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Assessment of Yield Losses with percent decrease in Yield over Organically Protected Mungbean (*Vigna radiata* L.) Influence by *Alternaria* Leaf Spot and Powdery Mildew

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ABSTRACT: An experiment was carried out at the Instructional Farm of Rajasthan College of Agriculture, MPUAT, Udaipur. The experiment was laid out in Randomized Block Design (RBD) with four treatments and six replications. To estimate the yield loss under disease severity generated by inoculation of most virulent *A. alternata* isolate MAa- 2 cultured in laboratory with 1×10^3 conidia ml^{-1} concentration and in natural conditions of powdery mildew. The results revealed that both the years' *kharif* 2017-18, organically protected plots inoculated with *A. alternata* recorded significantly the highest seed yield of mungbean is 9.11 and 9.18 Qha^{-1}. The data on per cent decrease yield in unprotected plots over organically protected plots during 2017 and 2018 indicated that under inoculations of *A. alternata* when the crop was left unprotected, the yield was decreased to 45.38 and 42.29 per cent and the case of naturally infected powdery mildew unprotected plots, the seed yield of mungbean was decreased to 43.91 and 46.11 per cent.

Keywords: *Alternaria*, Mungbean, Organic, Powdery mildew, Yield losses.

INTRODUCTION

Realizing the importance of food hygiene, demand for organic products has been increasing day by day worldwide. About, 186 countries are practicing the organic farming on 71.5 million ha of land. To make agriculture as sustainable for round about 600 years, different organic technologies have been utilized with conservation of soil, water, energy and biological resources (Pimentel *et al*., 2005).

Mungbean (*Vigna radiata* L.), commonly known as greengram is third most important pulse crop among thirteen food legume crops grown in India. Being versatile crop, mungbean is mainly grown for seeds, green manure and forage purpose and is also considered as "Golden Bean" because of it's nutritional values and suitability for increasing the fertility of the soil by way of addition of nitrogen to the soil. India is contributing 25.08% global pulses in world production from an area of about 34.88% (Anon. 2018-19). In India, mungbean 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).

Sustainable mungbean production is continuously challenged by biotic and abiotic stresses, that take a heavy toll of the crop and diseases could cause an estimated yield loss of 40 to 60 % (Kaur *et al*., 2011). Losses in production occur as a result of powdery mildew (*Erysiphe polygoni*), *Alternaria* leaf spot (*Alternaria alternata*), anthracnose (*Colletotrichum lindemuthianum*), bacterial blight (*Xanthomonas phaseoli*), *Cercospora* leaf spot (*Cercospora canescens*), rust (*Uromyces appendiculatus*), leaf crinkle and yellow mosaic virus (Dubey, 2003).

Among them, *Alternaria* leaf spot diseases have been observed causing considerable qualitative and quantitative damage in mungbean crop. *A. Alternata* was also reported from Udaipur, India by Gupta (1970) causing 80 per cent incidence when the crop age was 65 days. *A. Alternaria* leaf spot caused by *A. alternata* is external and internal seed borne disease and occur in serious proportion (30.9 to 32 PDI) during Kharif season, 2003 in south Gujarat (Patel, 2003). Powdery mildew is also a destructive disease which causes huge losses up to 50-90% under Indian condition (Gupta and Mate, 2009). The yield losses of powdery mildew in

mungbean are reported to be 20 - 40% (Fernandez and Shamugasundaram, 1987) and 100 per cent when it occurs at the seedling stage (Reddy *et al.*, 1994).

In organic agriculture, management is directed towards preventing problems, while stimulating processes which assist in nutrition and pest & disease management. Besides, management of pest and diseases through organic methods is one of the important constraints in enhancing productivity of mungbean.

MATERIAL AND METHODS

Field experiment were carried out at the Instructional Farm of Rajasthan College of Agriculture, MPUAT, Udaipur during *kharif* 2017 and 2018 which is situated at latitude 24.55°N, longitude of 73.71°E and altitude of 598.00 meters above Mean Sea level (MSL). The region falls under Sub-humid southern plains (Climatic Zone- IVa) of Rajasthan. The trial was laid in Randomized Block Design (RBD) with four treatments and six replications. The seeds of local susceptible cultivar of mungbean were sown in last week of July with a spacing of 30 cm and 10 cm between rows and plants, adopted in plot size of 3×2.4m, respectively.

At maturity, plants from each plot were harvested and seed yield/ plot obtained was converted into Qha^{-1}. The per cent losses in grain yield were determined as:

$$\% \text{ loss in yield} = \frac{\text{Yield in control (Organically protected plots) - inoculated unprotected plo}}{\text{Yield in control plots}} \times 100$$

RESULT AND DISCUSSION

The results and discussion of the experiment conducted on various aspects of *Alternaria* leaf spot and powdery mildew of organically grown mungbean with reference to assessment of losses in seed yield (Qha^{-1}) affected by organic practices are presented here under. The field experiments were carried out in two consequent seasons (*Kharif* 2017 and 2018) to estimate the yield loss under disease severity generated by inoculation of most virulent *A. alternata* isolate MAa-2 cultured in laboratory with 1×10^3 conidia ml^{-1} concentration and in natural conditions of powdery mildew. Isolation and purification of the *Alternaria* pathogen was done in the laboratory from the symptomatic leaves of mungbean plants collected from farmer's field. Along with inoculated plots, organically protected plots for respective pathogens were also maintained for comparison. This way, the whole experiment was laid out in Randomized Block Design (RBD) with four treatments and six replications. An observation of the Seed yield obtained in these plots was converted into Qha^{-1} to asses per cent decrease in yield over organically protected plots. The data so obtained have been presented in Table 1 and described as under.

The results presented in Table 1 revealed that during 2017, organically protected plots inoculated with *A. alternata* recorded significantly the highest seed yield of mungbean (9.11 Qha^{-1}). It was followed by the plots which were naturally infected by powdery mildew and protected by organic methods with 8.96 Qha^{-1} seed yields. Unprotected plots inoculated with *A. alternata* and naturally infected with powdery mildew had lower seed yield of 4.98 and 5.03 Qha^{-1}, respectively. Similarly, in the next year (2018), seed yield was recorded significantly maximum (9.18 Qha^{-1}) in plots that were artificially inoculated with *A. alternata* and protected organically. The yield was also recorded higher (9.12 Qha^{-1}) in plots naturally infected by powdery mildew and protected by organic means. Both the unprotected plots under artificial and natural infection conditions recorded significantly lower yield of 5.30 and 4.92 Qha^{-1} respectively.

Similar results were obtained in the pooled analysis of both years (2017 and 2018) of the study. Significantly highest seed yield of 9.15 Qha^{-1} was recorded in organically protected *A. alternata* inoculated plots which were followed by protected plots under natural infection condition of powdery mildew (9.04 Qha^{-1}).

Table 1: Assessment of losses in mungbean due to *Alternaria* leaf spot and powdery mildew disease during *Kharif* 2017 and 2018.

Sr. No.	Treatments	Seed yield (Qha^{-1})			Percent decrease in yield over organically protected		
		2017	2018	Pooled	2017	2018	Pooled
1.	Under inoculations *Alternaria* sp. with 1×10^3 conidia ml^{-1} concentration	4.98	5.30	5.14	45.38	42.29	43.84
2.	Organically protected *Alternaria* sp. under inoculations with 1×10^3 conidia ml^{-1} concentration	9.11	9.18	9.15	—	—	—
3.	Under natural conditions powdery mildew	5.03	4.92	4.97	43.91	46.11	45.01
4.	Organically protected powdery mildew under natural conditions	8.96	9.12	9.04	—	—	—
	SEm±	0.12	0.13	0.10			
	CD at 5%	0.37	0.39	0.29			
	CV %	3.47	3.61	3.54			

In unprotected plots, the disease intensity of *A. alternata* and powdery mildew was recorded higher and seed yield was decreased to 5.14 and 4.97 Qha^{-1}. The data on per cent decrease yield in unprotected plots over organically protected plots during 2017 and 2018 indicated that under inoculations of *A. alternata* when the crop was left unprotected, the yield was decreased to 45.38 and 42.29 per cent, respectively. In pool of both the years, the decrease in yield was noted to be 43.84 per cent. In the case of naturally infected powdery mildew unprotected plots, the seed yield of mungbean was decreased to 43.91 and 46.11 per cent during 2017 and 2018, respectively. As per pooled analysis for both the years, it was recorded as 45.01 per cent. Conn and Tewari (1990) corroborate the present findings who concluded that the blight disease caused by genus *Alternaria*, is one of the most dominant which cause average yield loss in the range of 32-57 per cent in crops. Results of the present investigation are also in line with the results of Khunti *et al.* (2002) who reported 35% yield losses from powdery mildew in Gujarat, Western India; Khare *et al.* (1998) reported 20–40% from Chhattisgarh, central-Eastern India; Mandhare and Suryavanshi (2008) reported 20–40% in Maharashtra Western-Central India; and Pandey *et al.* (2009) reported from 9 to 50% in Uttarakhand and Uttar Pradesh of Northern India. However, in Maharastra, Reddy *et al.* (1994) found 100% loss of the crop at the seedling stage due to powdery mildew.

FUTURE SCOPE

Looking to the importance of the disease and intensification of cultivation of major mungbean growing areas of Rajasthan, a need was felt to develop its effective and eco-friendly management strategy are needed. The organic based finding for management of leaf spot and powdery mildew are helpful to design IDM strategies based on organic inputs which can be applied at farmer's field.

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Conflict of Interest. None.

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