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## Real-time surveillance decrypts prevalence of *Alternaria* leaf spot of brinjal in northern region of Madhya Pradesh

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### Abstract

Brinjal or eggplant (*Solanum melongena* L.) belongs to family *Solanaceae* and is recognized as vegetable crop yielding plant and grown throughout the tropical, sub-tropical and warm temperate areas of the world. Various biotic and abiotic constrains in brinjal crop were responsible for lowering average yield of crop as compared to its potential yield. Thus, it becomes imperative to sustain the productivity of brinjal by gathering the information and behavior of disease distribution pattern in the northern region of M.P. The current study therefore greatly emphasized to find out the prevalence and distribution pattern of diseases in major brinjal growing areas northern Madhya Pradesh. An intensive survey was conducted with an objective to access the prevalence and intensity of *Alternaria* leaf spot of brinjal in one hundred eight sites of seven district of northern region of Madhya Pradesh between 2021-22 and 2022-23. Two year mean data clearly indicates that the maximum percent disease intensity was recorded in Guna (17.20%), followed by Ashoknagar (16.20%), Shivpuri (15.23%), Gwalior (10.63%), Bhind (10.00%), and Sheopur (6.85%). Morena (6.53%) recorded minimum percent disease intensity of *Alternaria* leaf spot of brinjal.

**Keywords:** Brinjal, *Alternaria* leaf spot, surveillance, *A. alternate*, Intensity

### Introduction

Brinjal (*Solanum melongena* L.) also known as eggplant or garden egg a member of *Solanaceae* family is a popular vegetable crop grown almost worldwide. In India, it is one of the most common vegetable crops grown throughout the country except higher altitudes. The fruits of eggplant are very common in Indian daily dietary as it associates good nutritional value (Ribeiro *et al.*, 1998) [8] and therapeutic properties. Brinjal is grown in China, India, Bangladesh, Pakistan and Philippines. Brinjal described as “king of vegetables” due to its wide usage in Indian foods (Choudhary and Gaur, 2009; Singh *et al.*, 2014) [4, 10]. Major brinjal growing states in India are Orissa, Bihar, Punjab, West Bengal, Karnataka, Maharashtra, Andhra Pradesh and Uttar Pradesh. The global area of eggplant is roughly 2.67 million hectares, with a yield of 34.91 tonnes per hectare, and production is close to 93.21 million tonnes (Anon, 2020) [1]. Brinjal is grown on 0.73 million hectares in India, where it produces 12.78 million tonnes and yields 17.36 tonnes per hectare (Anon, 2020) [1].

*Alternaria solani* is a major destructive species of the *Alternaria* genus which cause early blight on solanaceous crops, more scientific studies are found on *A. solani* in literature but nowadays *A. alternata*, *A. tenuissima* and other species of genus also show increase destruction of crops. *Alternaria tenuissima* causing leaf spot and fruit rot on eggplant in India firstly reported by Raja *et al.*, (2005). *Alternaria* leaf blight and fruit rot diseases is most severe disease of brinjal and appears regularly, causing heavy losses in yield (Balai and Ahir, 2013) [2]. The disease first makes its appearance in young seedling. It attacks leaves and then spreads to fruits which subsequently rot and become unfit for consumption (Bochalya *et al.*, 2012) [3]. The disease is favoured by warm and humid climate. The accidental rain at flowering stage leads the expansion of *Alternaria* leaf spot incidence and results in the poor seed set and seed yield. Diseases cause heavy damage upto 35-40 per cent to this crop and reduce its seed yields upto 20-30 per cent.

### Materials and Methods

The present investigations on the status of *Alternaria* leaf spot of brinjal was undertaken in

seven districts located from northern region of M.P. were surveyed to assess the disease intensity. The details of materials and methodologies followed during the course of investigation are described here under:

**Survey for disease status**

The field survey was carried out in brinjal growing region of Madhya Pradesh viz., Gwalior, Bhind, Morena, Shivpuri, Sheopur, Guna and Ashoknagar areas presented in Table. To find out the intensity of *Alternaria* leaf spots during 2021-22 and 2022-23.

**Data analysis**

One hundred eight Brinjal fields were surveyed during January to March in 2021-22 and 2022-23 at flowering stage of the crop. For such survey of all the blocks of the selected districts were taken and from each block three villages were randomly selected. Five fields from each village were randomly selected and an area of 1 m × 1 m was marked at

five randomly selected spots on each farmer's field. The numbers of diseased plants were recorded in five 1M<sup>2</sup> quadrates in each field. The quadrates were placed 10-30 m from the edge of a field, usually at each of the four corners and halfway down one side. 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 will carried out on information regarding about each field were noted information as intensity of the field was recorded. The infected disease samples will be collected and dried for future studies. In each field the intensity of *Alternaria* leaf spot was recorded on five 1m<sup>2</sup> patches by counting the total infected plants and total number of plants than the intensity per-cent calculated. The intensity will be calculated with the help of following formulas.

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Total number of observations} \times \text{highest grade in the scale}} \times 100$$

**Table 1:** List of surveyed districts of Northern of Madhya Pradesh

S. No	Districts	Blocks/Locations	S. No	Districts	Blocks/Locations
1	Gwalior	Bhitarwar	5	Sheopur	Vijaypur
	Gwalior	Dabra		Sheopur	Karahal
	Gwalior	Morar		Shivpuri	Khaniyadhana
	Gwalior	Ghatigaon		Shivpuri	Kolaras
2	Bhind	Lahar	5	Shivpuri	Narwar
	Bhind	Bhind		Shivpuri	Pichhore
	Bhind	Gouhad		Shivpuri	Pohari
	Bhind	Atair		Shivpuri	Badarwas
	Bhind	Mihona		Shivpuri	Karera
	Bhind	Mehagoan		6	Guna
Morena	Porsa	Guna	Aron		
Morena	Joura	Guna	Raghagard		
Morena	Ambaha	Guna	Bamori		
Morena	Pahadgard	Guna	Guna		
Morena	Sabalgard	7	Ashoknagar		Mungawali
Morena	Kailaras		Ashoknagar	Chanderi	
Morena	Morenagaon		Ashoknagar	Isagarh	
4	Sheopur		Sheopur	Ashoknagar	Ashoknagar

**Results**

During 2021-22 the data presented in Table-2, Fig-1 and Plate-1 revealed that *Alternaria* leaf spot of brinjal was prevalent in all the sites of districts surveyed with varying levels of intensity ranging from 3.73 per cent to 20.80 per cent. In Gwalior district maximum percent disease intensity was recorded in Bhitarwar (11.73%), followed by Dabra (11.47%) and Morar (9.60%), while minimum percent disease intensity was recorded Ghatigaon (8.80%). Gouhad block of Bhind district recorded maximum disease intensity (13.07%), followed by Mehagoan (10.40%), Lahar (9.87%), Atair (9.07%) and Mihona (8.27%), while minimum disease intensity was recorded Bhind (7.73%). In Morena district the disease intensity was ranged from 3.73% (Sabalgard) to 9.33% (Pahadgard). Maximum percent disease intensity was recorded Pahadgard (9.33%), followed by Ambaha (8.53%), Porsa (6.67%), Joura (6.40%), Kailaras (5.87%) and Morenagaon (4.80%), while minimum disease intensity was recorded Sabalgard (3.73%). Karahal (8.27%) recorded maximum *Alternaria* disease intensity followed by Vijaypur (5.87%), while minimum *Alternaria* infection was recorded in Sheopur (5.07%). Shivpuri district maximum percent disease intensity was recorded Pichhore (20.80%), followed by Pohari (19.20%), Kolaras (17.60%), Karera (17.33%), Khaniyadhana

(13.87%), Badarwas (12.80%) and Shivpuri (12.00%), while minimum disease intensity was recorded Narwar (11.73%). In Guna district of Bamori block (18.91%) was recorded maximum disease intensity followed by Guna (18.40%), Chachaura (17.20%), Raghagard (17.07%), while minimum disease intensity was recorded Aron (16.27%). Isagarh (18.67%) recorded maximum *Alternaria* infection followed by Ashoknagar (15.73%), and Mungawali (15.47%), while minimum disease intensity was recorded Chanderi (14.40%). During 2022-23 the data presented in table revealed that *Alternaria* leaf spot of brinjal. Gwalior district maximum percent disease intensity was recorded in Bhitarwar (13.07%), followed by Morar (10.40%), Ghatigaon (10.13%), while minimum percent disease intensity was recorded in Dabra (9.87%). In Morena district Pahadgard block recorded maximum disease intensity (9.60%) followed by Ambaha (8.00%), Joura (6.93%), Kailaras (6.67%), Porsa (6.13%), and Morenagaon (4.53%), while minimum disease intensity was recorded in Sabalgard (4.27%). In Bhind district the disease ranged from 8.00 to 14.13%. Maximum percent disease intensity was recorded in Mehagoan (14.13%), followed by Gouhad (11.20%), Lahar (10.40%), Mihona (9.07%) and Atair (8.80%), while minimum disease intensity was recorded in Bhind (8.00%). In Sheopur district it was range from

5.87% (Sheopur) to 9.07% (Karahal). In Karahal the maximum percent disease (9.07%) followed by Vijaypur (6.93%), while minimum disease was recorded Sheopur (5.87%). In Shivpuri district it was ranged from 11.47% (Narwar) to 19.20% (Pichhore). The maximum disease intensity was recorded (19.20%) in Pichhore followed by Pohari (18.13%), Kolaras (16.53%), Karera (16.27%), Shivpuri (13.07%) and Badarwas (12.27%), while minimum disease intensity was recorded in Khaniyadhana (12.00%). The disease intensity in Guna was ranged from 15.47% (Aron) to 17.73% (Chachaura). Maximum *Alternaria*

infection was recorded in Chachaura block (17.73%) followed by Guna (17.60%), Bamori (17.05%) and Raghagard (16.27%), while minimum disease intensity was recorded in Aron (15.47%). In Ashoknagar it was in the range of 13.87% (Chanderi) to 18.40% (Isagarh). The maximum percent disease intensity was recorded Isagarh (18.40%) followed by Ashoknagar (16.80%) and Mungawali (16.27%), while minimum disease intensity was recorded in Chanderi (13.87%). The pressure of disease in 2022-23 was low as compared to 2021-22.

**Table 2:** Prevalence of *Alternaria* leaf spot of Brinjal in major growing regions of M.P.

S. No	Districts	Blocks/Locations	Disease intensity%		Mean
			2021-22	2022-23	
1	Gwalior	Bhitarwar	11.73	13.07	12.40
		Dabra	11.47	9.87	10.67
		Morar	9.60	10.40	10.00
		Ghatigaon	8.80	10.13	9.47
		Mean	10.40	10.86	10.63
2	Bhind	Lahar	9.87	10.40	10.14
		Bhind	7.73	8.00	7.87
		Gouhad	13.07	11.20	12.14
		Atair	9.07	8.80	8.94
		Mihona	8.27	9.07	8.67
		Mehagoan	10.40	14.13	12.27
		Mean	9.73	10.26	10.00
3	Morena	Porsa	6.67	6.13	6.40
		Morena goan	4.80	4.53	4.67
		Joura	6.40	6.93	6.67
		Ambaha	8.53	8.00	8.27
		Pahadgard	9.33	9.60	9.47
		Sabalgard	3.73	4.27	4.00
		Kailaras	5.87	6.67	6.27
		Mean	6.47	6.59	6.53
4	Sheopur	Sheopur	5.07	5.87	5.47
		Vijaypur	5.87	6.93	6.40
		Karahal	8.27	9.07	8.67
		Mean	6.40	7.29	6.85
5	Shivpuri	Khaniyadhana	13.87	12.00	12.94
		Shivpuri	12.00	13.07	12.54
		Kolaras	17.60	16.53	17.07
		Narwar	11.73	11.47	11.60
		Pichhore	20.80	19.20	20.00
		Pohari	19.20	18.13	18.67
		Badarwas	12.80	12.27	12.54
		Mean	15.66	14.80	15.23
6	Guna	Chachaura	17.20	17.73	17.47
		Aron	16.27	15.47	15.87
		Raghagard	17.07	16.27	16.67
		Bamori	18.91	17.05	17.98
		Guna	18.40	17.60	18.00
		Mean	17.57	16.82	17.20
7	Ashoknagar	Mungawali	15.47	16.27	15.87
		Chanderi	14.40	13.87	14.14
		Ashoknagar	15.73	16.80	16.27
		Isagarh	18.67	18.40	18.54
		Mean	16.06	16.33	16.20

During the year 2021-22 the disease intensity of *Alternaria* leaf spot of brinjal. Maximum *Alternaria* diseases was noticed in Guna (17.57%), followed by Ashoknagar (16.06%), Shivpuri (15.66%), Gwalior (10.40%), Bhind (9.73%) and Morena (6.47%), while minimum disease was noticed in Sheopur (6.40%) district. During the year 2022-23 data

present in table-13 clearly indicates that Guna district noticed maximum disease intensity (16.82%), followed by Ashoknagar (16.33%), while minimum disease was noticed in district Morena (6.59%) followed by Sheopur (7.29%), Bhind (10.26%), Gwalior (10.86%) and Shivpuri (14.80%). The two year mean data clearly indicate that maximum

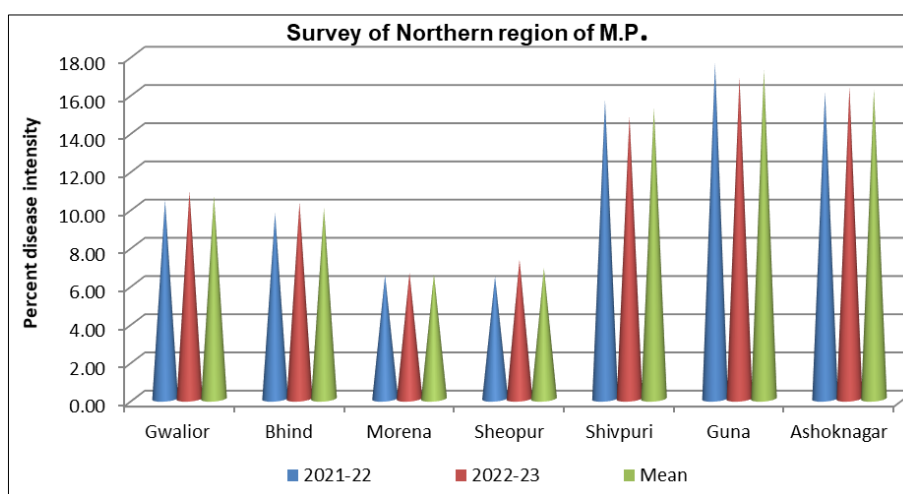
percent disease intensity was recorded Guna (17.20%), followed by Ashoknagar (16.20%), Shivpuri (15.23%), Gwalior (10.63%), Bhind (10.00%), while Sheopur (6.85%)

and Morena (6.53%) recorded minimum percent disease intensity of *Alternaria* leaf spot of brinjal.

**Table 3:** Survey of *Alternaria* leaf spot of Brinjal during 2021-22 and 2022-23 in Northern region of M. P.

S. No	Districts	Percent disease Intensity		Mean
		2021-22	2022-23	
1	Gwalior	10.40	10.86	10.63
2	Bhind	9.73	10.26	10.00
3	Morena	6.47	6.59	6.53
4	Sheopur	6.40	7.29	6.85
5	Shivpuri	15.66	14.80	15.23
6	Guna	17.57	16.82	17.20
7	Ashoknagar	16.06	16.33	16.20
Mean		11.76	11.85	11.80

\*Over all status of *Alternaria* leaf spot infection in northern region of M.P. 11.80%



**Fig 1:** Survey of Northern region of M.P.



**Plate 1:** Survey and collection of *Alternaria* infected sample of Northern region of M.P

**Discussion**

Status of *Alternaria* leaf spot of brinjal in Northern region of Madhya Pradesh, the survey was carried out in seven districts viz., Bhind, Morena, Sheopur, Shivpuri, Gwalior, Guna and Ashoknagar of Madhya Pradesh for the prevalence of *Alternaria* leaf spot of brinjal. Two year mean data clearly indicate that maximum percent disease intensity was recorded in Guna (17.20%), followed by Ashoknagar (16.20%), Shivpuri (15.23%), Gwalior (10.63%), Bhind (10.00%), while Sheopur (6.85%) and Morena (6.53%) recorded minimum percent disease intensity of *Alternaria* leaf spot of brinjal. Similar result was found out in several workers Pucci (1947) [7] reported that planting of Brinjal in the vicinity of La Plata, Argentina, were severely attacked by a species of *Alternaria*, which formed ash-en-greay lesion on the leaves and stems and

yellow brown to black ones (scabbed in the case of Brinjal) on the fruit. Danger and Singh (1985) [5] observed maximum disease intensity (33.87 and 34.31%) was observed during second and first fortnight November of 1979 and 1980, respectively in Kanpur (UP). Singh and Shukla (1986) [11] observed maximum disease intensity (39.12%) was recorded in 120 days old plant and minimum disease intensity (13.06) of Brinjal infected with leaf spot (*A. alternata*) at Kanpur (UP). Balai and Ahir (2013) [2] survey conducted in Brinjal fields near Jobner (Jaipur) during *rabi* season 2006-07 to estimate the disease intensity of leaf spot (*A. alternata*). The maximum disease intensity 25.32% was recorded in Bagru whereas; it was recorded minimum disease intensity in Phulera 9.20% in the area surveyed. The disease first makes its appearance in young seedling but intensity is less. It attacks leaves and then spreads to fruits, which subsequently rot and become unfit for consumption (Bochalya *et al.* 2012) [3]. Premila (2014) [6] recorded 9.5 to 29.5% intensity of leaf spot disease on Brinjal in Manipur. An extensive survey was conducted in Kashmir revealed that disease was prevalent disease intensity 30.76% maximum and 9.77% minimum, respectively was noted by Raina *et al.* (2018) [9].

**Conclusion**

The distribution and intensity of *Alternaria* leaf spot of brinjal varied in each district. These diseases are emerging as a potential threat to brinjal production. Maximum percent disease intensity was recorded in Guna (17.20%), while Morena district (6.53%) recorded minimum percent disease



intensity of *Alternaria* leaf spot of brinjal.

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