to occur. Therefore, there is an urgent need to develop resistant varieties of tomato for changing climatic scenarios.

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Figure 1



Figure 2



Figure 3

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