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Integrated management of major diseases of sesame (*Sesamum indicum* L.)

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Abstract

Among fungal diseases, stem and root rot, *Alternaria* leaf spot and *Cercospora* leaf spot were become major constraints for cultivation of sesame in South 24-Parganas district of West Bengal, India. Considering the fact, the following investigation was carried out for this pathological problem. Field trials conducted on integrated disease management practices to combat major diseases and to increase the seed yield of sesame during summer, 2018 and 2019. Minimum incidence of stem and root rot (8.8% and 11.2%) with higher yield of 527 kg/ha and 577 kg/ha were recorded in summer, 2018 and 2019 with application of organic amendment with FYM and neem cake @ 150 kg/ha (1:1, T₄). In case of foliar diseases of sesame, applications of FYM + NPK @ 60:30:30 (1:1, T₃) was found to be significantly effective by recording minimum incidence of *Alternaria* leaf spot (6.3% and 8.4%) and *Cercospora* leaf spot (4.2% and 5.3%) coupled with maximum yield (512 kg/ha and 541 kg/ha) with higher cost benefit (C:B) ratio in summer, 2018 and 2019.

Keywords: Incidence, integrated management, leaf spot, rot, sesame

Introduction

Sesame (*Sesamum indicum* L.) is an important oilseed crop in India preferred due to edible oil content (about 50%), nutritious protein (about 23%) and having sufficient carbohydrate (15%) (Ranganatha *et al.*, 2012) ^[1]. India is the fifth largest vegetable oil economy in the world, next only to USA, China, Brazil and Argentina and has an annual turnover of about Rs. 80,000 crore. India accounts for 12-15% of oilseeds area, 7-8% of oilseeds production, 6-7% of vegetable oils production, 9-12% of vegetable oils import and 9-10% of edible oils consumption (Jha *et al.*, 2014) ^[2]. Among the oilseed crops, sesame ranks first for its higher oil content with 6335 kcal kg⁻¹ of dietary energy in seeds (Kumar and Goel, 1994) ^[3]. Due to intensive cultivation practices the crop has been found to suffer from various diseases. About 72 fungi, 7 bacteria, 1 phytoplasmal and 1 viral disease have been reported from India (Vyas *et al.*, 1984) ^[4]. Out of these, about 32 diseases (14 major and 18 minor) occur in India.

Sesame cultivated in summer season in the South 24-Parganas district of West Bengal is affected by root rot, *Alternaria* leaf blight and *Cercospora* leaf blight diseases resulting in low productivity. Root rot of sesame caused by *Macrophomina phaseolina* (Tassi) Goid a pycnidia producing fungus is one of the most important soil inhabiting pathogen, attacks a large number of host plants including oilseeds, pulses, vegetables and ornamentals (Shaw, 1912; Pearl, 1923; Park, 1927; Likhite, 1936; Thirumalachar, 1953; Zak, 1971; Grower and Shakhujia, 1981; Gangopadhyay *et al.*, 1982) ^[5, 6, 7, 8, 9, 10, 11, 12]. *Macrophomina phaseolina* as very serious and destructive pathogen in all sesame growing areas and causes 5-100% yield loss (Vyas, 1981) ^[13]. Other researchers estimated yield loss of around 57% at about 40% of disease incidence (Maiti *et al.*, 1988) ^[14]. However, information is lacking particularly in South 24 Parganas district of West Bengal for management of these diseases in sesame. Keeping in view, the present investigation was undertaken to find the potential of IDM practices to manage these diseases.

Materials and Methods

A field trial was conducted at Agricultural Experimental Farm, Institute of Agricultural Science, University of Calcutta, Baruiapur, South 24 Parganas during two consecutive summer seasons, 2018 and 2019. The experiment was laid out in randomized block design with five

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treatments in integrated manner, viz. T₁: NPK @ 60:30:30; T₂: NPK @ 40:20:20; T₃: FYM + NPK @ 60:30:30 (1:1); T₄: Organic amendment with FYM and neem cake @ 150 Kg/ha (1:1); T₅: Untreated check (control) in four replications using the local variety, savitri. The incidence of *Macrophomina* root rot was recorded individually by counting the number of affected and healthy plants at random quadrat selection in each plot and the percent incidence was calculated. Per-cent disease incidence (PDI) was worked out for *Alternaria* leaf spot and *Cercospora* leaf spot of sesame. The grain yield was recorded and cost benefit (C:B) ratio was worked out. The statistical analysis of the experimental data was carried out by adopting the standard method as described by Gomez and Gomez (1984) [15].

Results and Discussion

Totally five treatments were tested, among them the minimum

root rot incidence (8.8%) with maximum seed yield (527 kg/ha) and C:B ratio was recorded in the treatment of T₄ (organic amendment with FYM and neem cake @ 150kg/ha) followed by root rot incidence (15.1%) with 512 kg/ha higher yield was recorded in T₃ (FYM + N:P:K @ 60:30:30, 1:1) in summer, 2018 (Table 1). On the other hand, the minimum root rot incidence (11.2%) with maximum yield (577 kg/ha) was recorded in the treatment of T₄ (organic amendment with FYM and neem cake @ 150kg/ha) followed by root rot incidence 15.1% with 541 kg/ha higher seed yield was recorded in T₃ (FYM+N:P:K @ 60:30:30, 1:1) in summer, 2019 (Table 2). The present investigation is in line with the report of Adhikary *et al.*, (2019) [16]. Addition of neem cake promotes biological activity in soil by providing nutrients and favorable conditions for the antagonists besides enhancing host growth and vigor was documented by Mallesh *et al.* (2008) [17].

Table 1: Integrated management of major diseases of sesame during summer, 2018.

Treatment	Root rot (%)	<i>Alternaria</i> leaf spot (%)	<i>Cercospora</i> leaf spot (%)	Yield (kg/ha)	B:C ratio
T ₁ : NPK @ 60:30:30	17.2 (24.9)	14.4 (22.6)	11.2 (19.9)	483	2.10
T ₂ : NPK @ 40:20:20	21.4 (27.9)	10.9 (19.7)	13.3 (21.8)	439	1.94
T ₃ : FYM + NPK @ 60:30:30 (1:1)	15.1 (23.2)	6.3 (14.9)	4.2 (12.1)	512	2.21
T ₄ : Organic amendment with FYM and Neem cake @ 150 Kg/ha (1:1)	8.8 (17.6)	7.7 (16.0)	6.7 (15.2)	527	2.34
T ₅ : Untreated check	26.3 (31.2)	22.1 (28.4)	16.8 (24.6)	343	1.53
S.E.m _±	1.01	1.74	1.35	4.33	
CD (5%)	3.30	5.69	4.40	14.11	

*Figures in parenthesis are angular transformed values

Table 2: Integrated management of major diseases of sesame during summer, 2018.

Treatment	Root rot (%)	<i>Alternaria</i> leaf spot (%)	<i>Cercospora</i> leaf spot (%)	Yield (kg/ha)	C:B ratio
T ₁ : NPK @ 60:30:30	20.7 (27.39)	14.4 (22.64)	15.1 (23.22)	501	2.17
T ₂ : NPK @ 40:20:20	22.5 (28.58)	9.1 (18.03)	14.7 (22.92)	474	1.92
T ₃ : FYM + NPK @ 60:30:30 (1:1)	15.1 (23.21)	8.4 (17.30)	5.3 (13.85)	541	2.22
T ₄ : Organic amendment with FYM and Neem cake @ 150 Kg/ha (1:1)	11.2 (20.00)	12.6 (21.24)	9.1 (18.03)	577	2.29
T ₅ : Untreated check	28.8 (32.73)	22.5 (28.60)	18.9 (26.10)	419	1.75
S.E.m _±	0.91	1.04	1.23	6.66	
CD (5%)	2.97	3.40	4.03	21.74	

*Figures in parenthesis are angular transformed values

Conclusion

In the present investigation, among five different treatments in integrated management practices, soil application of organic amendment with FYM and neem cake @ 150 kg/ha (1:1) and FYM + NPK @ 60:30:30 (1:1) were observed to be superior over other treatment in management of stem and root rot. In case of both foliar diseases of *Alternaria* leaf spot and *Cercospora* leaf spot, soil applications of FYM + NPK @ 60:30:30 (1:1) was quite effective. Such information will be helpful in formulation of integrated management schedule for the management of these diseases in sesame.

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