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Survey and surveillance to observe occurrence and severity of powdery mildew of mungbean (*Vigna radiata* L.) growing areas around Udaipur region

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Abstract

Surveys were conducted to study the occurrence and severity of powdery mildew diseases in major mungbean growing areas around Udaipur district of Rajasthan during *Kharif* 2017 and 2018. As a result of survey, it was observed that the powdery mildew disease was observed maximum with mean PDI of 34.79 with 25.40 PDI at flowering stage and 44.17 PDI at pod formation stage in the field of Rajasthan College of Agriculture during 2017. Lowest mean PDI of 23.78 with 15.16 and 32.41 PDI at flowering and pod formation stages were recorded at Kalibheet. During 2018, the order of disease severity differed and maximum mean PDI of 35.19 with 23.11 and 42.37 PDI at flowering and pod formation stages was observed at Mavli village. The mean PDI was least at Gogunda and it was 26.28 with 17.32 and 35.25 PDI at flowering and pod formation stage.

Keywords: Mungbean, powdery mildew, isolation, severity, survey

Introduction

Mungbean (*Vigna radiata* L.), commonly known as greengram is third most important pulse crop among thirteen food legume crops grown in India (Ali and Shivkumar, 2000) [2]. Being versatile crop, mungbean is mainly grown for seeds, green manure and forage purpose and is also considered as “Golden Bean” because of its nutritional values and suitability for increasing the fertility of the soil by way of addition of nitrogen to the soil.

Mungbean is a protein rich (24.5%) staple food with high quality of lysine (460 mg/g N) and tryptophan (60 mg/g N), 1.0 to 1.5 per cent oil, 3.5 to 4.5 per cent fibre, 4.5 to 5.5 per cent ash and 62.0 to 65.0 per cent carbohydrate on a dry weight basis (Singh *et al.*, 1970 and Tsou *et al.*, 1979) [6, 7]. It has also remarkable quantity of ascorbic acid when sprouted and also contains riboflavin (0.21 mg/ 100 gm) and minerals (3.84 g/100g) (Gopalan *et al.*, 1995) [3].

In India, mungbean is mainly grown in the states of Andhra Pradesh, Madhya Pradesh, Orissa, Maharashtra, Rajasthan, Bihar, Uttar Pradesh, Tamil Nadu and Gujarat. India occupies an area of 47.55 lakh hectares with total production of 24.55 lakh tonnes and productivity of 516 kg per hectare of mungbean (Anon. 2018-19). In Rajasthan, it is cultivated on about 24.66 lakh hectares with total production of 12.22 lakh tonnes and productivity of 496 kg per hectare (Anon. 2018-19). The major mungbean growing districts of Rajasthan are Tonk, Jaipur, Nagaur, Jalore, Churu, Jodhpur, Jhunjhunu, Ajmer, Barmer and Sikar.

Sustainable mungbean production is continuously challenged by biotic stresses that take a heavy toll of the crop and diseases could cause an estimated yield loss of 21.93 to 68.77% (Sharma *et al.*, 2008) [5]. Mungbean suffers from many diseases caused by fungi, bacteria, viruses, nematodes. Considerable losses in the production of mungbean occur as a result of *Alternaria* leaf spot (*Alternaria alternata*), powdery mildew (*Erysiphe polygoni*), anthracnose (*Colletotrichum lindemuthianum*), *Cercospora* leaf spot (*Cercospora canescens*), bacterial blight (*Xanthomonas phaseoli*), rust (*Uromyces appendiculatus*), leaf crinkle and yellow mosaic virus. Among the diseases, powdery mildew is one of the major foliar disease which cause considerable qualitative and quantitative losses in the mungbean. Powdery mildew is also a destructive disease which causes huge losses up to 50-90% under Indian condition (Gupta and Mate, 2009) [4].

Material and Methods

Survey and collection of diseased plant materials

Surveys were conducted during 2017 and 2018 *kharif* season from farmers' fields of major mungbean growing areas around udaipur to study the occurrence and severity of powdery mildew. Mungbean fields were selected randomly from a location on the survey route. In each field, mungbean

plants of 1 metre square area from randomly 5 sites were selected and the occurrence and severity of the disease were recorded for powdery mildew. The per cent disease index was estimated by counting the number of plants showing symptoms of powdery mildew. Observations for disease severity were recorded using 1-5 disease rating scale given by Adinarayana *et al.*, 2012^[1] for powdery mildew.

Table 1: Standard disease rating scale (1-5 scale) for accessing PDI for Powdery mildew

Scale	Description of the symptom
0	No symptoms
1	Plant showing traces to 10% infection on leaves, stem free from infection.
2	Slight infection with thin coating of powdery growth on leaves covering 10.1 - 25% of leaf area, slight infection on stem, pods usually free.
3	Dense powdery coating covering 25.1 to 50% of leaf area. Moderate infection on stems, slight infection on pods.
4	Dense powdery coating covering 50.1 to 75% of leaf area, stem heavily and pods moderately infected. Infected Portion turns grayish.
5	Severe infection with dense powdery growth, covering more than 75% area of the whole plant including pods, plants resulting in premature defoliation and drying.

Result and Discussion

Surveys were conducted to study the occurrence and severity of powdery mildew diseases in major mungbean growing areas around Udaipur district of Rajasthan during *Kharif* 2017 and 2018. The roving survey of the farmer's field was carried out during both the years for symptomatology, severity, distribution, and spread of both the diseases at the flowering

and pod formation stage of the mungbean crop. The disease severity in selected areas was recorded following 1-5 disease rating scale proposed by Adinarayana *et al.* (2012)^[1] for powdery mildew. The selected location-wise data of Udaipur district on disease severity of powdery mildew as shown by Per cent Disease Index (PDI) have been presented in Table 2, 3 and plate 1.

Table 2: Distribution and Intensity of powdery mildew disease of mungbean in major growing areas of Udaipur district during *Kharif* 2017

S. No	Village name	Host variety	Area (ha)	Per cent Disease Index* (PDI)		Mean
				Flowering stage	Pod formation stage	
1.	Sisarma	Local	3.2	23.35 (28.85)	38.27 (38.20)	30.81 (33.70)
2.	Kotra	Local	2.4	18.44 (25.39)	40.45 (39.48)	29.44 (32.84)
3.	Sarada	Local	1.0	21.22 (27.39)	34.32 (35.82)	27.77 (31.78)
4.	Jhadol	Local	1.6	16.96 (24.28)	43.70 (41.37)	30.33 (33.40)
5.	Jhallara	Local	1.2	14.72 (22.52)	33.69 (35.47)	24.20 (29.47)
6.	Mavli	Local	0.8	20.24 (26.68)	36.97 (37.44)	28.60 (32.32)
7.	RCA	Local	2.0	25.40 (30.23)	44.17 (41.65)	34.79 (36.14)
8.	Gogunda	Local	1.4	19.09 (25.86)	35.59 (36.62)	27.34 (31.51)
9.	Kali bheet	Local	1.0	15.16 (22.87)	32.41 (34.69)	23.78 (29.17)
10.	Bhatewar	Local	1.7	17.63 (24.78)	35.16 (36.35)	26.39 (30.89)
S.Em±				1.03	1.04	0.74
CD at 5%				2.99	3.02	2.15
CV (%)				7.97	5.52	4.62

Figures in parentheses are arcsine $\sqrt{\text{per cent}}$ transformed values

Results presented in Table 2 on disease intensity of powdery mildew in major mungbean growing areas of Udaipur district during *kharif* 2017 inferred that the disease was commonly prevalent. In the experimental field of Rajasthan College of Agriculture, mean PDI (34.79 per cent) was maximum with 25.40 PDI at flowering stage and 44.17 PDI at pod formation stage. It was followed by Sisarma, Jhadol and Kotra where the mean PDI was recorded as 30.81, 30.33 and 29.44 per cent and all these were found statistically at par with each other. In Sisarma, the PDI at flowering stage was 23.35 and PDI at pod formation stage was 38.27. Similarly, the PDI at flowering and pod formation stages was observed to be 16.96 and 43.70 per cent in Jhadol and 18.44 and 40.45 per cent in Kotra. There was no significant difference among disease severity in

Mavli, Sarada and Gogunda wherein the score of mean PDI was recorded 28.60, 27.77 and 27.34 per cent. The PDI at flowering stage in the fields observed at these villages was 20.24, 21.22 and 19.09 per cent and it increased to 36.97, 34.32 and 35.59 per cent, respectively. Further, the mean PDI of 26.39 per cent was recorded in Bhatewar where disease severity of powdery mildew at flowering stage was 17.63 which rose to 35.16 per cent at pod formation stage. Following decreasing order of severity, Jhallara village depicted mean PDI of 24.20 per cent with PDI at flowering stage was 14.72 per cent which later increased to 33.69 per cent at pod formation stage. In Kali bheet village mean PDI was 23.78 per cent, it recorded 15.16 per cent PDI at flowering stage and 32.41 per cent at pod formation stage.

Table 3: Distribution and Intensity of powdery mildew disease of mungbean in major growing areas of Udaipur district during *Kharif* 2018

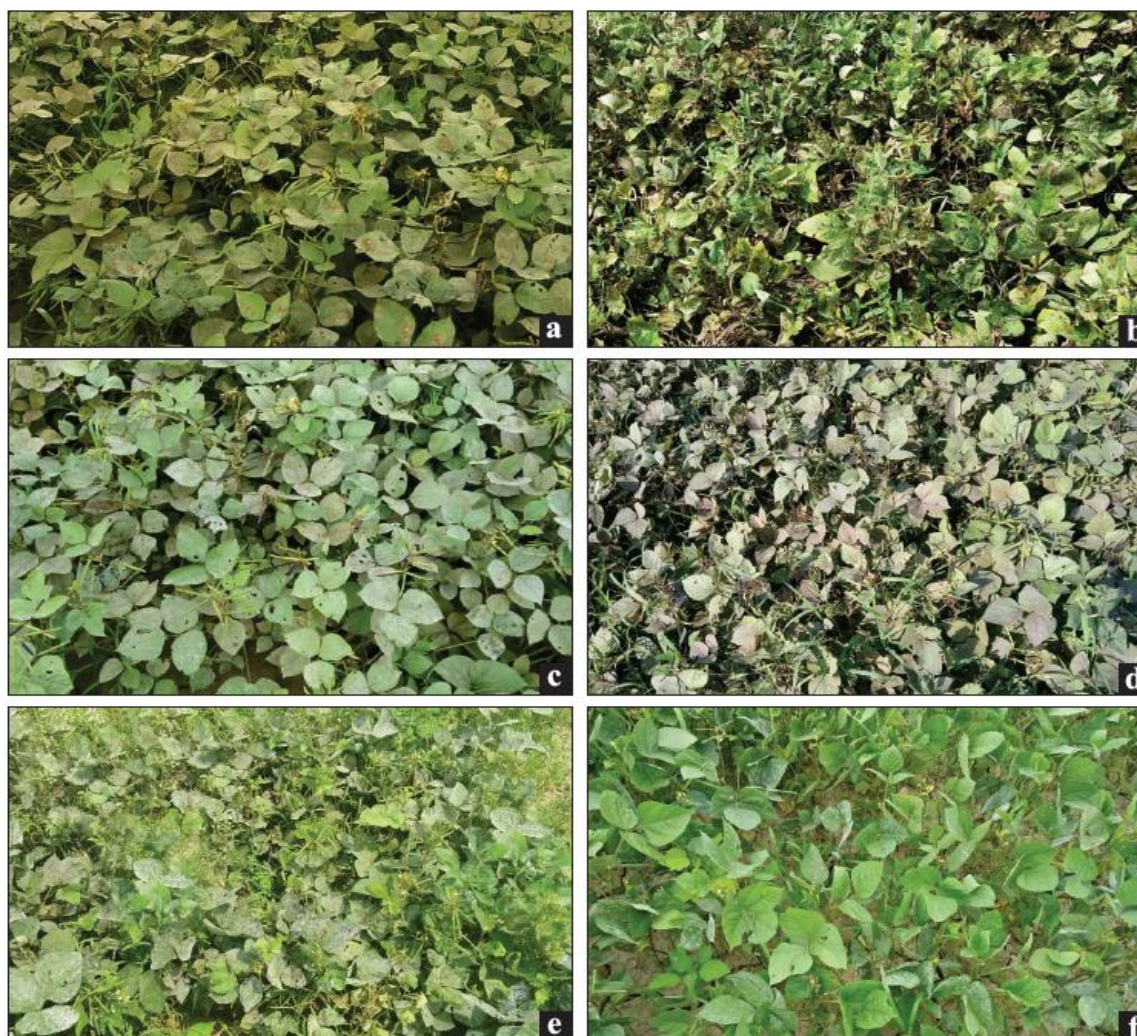
S. No	Village name	Host variety	Area (ha)	Per cent Disease Index* (PDI)		Mean
				Flowering stage	Pod formation stage	
1.	Sisarma	Local	2.8	20.17 (26.64)	40.62 (39.58)	30.40 (33.45)
2.	Kotra	Local	1.9	24.68 (29.77)	44.30 (41.72)	34.49 (35.95)

3.	Sarada	Local	1.3	27.10 (31.35)	39.55 (38.95)	33.33 (35.25)
4.	Jhadol	Local	2.1	19.34 (26.05)	38.96 (38.61)	29.15 (32.66)
5.	Jhallara	Local	1.5	15.96 (23.51)	41.37 (40.02)	28.66 (32.36)
6.	Mavli	Local	1.2	23.11 (28.70)	47.28 (43.44)	35.19 (36.37)
7.	RCA	Local	2.5	20.98 (27.21)	42.85 (40.88)	31.91 (34.39)
8.	Gogunda	Local	0.8	17.32 (24.56)	35.25 (36.41)	26.28 (30.83)
9.	Kali bheet	Local	1.3	18.74 (25.62)	36.74 (37.29)	27.74 (31.77)
10.	Bhatewar	Local	1.5	25.28 (30.15)	40.16 (39.31)	32.72 (34.87)
S.Em±				0.95	1.08	0.78
CD at 5%				2.77	3.14	2.25
CV (%)				6.97	5.47	4.59

Figures in parentheses are arcsine $\sqrt{\text{per cent}}$ transformed values

The data in Table 3 for the year 2018 clearly depicts that disease intensity of powdery mildew in mungbean fields of the surveyed areas of Udaipur district varied from the previous year. The mean PDI was recorded maximum at Mavli village which was 35.19 per cent. Here, the PDI was 23.11 per cent at flowering stage which was reached as high as 47.28 per cent at pod formation stage. It was followed by Kotra and Sarada villages which were at par to each other and recorded the mean PDI of 34.49 and 33.33 per cent. The PDI at flowering and pod formation stages was 24.68 and 44.30 per cent for Kotra and 27.10 and 39.55 per cent for Sarada. Bhatewar, RCA experimental field and Sisarma were found next and did not differ significantly with each other and scored mean PDI of 32.72, 31.91 and 30.40 per cent. In Bhatewar village, The PDI of 25.28 and 40.16 per cent was registered at flowering and pod formation stage, while in the

RCA experimental field, 20.98 and 42.85 per cent disease severity was observed at flowering and pod formation stage. The PDI of powdery mildew in Sisarma village was recorded 20.17 at flowering stage and 40.62 per cent at pod formation stage. Likewise, Jhadol, Jhallara and Kali bheet village were listed next with respect to mean intensity of powdery mildew disease (29.15, 28.66 and 27.74 per cent) and were at par with each other. For Jhadol, the PDI at flowering stage was 19.34 and it increased to 38.96 per cent at pod formation stage. For Jhallara, the PDI at flowering and pod formation stage was recorded to be 15.96 and 41.37 per cent. The PDI at flowering and pod formation stage in Kali bheet village was noted as 18.74 and 36.74 per cent. With least mean PDI of 26.28 per cent Gogunda exhibited 17.32 PDI at flowering stage and 35.25 PDI at pod formation stage.



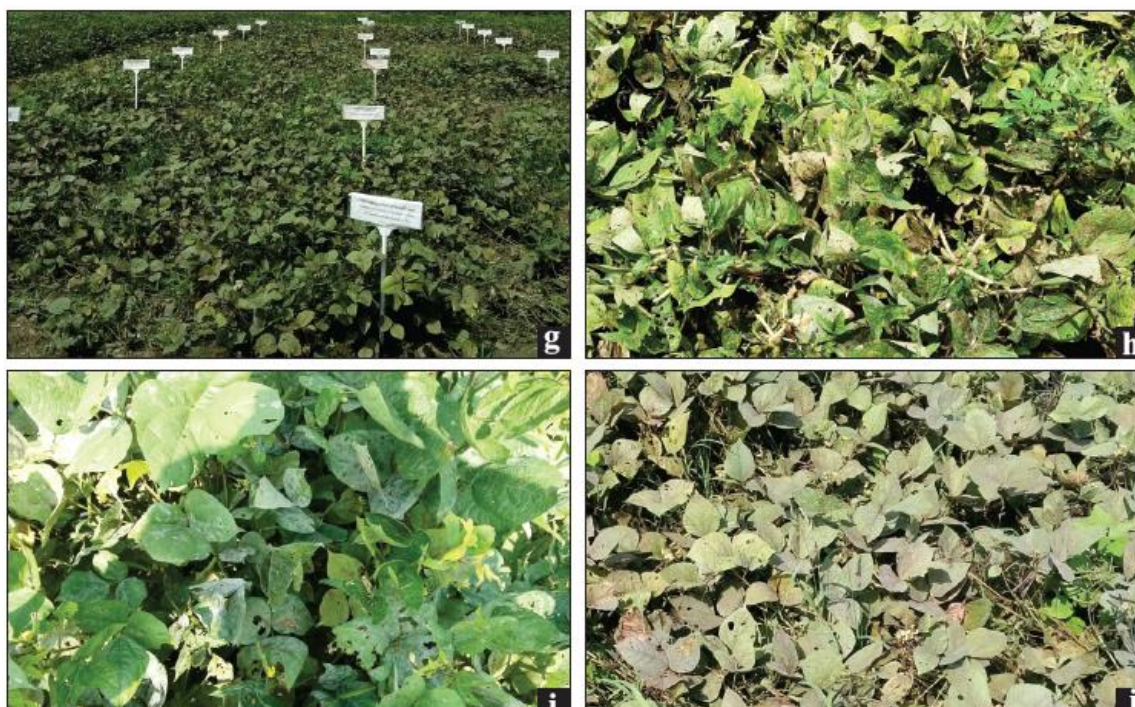


Plate 1: Survey and Surveillance for incidence of Powdery mildew of mungbean on farmers field around udaipur region
(a) Sisarma (b) Kotra (c) Sarada (d) Jhadol (e) Jhallara (f) Mavli (g) RCA (h) Gogunda (i) Kalibheet (j) Bhatewar

Conclusion

In both years of *kharif* 2017 and 2018 disease prevalence ranged between 14.72% to 47.28% during flowering and pod formation stages. Results showed local land races used by farmers were more susceptible and diseases progress increases with age of host in direct proportion. The disease was present in traces to severe form in most of the surveyed areas.

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