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Short Note

Bacterial rot: a new threat for rapeseed-mustard production system in India

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Abstract

Root rot caused by *Erwinia caratovora* pv. *carotovora* (Jones) Bergy is an emerging threat for rapeseed-mustard production system, recently reported from the farmers' field in some pockets of India. On an average, about 60 to 80 per cent of plants were affected by the disease at farmer's field in Mahua Simpani village of Bharatpur district of Rajasthan.

Key words: *Root rot, rapeseed-mustard, Erwinia caratovora*

Introduction

Many problems of modern agriculture, such as the overuse of fertilizers and pesticides are a result of the trend in crop production toward homogeneous crop genotypes for certain agricultural areas (Browning and Frey, 1969). In fact, monoculture is presently the dominant form of crop management worldwide, which play the major role in disease progression (Zhu *et al*., 2000). Indian mustard [*Brassica juncea* (L.) Czern & Coss.] is one of the major oilseed crops cultivated in India and convenient as monoculture because one variety is easier to plant, harvest, and market than mixtures of several vis-à-vis low water requirement.

Root rot is an emerging threat for rapeseed-mustard production system, recently reported from the farmers' field in some pockets of the country, which was initially identified as stand-alone bacterial or fungal incidence or in combinations. During the crop season 2008-09, infected plants of mustard by stand-alone bacterial or fungal incidence or in combinations were received from the farmer's of Bharatpur (27°12'N; 77°27'E) district. Reports of the same problem were also received from various other parts of the country viz., other districts of Rajasthan, Madhya Pradesh, Uttar Pradesh and Haryana (Satya Vir *et al*., 1973). The first report about occurrence of stalk rot caused by *Erwinia carotovora* (Jones) Holland appears to have been made by Bhowmik and Trivedi (1980). According to them, the disease appeared in epiphytotic proportion on the commonly cultivated *B. juncea* variety Varuna in 1979 in the Pali district of Rajasthan state, India. Keeping is view the importance of this threat, quick action was undertaken by NRCRM and a team of scientists visited Mahua Simpani village on 25 Nov 2008. The poor widow farmer Mrs. Moharvati of scheduled caste community was very much puzzled due to heavy loss. Mustard seed was procured by the farmer from the local Oil Mill in Bharatpur and sown during first week of October 2008 in fallow-mustard crop sequence.

Affected plant samples were collected to identify the various pathogens associated with the problem from farmers' fields of Mahua Simpani village of Nadbai tehsil in Bharatpur district. On an average, about 60 to 80% of plants were affected by the disease. Badly affected plants toppled down at the basal region within a few days such samples were brought to the Plant Pathology laboratory, National Research Centre on Rapeseed-Mustard, Sewar, Bharatpur for further investigations. Vigorously growing succulent plants, due to an extra dose of nitrogen, as well as those growing poorly in drained soil were affected more severely. Symptoms of the disease were characterized by the appearance of water-soaked lesions at the collar region of plants,

which was usually accompanied by a white frothing. The tender branches were also affected as the lesions advance further to cover larger areas. The leaves showed signs of water stress and withering. The affected stem and branches, particularly the pith tissues, became soft, pulpy and produced dirty white ooze with a foul smell. The infected collar region became sunken and turned buff-white to pale-brown in colour. Infected tissue bits were placed on potato dextrose agar medium after surface sterilization with sodium hypochlorite. After three days incubation it was observed that there was bacterial colony around the bits apart from some other fungal growth. Microscopic observations revealed that the bacterial colonies were *Erwinia* spp. while the fungal colonies were due to *Rhizoctonia solani, Fusarium* and *Sclerotium rolfsii*.

The causal agent *Erwinia caratovora* pv. *carotovora* (Jones) Bergy was confirmed at Division of Plant Pathology, IARI, New Delhi (Burkholder, 1957). The pathogen, a ubiquitous organism, found in soil and water, easily spread during field culture. The bacterium is gram negative, rod-shaped with blunt ends, capsulated, and motile. It formed grayish, circular, translucent, shining, smooth colonies on nutrient agar with a raised centre and wavy margin.

Diseases of the major oilseed crop Indian mustard (*Brassica juncea*), hitherto unknown in farmers' fields viz., rots caused by *Erwinia carotovora* pv. *carotovora, Fusarium, Rhizoctonia solani* and *Sclerotium rolfsii* are being observed for the past few years in the north-western India. The aforesaid pathogens are known primarily as tropical ones and generally not reported from *B. juncea* cropping system. Recent changes, towards warmer winters and hotter, drier summers, are in line with current projections for future climate change. Several reports on climate change and the effect of high atmospheric CO_2, high temperature are indicating breakdown in salicylic acid, Ethylene pathways in plant, which are crucial in plant disease resistance. From the above, it seems as if the crop of Indian mustard in the farmers' fields are encountering abiotic stress related plant acute immuno-deficiency syndrome. Initially the farmers' fields were measured 60 m x 90 m size and was divided into ten equal size parts for spraying ten different treatments, which included garlic (*Allium sativum*) aqueous bulb extract (2% w/v), antibacterial antibiotic (Tetracycline 100 ppm), carbendazim 0.1% a.i., gypsum and kasu bioagent 5g/litre. Treatments were sprayed on 26 November 2008 singly or in combinations. Regular visit to keep a close watch on the crop was done. Plants which were a little alive and able to maintain absorption process recovered slowly after five days of spray. Tetracycline 100 ppm in combination with carbendazim showed best results among all ten treatments (table 1). Such plants were removed and burnt out side the field to avoid further contamination of neighbouring healthy crops. It was observed that after five days bent stem of the plants became straight with the growing up of new leaves in the treatments sprayed with antibacterial antibiotic (Tetracycline) treatment. However, other treatments also responded well. Plants which were disconnected from the root system due to complete rotting with foul smell died. Bacterial stem rot was recorded as per 0 to 5 scale (1: No Symptom, 2: One leaf wilted, 3: two to three leaves wilted, 4: four or more leaves wilted and 5: whole plant wilted-dead).

Table 1: Effect of different treatments on Bacterial rot in mustard

Treatments	% recovery over control
Tetracycline 100 ppm	52
Carbendazim 0.1%	47
Gypsum	15
Kasu bioagent 5g/litre	18
Garlic aqueous extract (2% w/v)	32
Tetracycline 100 ppm + Carbendazim 0.1%	66
Tetracycline 100 ppm + Carbendazim 0.1% + Garlic aqueous bulb extract (2% w/v)	48
Carbendazim 0.1% + Garlic aqueous bulb extract (2% w/v)	44
Gypsum + Garlic aqueous bulb extract (2% w/v)	21
Control	-

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