Applied Biological Research 24(4): 536-539; (2022) **SHORT COMMUNICATION**
DOI: 10.5958/0974-4517.2022.00058.1

PREVALENCE OF PHOMOPSIS BLIGHT AND FRUIT ROT OF BRINJAL IN KASHMIR

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(Received 24 April, 2022; accepted 5 November, 2022)

ABSTRACT

The present study was aimed to assess the status of Phomopsis blight and fruit rot, caused by *Phomopsis vexans*, in Kashmir (India), for which 27 sites in 3 districts (Bandipora, Baramulla and Ganderbal) were selected. The mean of three fields represented disease incidence and intensity of respective site. Nine plants each from 4 corners and centre of each field were randomly selected and their leaves, stem and fruits examined for disease incidence and intensity. The overall mean incidence and intensity of leaf blight, fruit rot and stem blight were 48.1 and 15.1%, 41.7 and 18.4%, and 21.4 and 6.2%, respectively. The maximum disease incidence and intensity on leaves, fruit and stem were 64.4 and 22.2%, 55.2 and 27.6%, and 31.8 and 10.1%, respectively, observed in district Baramulla. The minimum disease incidence and intensity on leaves (30.9 and 8.2%,), fruits (27.8 and 9.9%) and stem (12.9 and 3.1%) were observed in district Ganderbal.

Keywords: Brinjal, fruit rot, incidence, intensity, Phomopsis blight

INTRODUCTION

Brinjal (*Solanum melongena* L.), also known as aubergine, eggplant or locally as "Wangun" in Kashmir, belongs to the family Solanaceae. India is the 2nd largest producer of brinjal after China and it is cultivated throughout the country round the year. However, in Kashmir it is cultivated in summer only. In India, brinjal is grown on 0.37 million ha area, with annual production of 12.80 million t, and mean productivity of 17.54 t ha^{-1} (NHB, 2018). In Jammu and Kashmir, the crop is grown on 0.0025 million ha area, with the production of 0.045 million t, and productivity of 18.24 t ha^{-1} (NHB, 2018). Besides containing good quantity of essential nutrients, brinjal fruit has several medicinal properties including decholestrolizing property primarily due to the presence of higher amount of polyunsaturated fatty acids (linoleic and linolenic acids) in its flesh and seeds (Anwar *et al*., 2017).

Brinjal crop is susceptible to many diseases that causes severe losses during all its phenological stages of growth and development. The most significant and widespread among them are Phomopsis blight and fruit rot (*Phomopsis vexans*), leaf spot (*Alternaria melongena*), damping off (*Pythium aphanidermatum*), bacterial wilt *(Pseudomonas solanacearum* and *Ralstonia solanacearum*), wilt *(Verticillium dahlia*), little leaf *(Phytoplasma*) and root knot (*Meloidogyne incognita*) (Jayaramaiah *et al*., 2013; Nabi *et al.*, 2022). However, Phomopsis blight and fruit rot caused by *Phomopsis vexans* (Sacc & Syd.) Hater, an anamorphic stage of *Diaporthe vexans*, is a most destructive disease and a major constraint in successful brinjal cultivation (Islam *et al.*, 2010; Jayaramaiah *et al.*, 2013). Phomopsis blight ranks 2nd to bacterial wilt in destructiveness of brinjal (Khalil *et al*., 2013), thus reduces the yield and marketable value of crop by 20-50% (Reddy *et al*., 2018). The losses in fruit yield occur due to poor seed germination, poor plant stand and decrease in fruit number (34.8%) and

fruit weight (17.0%) (Reddy *et al*., 2018). Phomopsis blight and fruit rot affects the crop from seedling to maturity. The initial symptoms appear as small circular spots on leaves which become grey to brown with a light-coloured centre. Lesions also develop on petiole and stem causing blight in the affected portions. Pale to light brown sunken spots develop on the fruit surface and these symptoms enlarge and become depressed (Ronald, 2009). In Kashmir valley, severe epidemics of Phomopsis fruit rot has resulted in yield losses up to 47% (Anwar *et al*., 2017). However, no much systematic survey has been conducted to assess the status of this disease in Kashmir. Hence, the present study was aimed to assess the status of Phomopsis disease with respect to its distribution, incidence and severity.

MATERIALS AND METHODS

An intensive survey of main brinjal growing areas in districts of Bandipora, Baramulla and Ganderbal of Kashmir valley was conducted during August 2019 to record the incidence and intensity of Phomopsis blight and fruit rot (*Phomopsis vexans*). In each district three locations were observed for Phomopsis blight and fruit rot and in each location three sites were selected. Average of three fields represented disease incidence and intensity of respective site. All the locations, sites and fields were selected based on farmers feedback regarding the disease. In all, 27 sites were observed at 9 locations. Nine plants each at four corners and centre of the each of the field were randomly selected and their leaves, stem and fruits were examined for recording percent incidence and intensity of the disease. The incidence of Phomopsis blight and fruit rot were calculated by using the following formula (Sharma *et al*., 2011):

$$\text{Per cent disease incidence} = \frac{\text{Number of diseased plants}}{\text{Total number of plants examined}} \times 100$$

The severity of Phomopsis blight and fruit rot was measured using 0-7 scale described by Sharma *et al*. (2011) wherein, 0: no symptoms, 1: 1-10% of the area affected, 2: 11-25% area affected, 3: 26-50% area affected, 4: 51-75% area affected, 5: 76-90% area affected, 6: 91-99% area affected and 7: 100% area affected by the disease.

The per cent disease intensity was calculated as per the following formula:

$$\text{Per cent disease intensity} = \frac{\sum (n \times v)}{N \times S} \times 100$$

Where, n = Number of diseased leaves/fruits/stem in each category, v = Numerical value of the group, N = Total number of leaves/fruits/stem examined, and S = Maximum numerical rating

The data entry and processing were carried out in MS exel-10. Analysis was done at 5% level of significance (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Phomopsis blight incidence and intensity

The Phomopsis blight and fruit rot of brinjal was prevalent in all the 3 districts surveyed (Bandipora, Baramulla and Ganderbal) [Table 1]. The highest incidence of 64.4, 55.2 and 31.8% for leaf blight, fruit rot and stem blight, respectively, and intensity of 22.2, 27.6 and 10.1% for above respective diseases was observed in district Baramulla. Ganderbal district exhibited least incidence of 30.9, 27.8 and 12.9% for leaf blight, fruit rot and stem blight, respectively, and intensity of 8.1, 9.9 and 3.1% for above respective diseases. Among the locations surveyed, the incidence of leaf blight (65.7%), fruit rot (56.0%) and stem blight (33.6%) and intensity of leaf blight (24.0%), fruit rot (28.6%) and stem blight (10.9%) were highest in Bomai of district Baramulla, followed by Baramulla (64.7% leaf blight, 55.5% fruit rot, 33.3% stem blight incidence and 22.3% leaf blight, 27.5% fruit rot, 10.3% stem blight intensity). Least Phomopsis blight and fruit rot incidence and intensity was observed in Ganderbal (25.9 and 5.9% % leaf blight, 20.2 and 7.5% fruit rot, 11.1 and 2.4% stem blight, respectively).

Table 1: Incidence and intensity of leaf blight, fruit rot and stem blight of brinjal at various sites of Kashmir valley during 2019

Districts	Locations	Sites	Leaf blight		Fruit rot		Stem blight	
			Incidence* (%)	Intensity* (%)	Incidence* (%)	Intensity* (%)	Incidence* (%)	Intensity* (%)
Bandipora	Sumbal	Sumbal	46.7 (43.1)	13.3(21.4)	38.5(38.4)	13.4(21.5)	16.3(23.8)	4.2(11.8)
		Nesbal	47.4 (43.5)	13.4(21.5)	40.7(39.7)	16.3(23.8)	17.0(24.4)	4.3(12.0)
		Asham	39.3 (38.8)	12.2 (20.4)	35.6 (36.6)	12.9 (21.1)	14.8 (22.6)	3.6 (10.9)
		Submean	44.5 (41.8)	13.0 (21.1)	38.3 (38.2)	14.2 (22.1)	16.0 (23.6)	4.0 (11.6)
	Shadipora	Ganastan	49.6 (44.8)	15.9 (23.5)	43.7 (41.4)	18.4 (25.4)	20.7 (27.1)	5.8 (14.0)
		Shilvat	48.1 (43.9)	14.7 (22.5)	42.2 (40.5)	17.3 (24.6)	17.8 (24.9)	4.6 (12.4)
		Malikpora	50.4 (45.2)	16.0(23.6)	44.4(41.8)	20.3(26.8)	21.5(27.6)	5.9(14.1)
		Sub-Mean	49.4 (44.6)	15.5(23.2)	43.4(41.2)	18.7(25.6)	20.0(26.6)	5.5(13.5)
	Naidkhai	Naidkhai	48.9 (44.4)	15.2(22.9)	43.0(40.9)	17.0(24.3)	19.3(26.0)	5.3(13.3)
		Gundjehangir	59.3 (50.3)	16.2(23.8)	45.9(42.7)	22.4(28.3)	23.7(29.1)	6.8(15.2)
		Kanibathin	51.1 (45.6)	16.2(23.7)	45.2(42.2)	21.3(27.5)	23.0(28.6)	7.1(15.5)
		Sub-Mean	53.1 (46.8)	15.9(23.5)	44.7(41.9)	20.2(26.7)	22.0(27.9)	6.4(14.7)
	Mean disease		49.0 (44.4)[b]	14.8(22.6)[b]	42.1(40.5)[b]	17.7(24.9)[b]	19.3(26.1)[b]	5.3(13.3)[b]
Baramulla	Sopore	Arampora	60.0 (50.8)	16.8(24.2)	51.8(46.1)	24.6(29.8)	24.4(29.6)	7.7(16.1)
		Botingoo	67.4 (55.2)	25.4(30.2)	57.8(49.5)	30.0(33.2)	36.3(37.0)	11.6(19.9)
		Krankshivan	61.5 (51.6)	18.8(25.7)	52.6(46.5)	25.0(30.0)	25.2(30.1)	7.8(16.2)
		Sub-Mean	63.0 (52.5)	20.3(26.8)	54.0(47.3)	26.6(31.0)	28.6(32.3)	9.0(17.5)
	Baramulla	Arampora	64.4 (53.4)	22.4(28.3)	55.5(48.2)	27.6(31.7)	33.3(35.3)	10.3(18.7)
		Delina	63.7 (52.9)	21.3(27.5)	54.8(47.8)	26.7(31.1)	31.8(34.4)	9.7(18.5)
		Jhanbazpora	65.9 (54.3)	23.1(28.7)	56.3(48.6)	28.3(32.1)	34.8(36.2)	10.8(19.2)
		Sub-Mean	64.7 (53.5)	22.3(28.2)	55.5(48.2)	27.5(31.7)	33.3(35.3)	10.3(18.7)
	Bomai	Nathipora	68.1 (55.6)	26.7(31.1)	58.5(49.9)	30.2(33.4)	37.0(37.5)	13.0(21.1)
		Bomai	66.7 (54.7)	24.6(29.7)	56.3(48.6)	29.3(32.8)	35.5(36.6)	11.4(19.7)
		Wadura Payeen	62.2 (52.1)	20.6(27.0)	53.3(46.9)	26.1(30.7)	28.1(32.0)	8.4(16.9)
		Sub-Mean	65.7(54.1)	24.0(29.3)	56.0(48.5))	28.6(32.3)	33.6(35.4)	10.9(19.3)
	Mean disease		64.4(53.4)[a]	22.2(28.1)[a]	55.2(48.0)[a]	27.6(31.7)[a]	31.8(34.4)[a]	10.1(18.4)[a]
Ganderbal	Ganderbal	Khalmulla	24.4(29.6)	5.1(13.1)	18.5(25.5)	7.0(15.3)	10.4(18.8)	2.3(8.7)
		Nuner	27.4(31.6)	6.9(15.2)	22.2(28.1)	8.1(16.6)	11.8(20.1)	2.6(9.3)
		Lar	25.9(30.6)	5.6(13.7)	20.0(26.6)	7.4(15.8)	11.1(19.5)	2.4(8.9)
		Sub-Mean	25.9(30.6)	5.9(14.0)	20.2(26.7)	7.5(15.9)	11.1(19.5)	2.4(9.0)
	Batwina	Ahan	29.6(33.0)	7.0(15.3)	28.1(32.0)	10.3(18.7)	13.3(21.4)	3.1(10.2)
		Batwina	28.9(32.5)	6.4(14.6)	26.7(31.1)	9.4(17.9)	12.6(20.8)	3.0(10.1)
		Youngera	32.6(34.8)	10.1(18.6)	33.3(35.3)	12.0(20.3)	14.1(22.0)	3.4(10.7)
		Sub Mean	30.4(33.4)	7.8(16.3)	29.4(32.8)	10.6(19.0)	13.3(21.4)	3.2(10.3)
	Wakura	Patishallabug	41.5(40.1)	13.3(21.4)	36.3(37.0)	13.3(21.4)	15.6(23.2)	4.0(11.5)
		Wakura	37.8(37.9)	10.7(19.1)	34.1(35.7)	12.7(20.9)	14.1(22.0)	3.4(10.7)
		Nowabagh	30.4(33.4)	8.1(16.6)	31.1(33.9)	9.1(17.5)	13.3(21.4)	3.2(10.4)
		Sub-Mean	36.5(37.2)	10.7(19.1)	33.8(35.6)	11.7(20.0)	14.3(22.2)	3.5(10.9)
	Mean disease		30.9(33.8)[c]	8.1(16.6)[c]	27.8(31.8)[c]	9.9(18.4)[c]	12.9(21.1)[c]	3.1(10.1)[c]
Overall disease incidence and intensity			48.1(43.9)	15.0(22.8)	41.7(40.2)	18.4(25.4)	21.4(27.5)	6.1(14.4)
$CD_{0.05}$			1.9	1.4	2.0	1.3	1.6	1.1

*Mean of three fields at each site

Significantly highest mean disease incidence (64.4% leaf blight, 55.2% fruit rot and 31.8% stem blight) and mean intensity (22.2% leaf blight, 27.6% fruit rot and 10.1% stem blight) was observed in district Baramulla. Significantly least mean disease incidence (30.9% leaf blight, 27.8% fruit rot, 12.9% stem blight) and intensity (8.1% leaf blight, 9.9% fruit rot, 3.1% stem blight) was observed in district Ganderbal. These findings support the phenomenon of disease development i.e. more the disease incidence more will be its intensity (Anwar *et al*., 2017). Variation in infection by *P. vexans*

revealed variation in the distribution of pathogen in different growing areas in Kashmir. Variation in geographical distribution of *P. vexans* has previously been reported by Hossain *et al*. (2010). The intensity of leaf blight was less than fruit rot, which could be due to the inoculum build up till flowering period, thereby having the availability of more inoculum to cause higher intensity of fruit rot.

Establishing the disease status is pre-requisite to decide about the suitable management strategies. The present study revealed that Phomopsis blight and fruit rot were prevalent in all the locations studied, though the disease incidence and intensity differed among the locations. Similar variations in disease have been reported from other brinjal growing areas of India (Sharma *et al*., 2011; Hossain *et al*., 2013). Higher disease at some sites of districts could be attributed to the use of infected seed, absence of crop rotation, higher plant density leading to higher relative humidity in the microclimate of plants, besides non-disposal of fallen diseased leaves, fruits and plant debris. These observations are supported by earlier workers (Howard and David, 2007; Anwar *et al*., 2017).

Acknowledgements: The authors are highly thankful to the Head, Division of Plant Pathology, Faculty of Agriculture, SKUAST-K, Wadura for providing facilities to carry out the present work.

REFERENCES

Anwar, A., Bhat, M., Ganaie, N., Ambardar, V.K. and Hassan, G.M. 2017. Prevalence and management through relative performance of organic mulches and fungitoxicants of noxious Phomopsis fruit rot (*Phomopsis vexans* Sacc. & Syd.) Harter, in brinjal ecology of Kashmir. *The Pharma Innovation,* **6**(9): 318-323.

Gomez, K.A. and Gomez, A.A. 1984. *Statistical Procedures for Agricultural Research*. Wiley Inter-science, New York, USA.

Hossain, M.I., Islam, M.R., Uddin, M.N., Arifuzzaman, S.M. and Hasan, G.N. 2013. Control of Phomopsis blight of eggplant through fertilizer and fungicide management. *International Journal of Agriculture Research, Innovation and Technology,* **3**: 66-72.

Hossain, M.T., Hossain, S.M.M. and Bakr, M.A. 2010. Survey on major diseases of vegetable and fruit crops in Chittagong region. *Bangladesh Journal of Agricultural Research,* **35**(3): 423-429.

Howard, F.S. and David, H.G. 2007. *Phomopsis Fruit Rot (Phomopsis Blight).* Montana State University. Bozeman, Montana USA.

Islam, M.M., Asaduzamman, M., Hoque, M.E. and Meah, M.B. 2010. Morphological characterization of isolates of *Phomopsis vexans* of Bangladesh. *Journal of Science Foundation,* **8**: 123-130.

Jayaramaiah, K.M., Mahadevakumar, S., Charithraj, A.P. and Janardhana, G.R. 2013. PCR based detection of *Phomopsis vexans* (Sacc. & Syd.) Harter - The causative agent of leaf blight and fruit rot disease of Brinjal (*Solanum melongena* L.). *International Journal of Life Science,* **7**(1): 17-20.

Khalil, M.I., Meah, M.B. and Islam, M.M. 2013. Morphological and molecular characterization of eggplant lines for resistance to Phomopsis blight and fruit rot. *International Journal of Agricultural Research, Innovation and Technology,* **3**(1): 35-46.

Nabi Zarka., Ahanger, F.A., Bhat, K.A., Shah, T.A., Bhat, J.A., Mahreena Farooq., Banday, S.A. and Sofi, T.A. 2022. Screening of available germplasm for resistance to Phomopsis blight in brinjal. *The Pharma Innovation Journal,* **11**(5): 1295-1302.

NHB. 2018. *Area and Production for Horticultural Crops. National Horticulture Board Report, India*. National Horticultural Board, Gurgaon, Haryana, India [*https://nhb.gov.in*].

Reddy, Y.N.P., Jakhar, S.S. and Dahiya, O.S. 2018. Management of fruit rot of brinjal caused by *Phomopsis vexans. International Journal of Current Microbiology and Applied Sciences,* **7**(6): 2826-2839.

Ronald, F. 2009. *Phomopsis Fruit Rot and Blight on Eggplant.* Texas Agri Life Ext. Ser, Texas, USA.

Sharma, M., Razdan, V K. and Gupta, S. 2011. Occurrence of Phomopsis leaf blight and fruit rot of brinjal caused by *Phomopsi vexans* in Jammu. *Annals of Plant Protection Sciences,* **19**: 396-399.