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Bacterial Stalk Rot : An Emerging Disease of Mustard in Arunachal Pradesh

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Abstract Mustard is one of the major oilseed crops in Arunachal Pradesh. Bacterial stalk rot caused by *Erwinia caratovora* pv *caratovora* (Jones) Bergy and *Pseudomonas marginalis* pv *marginalis* (Brown) Stevens is an emerging threat for mustard cultivation in the state. The characteristic symptoms of the disease were water-soaked lesions on the stalk and branches of plants, which was usually accompanied by a white frothing. Infected plants failed to produce any inflorescences. This incidence of the disease which was noticed the 2nd week of November 2013 ranged from 10.11% in Pusa Mustard 26 to 68.27% in Pusa Agrani.

Keywords Arunachal Pradesh, Bacterial stalk rot, Rapeseed-mustard cultivation.

Introduction

Among the various oilseed crops grown in our country, rapeseed-mustard has occupied an important place in the diet of Indian people as a source of edible oil, condiment and vegetable. It is extensively grown traditionally as a pure crop as well as an intercrop in marginal and sub-marginal soils in the eastern, northern and north-western states of India. Globally, India is one of the largest rapeseed-mustard growing country, occupying the third position in acreage (21.01%) and production (12.58%) after Canada and China during 2011-12. Rapeseed-mustard oil in India contributes 26.5% to the total domestic edible oil production [1]. With ever increasing population, rising standard of living, aberrant weather and liberalization of import and export policies, imports have reached at 8.4 million tonnes during 2011-2012. Rapeseed-mustard is the major source of income especially to the marginal and small farmers in rainfed areas since these crops are cultivated mainly in the rain-fed and resource scarce regions of the country. Despite considerable increase in production and productivity, a wide gap exists between yield potential and yield realized at farmers' field, which is largely because of a number of biotic and abiotic stresses to which the crop is being exposed.

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 [2]. In fact, monoculture is presently the dominant form of

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Table 1. Bacterial stalk rot incidence in different varieties of Indian mustard, rapeseed/toria and broad-leaved mustard under natural condition of Basar (Arunachal Pradesh). T_1 & T_2 : Total number of plants. D_1 & D_2 : Total number of diseased plants. % : diseases incidence (%) = Total number of diseased plants/ Total number of plants \times 100. Mean (%) : Diseases incidence (%) = Total number of diseased plants ($D_1 + D_2$)/ Total number of plants ($T_1 + T_2$) \times 100. -: Crop was not sown. X : Yield data was not recorded. **: Mean of three replications.

Crop with variety/type	T	Disease Incidence (%)					Mean %	Avg.Seed yield (g/m ²)	Calculated seed yield (q/ha)
		2013-14			2014-15				
		D	%	T	D	%			
A. Indian Mustard (<i>Brassica juncea</i> (L.) Czern & Coss)									
Pusa Mustard 25	1419	427	30.09	2323	797	34.31	32.71	122.80	12.28
Pusa Mustard 26	1458	198	13.58	2261	178	07.87	10.11	168.70	16.87
Pusa Mustard 27	1517	533	35.14	2198	775	35.26	35.21	250.80	25.08
Pusa Mustard 28	1305	658	50.42	1610	453	28.14	38.11	87.50	08.75
Pusa Tarak	1666	776	46.58	1463	446	30.49	39.05	293.70	29.37
Pusa Mahak	1492	605	40.55	1294	505	39.03	39.84	40.60	04.60
Pusa Agrani	1619	1251	77.27	1400	810	57.86	68.27	25.00	02.50
B. Rapeseed/toria (<i>Brassica rapa</i> var <i>toria</i>)									
M-27	-	-	-	2350	364	15.49	15.49	325.00	32.50
TS-36	-	-	-	2200	370	16.82	16.82	310.00	31.00
TS-38	-	-	-	2300	325	14.13	14.13	291.67	29.16
TS-46	-	-	-	1600	238	14.88	14.88	250.00	25.00
TS-67	-	-	-	2200	310	14.09	14.09	285.00	28.50
C. Laaii Pattal/Broad-leaved mustard (<i>Brassica juncea</i> (L.) Czern var. <i>rugosa</i> (Roxb.) Tsen & Lee)									
Purple leaf type	90	40	44.44	53	21	39.62	42.66	X	X

crop management worldwide, which plays a major role in disease progression [3]. Mustard is one of the major oilseed cultivated in India and is convenient to grow as monoculture because one variety is easier to plant, harvest, and market than mixtures of several varieties.

Bacterial stalk rot in mustard crop caused by *Erwinia caratovora* pv. *caratovora* (Jones) Bergy and *Pseudomonas marginalis* pv. *marginalis* (Brown) Stevens has been reported from the farmer's field in some pockets of Rajasthan, Madhya Pradesh, Uttar Pradesh and Haryana [4]. Bacterial stalk rot is an emerging threat for rapeseed-mustard production system of the country. Keeping in view the importance of this threat; this paper highlights the potential of the disease and also documents the varietal reactions.

Materials and Methods

The information about bacterial stalk rot disease and

its incidence was recorded from a field experiment (during the rabi season of 2013 and 2014) of mustard crop at ICAR Research farm, Basar (Arunachal Pradesh). Crop was sown in the month of September in maize-mustard crop sequence. Twelve varieties were grown in a plot 1.0m \times 4.0 m with 45 cm \times 15 cm spacing and replicated thrice in randomized block design. All the recommended agronomical practices were followed except use of pesticides. Affected plant samples were collected from the experimental site and brought to the laboratory for further confirmation of the pathogen. Disease incidence was calculated at terminal stage of the crop.

Results and Discussion

The first symptom of the disease was noticed during the 2nd week of Nov, 2013. Symptoms of the disease were observed as water-soaked lesions on the stalk and branches of plants (Fig. 1), which was usually accompanied by a white frothing. The lesions advance

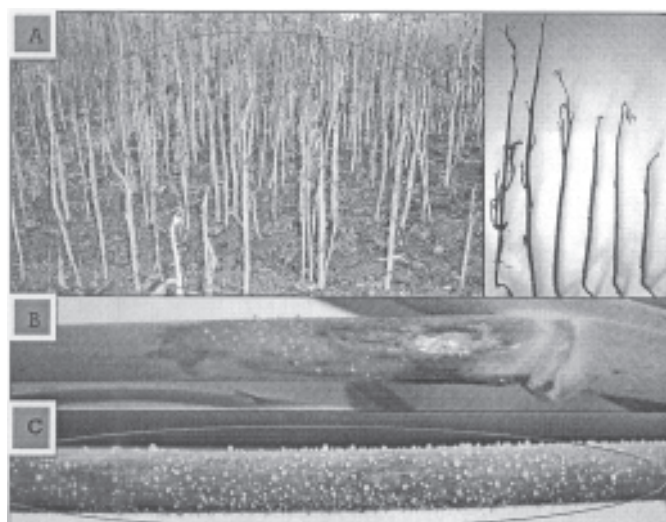


Fig. 1. Bacterial stalk rot : (A) Field view of diseased plants, (B) Initially water-soaked lesion (C) Bacterial Ooze mixed with pollens appears as light yellow colored granules during foggy morning.

further to cover larger areas, thereby, affecting tender branches. The leaves showed the symptoms 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 stalk became sunken and turned buff-white to pale-brown in color. Badly affected plants toppled down at the basal region. Plants with such symptoms failed to produce any inflorescences. The disease has been reported from various other parts of the country viz., Rajasthan, Madhya Pradesh, Uttar Pradesh and Haryana [4].

Bacterial stalk rot incidence was recorded in different varieties of Indian mustard, rapeseed/toria and broad-leaved mustard under natural conditions. On an average, about 10.11 to 68.27% of the plants were affected by this disease (table-1). Maximum disease incidence was recorded in Pusa Agrani (68.27%) and minimum in Pusa Mustard 26 (10.11%). Maximum seed yield was recorded in M-27 (32.5q/ha) followed by TS-36 (31q/ha) and Pusa Tarak (29.37 q/ha).

The aforesaid pathogen is reported from primarily from tropical areas and generally not from mus-

tard cropping system in North-eastern states of the country. 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 CO₂, 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 mustard, toria and broad-leaved mustard in the experiment fields are encountering abiotic stress related plant acute immuno-deficiency syndrome.

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