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Prevalence of Collar Rot of Tomato Caused by *Sclerotium rolfsii* (Sacc.) under the Red and Lateritic Zone of West Bengal, India

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ABSTRACT

Keywords

Tomato, Collar rot, *Sclerotium rolfsii*, Disease incidence, Lateritic zone.

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Tomato (*Solanum lycopersicon* L.) a member of the family Solanaceae, is the world's largest vegetable crop after potato and sweet potato. Diseases of tomato act as the chief limiting factor to its economic production. Recently, the collar rot caused by *Sclerotium rolfsii* is becoming sever disease of tomato in India. Crop Losses up to 30 per cent due to collar rot disease have been reported by many researchers in this crop. Hence to get a preliminary idea regarding the incidence level and pattern of prevalence of the disease in the agro-ecological condition of undulating red and lateritic zone of West Bengal, a roving survey was conducted at different locations of the aforesaid agro climatic zone during the crop growing season of 2014-15 and 2015-16. The pooled analysis of two years data revealed that disease incidence was ranged from 7.61 to 21.79 % in this zone and the Purulia district had maximum level of disease incidence ranging from 13.14 to 21.79 % followed by Bankura districts 11.90 to 16.64 %, Birbhum district 9.75 to 17.73%, Burdwan district 7.61 to 14.54 %. Paschim Medinipur district was noticed with less incidence levels ranging from 9.08 to 9.51 %. This study provided an elementary idea about the disease incidence pattern in this zone as well as paved the path for seeking resistance sources under local conditions and recommendation of proper farming practices to combat the drastic effects of collar rot disease.

Introduction

Tomato (*Solanum lycopersicon* L.) a member of the family Solanaceae, is the most popular and high-value vegetable crop in the world because of its taste, color and high nutritive value and also for its diversified use. It is the world's largest vegetable crop after potato and sweet potato. Due to its extensive cultivation in non-traditional areas, several biotic and abiotic factors have emerged as a major constraint in its successful cultivation. Among the biotic factors, diseases i.e., collar rot (*Sclerotium rolfsii*), damping off (*Pythium*

spp.), early blight (*Alternaria solani*), fruit rot (*Phytophthora nicotianae*), bacterial wilt (*Ralstonia solanacearum*), Bacterial fruit canker: (*Clavibacter michiganense* subsp. *Michiganense*), *Rhizoctonia* root rot (*Rhizoctonia solani*), Tomato spotted wilt-Tomato Spotted Wilt Virus (TSWV), Tomato Mosaic (*Tomato mosaic virus*), Root knot nematode (*Meloidogyne* sp), little leaf (phytoplasmal) are the major diseases of Tomato (Meah, 2003). But recently, the collar rot caused by *Sclerotium rolfsii* is becoming

sever disease of tomato in India. It caused 30 per cent of crop loss in Tomato (Thiribhuvanamala *et al.*, 1999). Banyal *et al.*, (2008) reported collar rot caused by *Sclerotium rolfsii* (*Corticium rolfsii*) is one of the major threats in Himachal Pradesh, India, with an incidence of 10-45%. The disease is distributed in tropical and sub-tropical regions of the world where high temperatures prevail. *Sclerotium rolfsii*, the causal agent of collar/foot rot of many crops (Aycok, 1966) having a wider host range (Talukdar, 1974 and Bhattacharya *et al.*, 1977) attracted the attention of plant pathologist and professional researcher throughout the world. The pathogen is known to cause diseases of cereals, pulses, oil crops, potatoes, vegetables, ornamentals, and nursery seedlings of fruits and forest trees (Bertus, 1929). The pathogen is a soil inhabitant, very aggressive nature, attacks the collar portion of plant, which ultimately leads to its death. The infection leads to the drying of lower leaves and eventually the whole plant dries giving a typical symptom of wilting. The collar rot of tomato may occur at any growth stage of the plant (Begum *et al.*, 1985). The disease has been reported by many workers in different agro climatic zone of West Bengal. But accurate information of natural incidence level of the disease particularly in the undulating red and lateritic zone of West Bengal is scanty. Inadequate knowledge about the incidence level of the disease, their distribution pattern etc. leads the use of chemicals indiscriminately. Therefore the present study was carried to find out the occurrence and distribution pattern of collar rot disease of tomato in the agro-ecological condition of undulating red and lateritic zone of West Bengal.

Materials and Methods

To estimate the natural incidence of collar rot disease of tomato under the agro-ecological

condition of undulating red and lateritic zone of West Bengal, surveys were carried out during the crop growing season of 2014-15 and 2015-16 in different district of undulating red and lateritic regions of West Bengal which include part of Birbhum, Bankura, Purulia, Burdwan and Paschim Medinipur, where tomato crops was cultivated extensively by the farmers.

In each place, field of more or less uniform size was selected at random and observation on the incidence of the diseases was recorded. Percent disease incidence was calculated by using the following formula.

$$\text{Percent Disease Incidence} = \frac{\text{Number of plants showing wilting symptom}}{\text{Total number of plants}} \times 100$$

Results and Discussion

To obtain information on the natural incidence of collar rot of tomato, surveys were conducted during the growing season (November' 2014-April' 2015 and November' 2015-April' 2016) in different locations of undulating red and lateritic zone of West Bengal i.e. Birbhum, Burdwan, Bankura, Purulia and Paschim Medinipur districts to record the incidence of the disease. The recorded data of disease incidence have been presented in the table 1 and 2.

It was evident from both the tables that the incidence of collar rot disease of tomato varied with the location and season. The incidence of the collar rot disease ranging from 7.36 % to 21.06 % was obtained during 2014-15 (Table 1) while during the year 2015-16 it was ranging between 7.86 % to 22.52 % (Table 2). The highest disease incidence of 17.75 % was found in district Purulia followed by district Bankura 14.54 %, Birbhum district 13.91 %, Burdwan District

10.48 % and least incidence was observed in Paschim Medinipur district 8.87 % during the year 2014-15 (Table 1 and Fig. 1). While, more or less similar trend was observed during the year 2015-16 with highest incidence in district Purulia on 18.00 % followed by Bankura district on 14.72 %, Birbhum district 13.97 %, Burdwan District 11.04 % and least incidence in Paschim Medinipur district 8.98 % (Table 2 and Fig.

1). Among the locations surveyed, disease incidence was highest at Nandura village of Raghunathpur-1 block under Purulia district during both the years of survey (21.06 % and 22.52 % during 2014-15 and 2015-16 respectively) while, it was lowest on 7.36 % and 7.86 % at Gobindapur village of Pandebeswar block, under Burdwan district during 2014-15 and 2015-16 respectively.

Photo Plate.1 Categorization of districts of red and lateritic zone of West Bengal based on prevalence of collar rot of tomato caused by *Sclerotium rolfsii*. (+) sign refers to the degree of prevalence of disease with (+++++) for maximum and (+) for minimum prevalence and subsequent degree of prevalence accordingly as per no. of (+) sign

Table.1 Natural incidence of collar rot of tomato *in different locations of red and lateritic zone of West Bengal during 2014-15*

S. No	District	Block	Village	No of Field Surveyed	Disease Incidence	District wise Average Disease Incidence
1	Purulia	Hura	Daldali	4	13.64	17.75
2		Manbajar	Nathurdi	5	18.54	
3		Raghunathpur 1	Nanduara	8	21.06	
4	Bankura	Gangalalghati	Dangjuria	6	16.52	14.54
5		Chatna	Chatna	4	15.36	
6		Borjora	Borjora	9	11.75	
7	Birbhum	Ilambajar	khayerbani	4	9.65	13.91
8		Labpur	Labpur	6	14.75	
9		Bolpur Sriniketan	Benuria	7	17.34	
10	Burdwan	Raniganj	Belebathan	5	14.04	10.48
11		Pandebeswar	Gobindapur	4	7.36	
12		Salanpur	Salanpur	6	10.03	
13	Paschim Medinipur	Gorbetha	Garberia	6	9.48	8.87
14		Jharagram	Jharagram	5	9.02	
15		Binpur	Binpur	4	8.10	

Table.2 Natural incidence of collar rot of tomato *at different locations of red and lateritic zone of West Bengal during 2015-16*

S. No	District	Block	Village	No of Field Surveyed	Disease Incidence	District wise Average Disease Incidence
1	Purulia	Hura	Daldali	4	12.64	18.00
2		Manbajar	Nathurdi	5	18.84	
3		Raghunathpur 1	Nanduara	8	22.52	
4	Bankura	Gangalalghati	Dangjuria	6	16.75	14.72
5		Chatna	Chatna	4	15.36	
6		Borjora	Borjora	9	12.05	
7	Birbhum	Ilambajar	khayerbani	4	9.85	13.97
8		Labpur	Labpur	6	13.95	
9		Bolpur Sriniketan	Benuria	7	18.12	
10	Burdwan	Raniganj	Belebathan	5	15.04	11.04
11		Pandebeswar	Gobindapur	4	7.86	
12		Salanpur	Salanpur	6	10.23	
13	Paschim Medinipur	Gorbetha	Garberia	6	9.53	8.98
14		Jharagram	Jharagram	5	9.14	
15		Binpur	Binpur	4	8.26	

Table.3 Natural incidence of collar rot of tomato in different districts of red and lateritic zone of West Bengal (Pooled analysis)

S.No	District	Block	Village	Disease Incidence		Average disease Incidence	District wise disease incidence
				2014-15	2015-16		
1	Purulia	Hura	Daldali	13.64	12.64	13.14	17.87
2		Manbajar	Nathurdi	18.54	18.84	18.69	
3		Raghunathpur 1	Nanduara	21.06	22.52	21.79	
4	Bankura	Gangalalghati	Dangjuria	16.52	16.75	16.64	14.63
5		Chatna	Chatna	15.36	15.36	15.36	
6		Borjora	Borjora	11.75	12.05	11.90	
7	Birbhum	Ilambajar	khayerbani	9.65	9.85	9.75	13.94
8		Labpur	Labpur	14.75	13.95	14.35	
9		Bolpur Sriniketan	Benuria	17.34	18.12	17.73	
10	Burdwan	Raniganj	Belebathan	14.04	15.04	14.54	10.76
11		Pandebeswar	Gobindapur	7.36	7.86	7.61	
12		Salanpur	Salanpur	10.03	10.23	10.13	
13	Paschim Midnapur	Gorbetha	Garberia	9.48	9.53	9.51	8.92
14		Jharagram	Jharagram	9.02	9.14	9.08	
15		Binpur	Binpur	8.10	8.26	8.18	

While comparison of the incidence level of collar rot disease in five districts, the pooled analysis (Table 3 and Fig. 1) indicated that the Purulia district had maximum level of disease incidence ranging from 13.14 to 21.79 % followed by Bankura districts 11.90 to 16.64 %, Birbhum district 9.75 to 17.73%, Burdwan district 7.61 to 14.54 %. Paschim Medinipur district was noticed with less incidence levels ranging from 9.08 to 9.51 % during seasons under surveyed (Photo plate 1). Higher incidence of collar rot of tomato in Purulia and Bankura districts in comparison to Burdwan, Birbhum and Paschim Medinipur districts was probably due to the higher range of soil and atmospheric temperature which help the pathogen *Sclerotium rolfsii* for faster multiplication and growth in soil and sandy clay loam soil fulfil the high oxygen demand for survival of sclerotia.

Banyal *et al.*, (2008) reported collar rot of tomato (*Sclerotium rolfsii*) is one of the major

threats in Himachal Pradesh, India, with an incidence of 10-45%. Thiribhuvanamala *et al.*, (1999) observed that 30 per cent of crop loss in tomato was due to *S. rolfsii*. Ingale and Mayee, (1986) reported that 25 per cent of seedling mortality in the cultivar JL-24 of Groundnut at Parbhani due to *S. rolfsii*. Naidu (2000) reported that *S. rolfsii* caused 40-50 per cent mortality in crossandra in Chittoor district of Andhra Pradesh. In Chickpea, upto 30 percent disease incidence reported in Jabalpur by Padole *et al.*, (2009). In Saurashtra, Gujarat, 30-40% seedling rot reported on garlic (Lukose *et al.*, 2003). Collar rot caused by *S. rolfsii* is the most destructive disease of tomato in Bangladesh (Talukder, 1974). The above information's are in line of the present findings.

The results obtained in this experimental study revealed that the collar rot of tomato caused by *Sclerotium rolfsii* was prevalent in all the districts of undulating red and lateritic

agro-climatic zone of West Bengal (India). The district Purulia showed maximum prevalence of collar rot whereas minimum prevalence was recorded in Paschim Medinipur district. The higher range of soil and atmospheric temperature and continuous cultivation of susceptible cultivars over years were responsible for high prevalence of collar rot in these locations. The finding emphasize on seeking new resistance sources under local conditions and encouraging of sowing resistance cultivars by following good management practices.

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