
Ascochyta Blight of Common Bean: Disease Status in Kashmir and Screening for Host Plant Resistance

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Ascochyta blight is one of the important foliar diseases of common bean (*Phaseolus vulgaris* L.) worldwide. In Kashmir, its status was recorded in three districts viz. Budgam, Baramulla and Pulwama during Kharif 2017 and the disease was found prevalent in all the geographical areas with overall mean incidence and intensity of 39.56 and 17.57 per cent, respectively. The maximum disease incidence (57.66%) and intensity (25.06%) was observed in district Baramulla and minimum disease incidence (29.65%) and intensity (13.80%) in district Pulwama. In germplasm screening programme under greenhouse conditions, all the 93 lines manifested typical blight symptoms when inoculated with *Phoma exigua*. However, depending on the variable disease intensity, five lines viz., WB-06, WB-285575, WB-371, PM-1 and WB-3629 were categorised as moderately resistant with disease intensity ranging from 6.5-6.87 per cent.

Key words: *Ascochyta* sp, *Phoma exigua*, *Phaseolus vulgaris*, bean blight, germplasm screening

INTRODUCTION

Common bean (*Phaseolus vulgaris* L.) belongs to family Leguminosae and occupies a premier place among legumes in the world including India, where it is locally called as Rajma. The crop is distributed worldwide and is grown under diverse agro-ecosystems ranging from tropical, sub-tropical to temperate region (Popelka *et al.*, 2004).

Global production of dry beans in 2018 was about 30.43 million tonnes, with India as the largest producer (6.22 million tonnes) followed by Brazil (2.9 million tonnes), and for green beans India ranked second after China with a production of 19.9 million tonnes (Anonymous, 2018).

In India, according to Choudhary *et al* (2018), common bean is grown mainly in the states of Maharashtra, Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh, Tamil Nadu (Nilgiri Hills, Palani Hills), Kerala (Parts of Western Ghats), Karnataka (Chickmagalur Hills) and West Bengal (Darjeeling Hills). The agro-climatic conditions of Kashmir valley offer an advantage for cultivation

of beans. However, the cool and moist climatic conditions prevalent during the growing season of beans predispose common bean crop to a number of biotic stresses particularly fungal diseases that adversely affect its production and productivity. Many fungi, bacteria and viruses are pathogenic to bean crop and cause diseases viz., Ascochyta blight (*Ascochyta phaseolorum*), angular leaf spot (*Phaeoisariopsis griseola*), white mold (*Sclerotinia sclerotiorum*), anthracnose (*Colletotrichum lindemuthianum*), rust (*Uromyces appendiculatus*), leaf spot (*Cercospora cruenta*), powdery mildew (*Erysiphe polygoni*), charcoal rot (*Macrophomina phaseolina*), dry root rot and wilt (*Fusarium solani*), bacterial blight (*Xanthomonas phaseoli*), bean common mosaic and bean yellow mosaic (Schwartz and Harveson, 2015). Ascochyta blight caused by *Phoma exigua desmaz.* var. *exiguadesmaz.* (syn. *Ascochyta phaseolorum* Sacc.) in Kashmir as reported by Parveen *et al.* (2019) has been considered an emerging disease in common beans particularly in areas with high humidity and moderate temperatures (Ferreira *et al.*, 2016).

Breeding for resistance is widely acknowledged as the most economic and environment friendly

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method of plant disease management. On the other hand, resistance breeding is not an easy task as one may or may not find a resistant source against a particular disease. In some relevant studies no good level of resistance to Ascochyta blight is identified in the primary gene pool of *Phaseolus vulgaris* in screening nurseries with both cultivated forms and wild forms. However, screening for resistance has to be a continuous process to see if any resistance source has evolved over a period of time. This study was undertaken to serve the same intention besides highlighting the status of this emerging disease in Kashmir.

MATERIALS AND METHODS

Status of disease in Kashmir

To record the status of Ascochyta blight of beans in the valley of Kashmir, important bean growing areas spread across three districts viz., Budgam, Baramulla and Pulwama were surveyed during June-July. Each district was represented by three blocks and each block by three locations/villages and each village by three bean fields. Considering plant as a unit, randomly selected twenty five plants, five each at four sides and centre of the field while avoiding boarder population, were examined for recording observations on severity of Ascochyta blight. On the basis of visual observations, these units were categorised as per the disease scoring scale of Schoonhoven and Corrales (1987) and the disease severity (%) was worked out by using the formula $\frac{(nxv)/NxG}{100}$, where, n = number of units in each category, v = category value (grade), N = total number of sampled/examined units and G = maximum grade (i.e., 9)

Isolation of pathogen and host plant screening

Bean leaves exhibiting typical disease symptoms of Ascochyta blight were used for isolation of the pathogen in pure culture on Potato Dextrose Agar medium following tissue bit transfer method (Sicard *et al.*, 1997). Common bean germplasm comprising of 93 lines was screened for their susceptibility/tolerance against the pathogen under poly house conditions. Plants were raised in pots and then inoculated at first trifoliate stage and pre-flowering stage with conidial suspension of test fungus (1.5×10^6 spores ml⁻¹) with the help of hand atomizer. High humidity was maintained by spraying the plants with sterilized water at frequent intervals post-inoculation. Terminal disease intensity as

manifested by bean genotypes was recorded while using 1-9 disease scoring scale as given above and the genotypes were categorised as per Schoonhoven and Corrales (1987) i.e., resistant (up to 2 % intensity), intermediate (2.1-7 % intensity) and susceptible (> 7 % intensity).

RESULTS AND DISCUSSION

Occurrence and severity of Ascochyta blight

Variable levels of Ascochyta blight was observed in bean crop in different locations spread over three important bean growing districts viz., Budgam, Pulwama and Baramulla (Table 1). Intensity of Ascochyta blight ranged from 10.82 per cent to 36.75 per cent. Among districts average intensity was recorded highest in Baramulla (25.06 %) followed by district Budgam (13.85 %) and least in Pulwama (13.80 %). Irrespective of districts and blocks, the highest disease intensity was recorded in Wusan (36.75 %) followed by Buran (35.10 %) and Palhalan (33.54 %). The least disease intensity of 10.82 per cent was recorded in Wanpora.

Statistical analysis of the surveyed data revealed that the limits for average disease intensity fluctuated between 12.09-15.62 per cent for Budgam district and 18.48-31.64 per cent for Baramulla district. Similarly, for Pulwama district the limits fluctuated between 12.54-15.07 per cent. However, the average statistical limits in all the three districts at all the locations in disease intensity fluctuated between 14.66-20.48 per cent. The survey results were supported by that of Tamiru (2017) who reported 14.8-37.7 per cent intensity of this disease in Ethiopia. Similarly, Tadesse *et al.* (2017) recorded incidence of 0-45.6 and intensity of 1.0-7.0 per cent in Ethiopia and Kaiser *et al.* (2007) recorded incidence of 1-34 per cent in Bolivia. The higher values of disease at Wusan, Buran and Palhalan (block Pattan of district Baramulla) may be attributed to several factors like poor cultural practices, closer plant spacing and frequent rains coupled with hail storm as revealed by concerned farmers. It is reported that crop rotation, wide plant spacing, planting clean seed, chemical treatment of seed and foliar application of fungicides control the disease.

Germplasm screening

The data on germplasm screening revealed a variable response of bean-Ascochyta interaction (Table 2). The collection exhibited disease intensity

Table 1: Intensity of Ascochyta blight of common bean at various locations in Kashmir during kharif 2017

District	Block	Location/Village	Disease intensity (%)	Confidence interval(95%)
Budgam	Chadoora	Bugam	18.27	12.09 - 15.62
		Qaisarmulla	10.84	
		Nowbugh	13.53	
	Mazhama	Kuthipora	12.53	
		Kawoosa	13.46	
		Kanihama	14.22	
		Wager	16.03	
	Khansahib	Kremshore	11.35	
		Khansahib	14.50	
	Sub mean			
Baramulla	Sopore	Arampora	24.20	18.48 - 31.64
		Chinkipora	25.37	
		Wadura	17.22	
	Pattan	Buran	35.10	
		Palhalan	33.54	
	Baramulla	Wusan	36.75	
		Rafiabad	14.60	
		Johama	20.44	
		Chakla	17.37	
	Sub mean			
Pulwama	Newa	Bangund	15.42	12.54 - 15.07
		Wanpora	10.82	
		Inder	13.13	
	Pampore	Patalbagh	13.09	
		Khrew	13.56	
	Tral	Barsu	12.61	
		Machama	14.32	
Sub mean			13.80	
Over all mean			17.57	14.66 - 20.48

Table 2: Response of common bean germplasm to *Phoma exigua*

Germplasm	Disease Intensity (%)	Reaction	Germplasm	Disease Intensity (%)	Reaction
WB-267	26.63	S	WB-6677	41.33	S
WB-06	6.79	MR	WB-901	27.64	S
WB-492	37.76	S	WB-1438	19.84	S
WB-341	8.03	S	WB-1319	27.06	S
WB-115	27.10	S	WB-1465	11.18	S
WB-195	27.29	S	WB-1701	32.60	S
WB-1587	39.00	S	WB-5176	21.75	S
WB-877	37.54	S	WB-1634	31.98	S
WB-335	31.05	S	WB-651	42.05	S
SFB-1	45.88	S	WB-373	15.97	S
WB-1282	23.81	S	WB-12827	16.73	S
WB-216	41.61	S	WB-1257	24.96	S
WB-956	25.39	S	WB-1518	23.90	S
SR-1	28.34	S	WB-241	27.72	S
WB-1274	19.32	S	WB-1139	21.57	S
WB-1140	22.87	S	WB-1273	21.95	S
WB-285575	6.503	MR	WB-471	13.58	S
WB-1316	24.96	S	WB-352	39.38	S
WB-952	39.37	S	WB-1680	31.82	S
WB-185	15.30	S	WB-779	32.98	S
WB-1705	28.37	S	WB-1006	32.78	S
WB-2273	32.66	S	WB-1129	33.40	S
WB-UK-2	9.15	S	WB-1187	25.13	S
WB-954	21.97	S	WB-10298	11.66	S
WB-371	6.79	MR	PM-1	6.876	MR
WB-393	10.73	S	WB-4564	34.60	S
WB-932	38.60	S	WB-634	11.93	S
WB-48	12.41	S	WB-1185	29.70	S
WB-861	26.24	S	WB-6960	27.04	S
WB-832	32.94	S	WB-920	26.47	S
WB-24044-C	18.03	S	WB-83	32.43	S
WB-335	23.30	S	WB-147	38.63	S
WB-643	12.64	S	ArkaAnoop	52.64	S
WB-222	27.53	S	WB-565	33.66	S
WB-1685	24.69	S	WB-1151	33.24	S

WB-62	36.63	S	WB-1644	23.64	S
WB-89	29.84	S	WB-1705	24.41	S
WB-319825	16.63	S	WB-451	25.13	S
WB-489	41.77	S	WB-379	15.23	S
WB-1690	27.02	S	WB-642	22.03	S
WB-1446	17.96	S	WB-3629	6.68	MR
WB-112	30.07	S	WB-401	33.74	S
WB-4709	25.86	S	WB-482	36.52	S
WB-765	14.14	S	WB-PBG-545	25.97	S
PBG-102	22.52	S	WB-1181	54.23	S
WB-322	38.84	S	WB-1693	33.34	S
R-121	24.88	S			

MR = moderately resistant; S = susceptible

of 6.50-54.23 per cent with most of the genotypes falling in susceptible category (disease intensity of > 7 %), with remaining 5.37 per cent exhibiting least disease intensity (up to 7 %) were moderately resistant to Ascochyta blight. The genotypes namely WB-06, WB 285575, WB-371, PM-1, WB-3629 were moderately resistant/ intermediate in reaction to disease with disease intensity ranging from 6.50-6.87 per cent.

These results were in agreement with those of Ferreira *et al.* (2016) who found most *Phaseolus vulgaris* accessions and breeding lines showed lower level of resistance to Ascochyta blight. It has also been reported that several accessions or breeding lines with moderate resistance to Ascochyta blight is available and it was further reported that very high level of resistance to Ascochyta blight was yet to be found in cultivated forms of common bean. However, Urinzwenimana, *et al.* (2017) had observed some level of Ascochyta resistance in thirteen genotypes against this disease.

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