



SURVEY AND SURVEILLANCE ON *ALTERNARIA* BLIGHT OF CLUSTER BEAN IN NORTHERN M.P., INDIA

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Abstract

Clusterbean is an important leguminous crop of North region of Madhya Pradesh. The crop suffers heavy losses every year due to *Alternaria* blight caused by *Alternaria cucumerina* var. *cyamopsidis*. A survey of the disease was undertaken covering guar-growing areas in Gwalior, Bhind, Morena, Shivpuri and Datia fields. The disease was observed at all the location and the disease intensity varied from low to high. All the aerial plant parts were found affected. *Alternaria* blight is an important disease of guar in Northern M.P. Its per cent incidence in Gwalior, Morena, Bhind, Datia and Shivpuri districts ranged from 28.8 to 34.36%. Further as per as the district wise disease value the intensity of *Alternaria* blight in Northern Madhya Pradesh was calculated and It was 29.94 and 33.18 per cent during 2016 and 2017 respectively, with the two years mean value are 31.56 %.

Key words: Survey Cluster bean, *Alternaria* blight Weather parameters Disease intensity

Introduction

Cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.] belongs to the family Fabaceae. It is an important dry land, draught hardy, annual Kharif crop grow widely under rainfed (barani) condition for grain, green fodder, vegetable, green manuring and for seed purposes. In India, guar cultivation is accounted for about 75 per cent of global trade and 80 per cent to total guar production in the world (Swamy and Naveena, 2015). In India, guar is grown in about 9.6 million hectare in North-western states viz; Rajasthan, Haryana, Gujrat, Punjab and parts of UP and MP (Anon, 2014). In Madhya Pradesh it is grown as a pure crop in 10.7 thousand hectare and as mixed crop with Bajra in 1.60 lakh hectare. About 80 per cent of this crop is found in gird region, which consists of Bhind, Morena, Shivpuri, Datia and Gwalior districts.

Although number of varieties with stable yield have been released which can be grown well under rainfed conditions but these varieties are susceptible to an array of phytopathogenic fungal and bacterial diseases (Anon, 1999). The production and productivity of clusterbean in

terms of grain and fodder is highly affected by a number of phytopathogenic fungal and bacterial diseases viz., bacterial blight (*Xanthomonas axonopodis* pv. *cyamopsidis*), *Alternaria* leaf spot (*Alternaria cucumerina* var. *cyamopsidis*), anthracnose (*Colletotrichum capsici* f. sp. *cyamopsicola*), *Curvularia* leaf spot (*Curvularia lunata*), charcoal rot/damping off (*Macrophomina phaseolina*), dry root rot/leaf blight (*Fusarium solani* and *Rhizoctonia solani*), *Myrothecium* leaf spot (*Myrothecium roridum*) and powdery mildew (*Oidiopsis taurica*).

Alternaria spp. are economically important pathogens widely distributed throughout the world and cause devastating disease on field crops. *Alternaria* leaf blight is a common disease in guar-growing area of western India and Pakistan. Severe *Alternaria* blight of clusterbean was also reported from Pusa and Madras (Ambesh *et al.*, 2014).

Material and Method

A total of one hundred twenty five Clusterbean fields of Northern Madhya Pradesh were surveyed in July to October 2016 and 2017 of the crop. The cluster bean

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fields of five districts *viz.*; Gwalior, Morena Bhind, Datia and Shivpuri were surveyed to find out the intensity of *Alternaria* blight in cultivated field. For such survey five villages from each district were randomly selected and from each village five fields were randomly selected. From each selected field the observation on intensity of *Alternaria* blight was made on five randomly selected 1m²pockets.

The information regarding each field was noted in the following proforma and the representative diseased samples were collected and dried in between blotting paper in plant press for further studies.

The survey deviated from this standard pattern in non-rectangular fields, but in all cases quadrate samples were widely dispersed in each field. The systematic survey was carried out and information regarding each field was noted like locations, cultivar, disease intensity, plants parts affected, stage of the crops and soil colour of the field was recorded. The representative disease samples were collected. The per cent disease intensity (PDI) was calculated as per the following formula by using 0-5 scale (Mc. Kinney, 1923).

Per cent disease intensity (PDI) =

$$\frac{\text{Sum of total numerical rating} \times 100}{\text{Total no. of observations} \times \text{rating scale}}$$

Total no. of observations X rating scale

Table 1: Disease rating scale for *Alternaria* blight

Rating Scale	Disease Reaction	Percent Disease Intensity	Description
0	Near immune/ Resistant reaction (I)	0	No symptoms
1	Resistant (R)	1-10	1 - 10 % leaf area infected
2	Moderately Resistant (MR)	11-25	11 – 25 % leaf area infected
3	Moderately Susceptible (MS)	26-50	26 - 50 % leaf area infected
4	Susceptible (S)	51-75	51 – 75 % leaf area infected
5	Highly Susceptible (HS)	76-100	76 % above leaf area Infected

Isolation, purification and identification naturally infected guar leaves showing typical symptoms of *Alternaria* blight of guar was collected from the fields, brought to the laboratory and washed thoroughly with distilled water. These leaves were then blotting dried with sterilized blotting paper and cut with sharp sterilized blade into small bits (5 mm), keeping half healthy and half-diseased portion intact. These pieces were surface sterilized with 0.1 per cent aqueous solution of sodium

hypochlorite for 30 seconds and then washed three times with sterile distilled water to remove the traces of disinfectant and blot dried. The surface sterilized diseased leaf bits were then inoculated on the solidified and cooled PDA (Potato dextrose agar) medium in petri plates under aseptic conditions. Inoculated plates were then placed in BOD incubator at $28 \pm 2^\circ\text{C}$ temperature. After three to four days of incubation, the well-developed mycelial growth, free from any contaminant was obtained.

Purification of the isolated fungus was carried out using hyphal tip techniques. The fungus was transferred aseptically on the PDA slants in culture tubes. Through frequent sub-culturing, the fungus was purified and pure culture was maintained on agar slants in culture tubes and stored in refrigerator for further studies. The growing mycelium was picked with an inoculation needle and transferred on to PDA slants and incubated at $28 \pm 2^\circ\text{C}$ for 7 days.

Results and Discussion

Intensity of *Alternaria* blight of Clusterbean in Northern M.P total of 25 locations (villages) from five major Clusterbean growing districts were surveyed during the *Kharif* season 2016 and 2017 to find out the intensity of *Alternaria* blight in Northern M.P. (Table 2 and Fig. 1). Among 25 locations, none of the surveyed villages were found free from the disease. In the year 2016, the minimum disease intensity was recorded in Govindpur (20.29 %) followed by Mahewa (22.21 %), Dhumeswar (22.42 %), Badaewas (24.33 %), Morar (26.45 %) and Panihar (27.25 %). While the maximum intensity was recorded in Tekary (41.20 %) followed by Bamor (36.62 %), Rairu (34.42 %), Sitapur (34.21 %), Gormy (33.85 %) and Lukwasa (33.36 %).

In the year 2017, the minimum disease intensity was recorded in Mahewa of Datia district (20.09 %) followed by Govindpur (20.29 %) and Virapur (28.27 %). While maximum disease intensity was recorded in Tekary (43.60 %) in Morena district followed by Goda (42.44 %), Rairu (40.42 %) in Gwalior district. The intensity of *Alternaria* disease in 2017 was higher than the previous year 2016.

Further on the basis of village wise value, the district wise intensity was calculated and the data are presented in (Table 3 and Fig. 2) which clearly indicate that the disease pressure across the districts during 2017 was

more as compared to the pressure of 2016. During 2016, the maximum disease was recorded in Morena district (34.05 %) followed by Bhind (31.76 %), Gwalior (28.81 %) and Shivpuri (27.89 %). While minimum disease intensity was recorded in Datia (27.25 %) (Figure 2). During 2017, the maximum disease was recorded in Morena (34.67 %) followed by Shivpuri (34.30 %), Gwalior (34.14 %) and Bhind (32.49 %). While minimum disease was recorded in Datia (30.36 %).

It is also obvious from the above table that the occurrence of *Alternaria blight* in Northern MP was maximum in Morena districts followed by Bhind, Gwalior, Shivpuri and Datia where the disease intensity was 34.36,



Plate 1: Pure culture *Alternaria cucumerina* var. *cyampopsidis*

Table 2: Survey of *Alternaria blight* of Clusterbean during 2016 and 2017 in different locations of five surveyed districts.

Districts	Locations	Variety	Stage of the crops	Soil type	Per cent Disease Incidence (PDI) <i>Alternaria blight</i>		
					2016	2017	Mean
Gwalior	Nayagaon	Local	Flowering	Black	28.86	32.78	30.82
	Panihar	Local	Flowering	Sandy clay loam	27.25	37.01	32.13
	Morar	Local	Flowering	Black	26.45	30.85	28.65
	Rairu	Local	Flowering	Sandy clay loam	34.42	40.42	37.42
	Sitholi	Local	Flowering	Yellow	27.05	29.65	28.35
Mean					28.81	34.14	31.47
Morena	Bamor	Local	Flowering	Yellow	36.62	38.58	37.60
	Tekary	Local	Flowering	Sandy clay loam	41.20	43.60	42.40
	JeeganiKhera	Local	Flowering	Black	30.53	33.47	32.00
	Dimani	Local	Flowering	Sandy clay loam	31.65	29.95	30.80
	Ambah	Local	Flowering	Alluvial	30.25	27.75	29.00
Mean					34.05	34.67	34.36
Bhind	Kachnawklla	Local	Flowering	Alluvial	32.72	28.48	30.60
	Gormy	Local	Flowering	Deep Alluvial	33.85	29.95	31.90
	Ater	Local	Flowering	Black	30.48	32.43	31.45
	Manikpur	Local	Flowering	Sandy clay loam	31.02	34.98	33.00
	Mehgaon	Local	Flowering	Black	30.71	36.59	33.65
Mean					31.76	32.49	32.12
Datia	Sitapur	Local	Flowering	Yellow	34.21	36.19	35.20
	Palana	Local	Flowering	Black	31.26	35.20	33.23
	Virapur	Local	Flowering	Black	28.27	32.13	30.20
	Govindpur	Local	Flowering	Black	20.29	28.19	24.24
	Mahewa	Local	Flowering	Black	22.21	20.09	21.15
Mean					27.25	30.36	28.80
Shivpuri	Iukwasa	Local	Flowering	Black	33.36	31.44	32.40
	Goda	Local	Flowering	Black	30.42	42.44	36.43
	Kolarash	Local	Flowering	Black	28.94	32.92	30.93
	Badaewas	Local	Flowering	Black	24.33	28.31	26.32
	Dhumesh war	Local	Flowering	Black	22.42	36.38	29.40
Mean					27.89	34.30	31.10

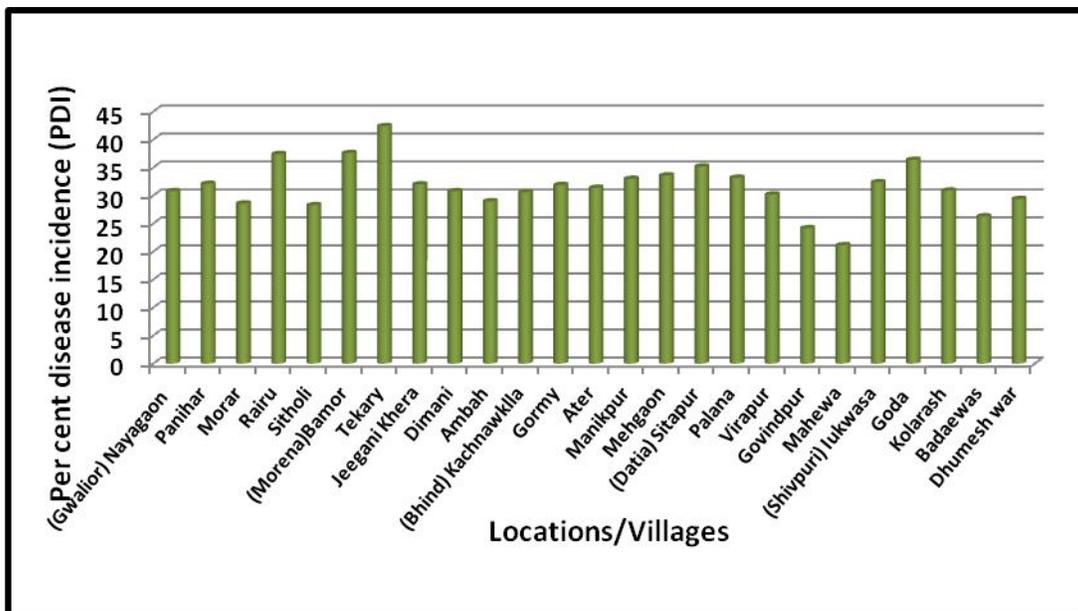


Fig. 1: Location wise intensity of *Alternaria* blight of Clusterbean during *Kharif* season of 2016 and 2017.

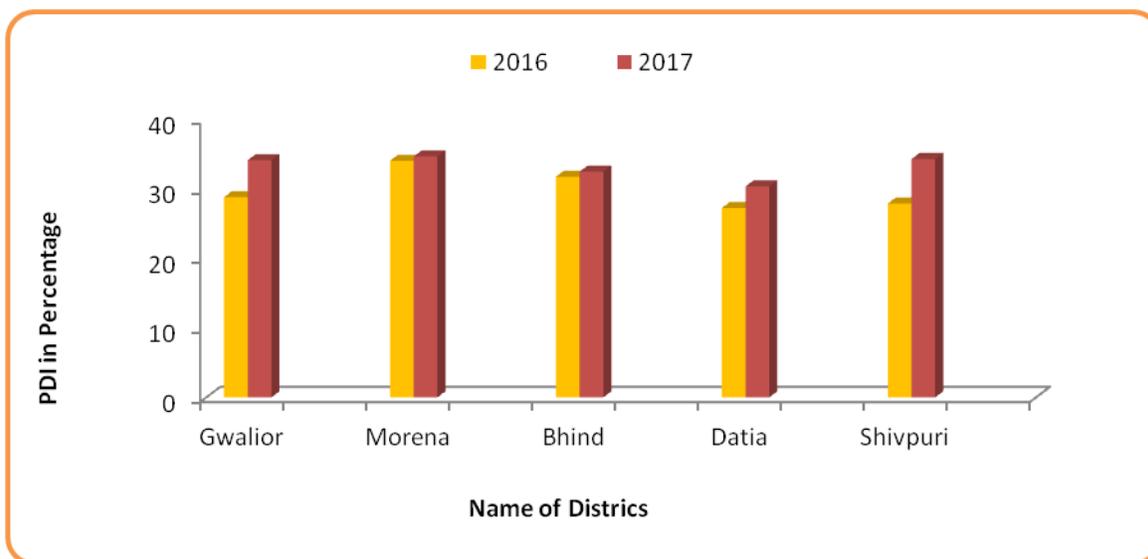


Fig. 2: District wise percentage disease intensity of *Alternaria* blight of Clusterbean in Northern Madhya Pradesh.

Table 3: District wise percentage disease intensity of *Alternaria* blight of Clusterbean in Northern Madhya Pradesh

S.N.	District	Per cent Disease Incidence (PDI)		Mean
		2016	2017	
1.	Gwalior	28.81	34.14	31.47
2.	Morena	34.05	34.67	34.36
3.	Bhind	31.75	32.48	32.11
4.	Datia	27.24	30.36	28.80
5.	Shivpuri	27.89	34.29	31.09
	Mean	29.94	33.18	31.56

32.12, 31.47, 31.10, and 28.80 per cent respectively.

Further as per as the district wise disease value the intensity of *Alternaria* blight in Northern Madhya Pradesh was calculated and It was 29.94 and 33.18 per cent during 2016 and 2017 respectively, with the two years mean value are 31.56 %

An intensive roving survey was conducted during the *Kharif* 2016 and 2017 in the farmers field of major Clusterbean growing districts of Northern M.P *viz.*, Gwalior, Morena, Bhind, Datia and Shivpuri. In the year 2016, the minimum disease intensity was recorded in Govindpur followed by Mahewa, Dhumeswar Badaewas, Morar and Panihar. While the maximum intensity was recorded in Tekray followed by Bamor,

Rairu Sitapur, Gormy and Lukwasa. In the year 2017, the minimum disease intensity was recorded in Mahewa of Datia district disease index is followed by Govindpur and Virapur. While maximum disease index was recorded in Tekray in Morena district followed by Goda, Rairu in Gwalior district. The intensity of *Alternaria* disease in 2017 was higher than the previous year 2016. *Alternaria* blight intensity was more in Morena district followed by Bhind, Gwalior while minimum disease intensity was recorded in Datia followed by Shivpuri. This is the first report on systematic survey of the disease in the M.P. state which is very essential for any further study on the disease. Butler (1918) described leaf spot disease of the crop caused by an organism identical to *Alternaria brassicae* (Berk). Narasimhan (1935) recorded an unidentified species of *Alternaria* on guar in Mysore. Uppal *et al.*, (1935) and Streets (1948) reported that *Alternaria* is a pathogen for *Cyamopsis tetragonoloba* grown as green manure crop in Arizona, U.S.A. Luttrell (1951) tentatively identified the organism as *Alternaria cucumarina*. A severe *Alternaria* blight of guar was observed (Ranga swami and Rao, 1957). Similarly Tomar (2000) observed disease intensity in all the aerial plant parts ranged from 8.8 to 28.10 per cent from guar growing areas in Gwalior and Morena districts. Balai *et al.*, (2013) carried out a survey of pigeon pea crop to assess the disease intensity of *Alternaria* blight during seasons 2009-10 and 2010-11 in Eastern Uttar Pradesh and neighbouring districts of Bihar. They found the disease intensity in different areas varied from 16.93 to 38.59 per cent and 15.12 to 38.86 per cent.

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