

Integrated management of diseases and pest through organic farming approaches in fenugreek (*Trigonella foenum-graecum* L.)

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Abstract

A field experiment was conducted in All India Coordinated Research Project on Spices at S.K.N. College of Agriculture, Jobner, India during *rabi* seasons of 2010 to 2013 for the organic management of diseases and pests in fenugreek. The pooled data over three years revealed that all the organic practices for the management of diseases and pest in fenugreek resulted in significantly low incidence of powdery mildew, downy mildew and aphid resulted in significantly more seed yield and benefit: cost ratio over the check. The pooled analysis of data further revealed that minimum incidence of powdery mildew (26.10%), downy mildew (18.60%) and aphid index (14.80%) and maximum seed yield (14.80 q ha⁻¹) and benefit: cost ratio (2.78) were recorded with soil application of neem cake @ 1.0 t ha⁻¹ + soil application of *Trichoderma viride* @ 2.5 kg ha⁻¹ + spray of neem seed kernel extract (NSKE) @ 5.0 percent. Control treatment resulted in maximum incidence of powdery mildew (72.50%), downy mildew incidence (63.80%) and aphid index (60.00%), minimum seed yield (9.80 q ha⁻¹) and minimum benefit: cost ratio (1.91).

Keywords: Aphid, *erysiphae polygona*, fenugreek, organic amendments, *peronospora trigonellae*

Introduction

Fenugreek (*Trigonella foenum-graceum* L.) is cultivated throughout India and other parts of the world as leafy vegetable, condiment, for medicinal and fodder purpose. Fenugreek is rich in minerals, protein, vitamin A and C (Arya, 2000). The diseases powdery and downy mildew caused by *Erysiphae polygona* and *Peronospora trigonellae* are serious diseases resulting 15 to 50 percent seed yield losses (Kumawat and Shekhawat, 2015). The symptoms of powdery mildew appeared in month of February. White floury patches were found on leaves, stems and pods. Symptoms start with white powdery growth on leaves which may coalesce and cover the white leaf with the white powdery growth of the fungus. Downy mildew disease occur on fenugreek in early stage of crop growth, showing downy growth of the fungus of the lower surface and yellow patches appear on the upper surface of the leaves. Aphids are small

insects found in large number on the aerial part of the plants. They suck the plant sap and make plants weak. Fenugreek has earlier been reported to be attacked by different species of aphids, viz. *Aphis craccivara* (Brar and Kanwar, 1994) and *Acyrtosiphon pisum* (Dadhich *et al.*, 1989). *Aphis craccivora* is reported to cause seed yield losses to the extent of 60 to 68 percent (Sharma and Kalra, 2002). Powdery Mildew is a soil born pathogen and is very difficult to control because of its continuous persistence and multiplication in the soil. Although, the number of chemicals have been suggested for its control but due to their adverse effect on ecosystem, management of these diseases and insect through some organic method were used and discussed in present research.

Materials and methods

The experiment consisted of five treatments of organic disease and pest management practices

i.e., check, soil application of farm yard manure @ 10.0 t ha⁻¹ + soil application of *Trichoderma viride* @ 2.5 kg ha⁻¹ + spray of *Psuedomonas flourescens* @ 10.0 percent, soil application of vermi-compost @ 3.5 t ha⁻¹ + soil application of *Trichoderma viride* @ 2.5 kg/ha + spray of *Psuedomonas flourescens* @ 10.0 percent, soil application of neem cake @ 1.0 t ha⁻¹ + soil application of *Trichoderma viride* @ 2.5 kg ha⁻¹ + spray of neem seed kernel extract (NSKE) @ 5.0 percent and soil application of neem cake @ 2.0 t ha⁻¹ + soil application of *Trichoderma viride* @ 2.5 kg ha⁻¹ + spray of neem seed kernel extract (NSKE) @ 5.0 percent. The treatments were taken in randomized block design with four replications. The crop variety RMt-1 was sown in plots of 3 m x 2.4 m with spacing 30 x 10 cm in last week of October every year with seed rate of 20 kg ha⁻¹. Required quantity of farm yard manure, neem seed kernel extract, neem cake, vermi-compost and *Trichoderma viride* were added in each plot 15 days before sowing and three sprays were given at 45,60 and 75 day after sowing (DAS) as per treatments in every year. Every year powdery and downy mildew diseases and aphid severity were recorded on 20 tagged plants of each plot at weekly interval from the appearance of powdery mildew disease using 0-4 scale; where, 0=healthy, 1= whitish small spots on leaves, 2 = whitish growth covering the entire leaf, 3 = growth on leaf and stem and 4 = growth on leaf, stem and pods, downy mildew was recorded on 20 tagged plants of each plot at weekly interval from the appearance of disease using 0-4 scale; where, 0 = healthy, 1=1-10 percent area of whitish spots on lower surface of leaves or plant, 2 = 11-25 percent area of whitish spots on lower surface of leaves or plant, 3 = 26-50 percent area of whitish spots on lower surface of leaves or plant and 4 = above 50 percent area of whitish spots on lower surface of leaves or plant. Aphid infestation was recorded on 20 tagged plants in each plot at weekly interval using 0-4 scale; where, 0 = no aphid, 1= isolated singly on few tender parts, 2 = singly on matured plant parts, 3 = colony countable and 4 = uncountable colony on whole plant and converted into Percent Disease Index (PDI) and converted into angular

transformation.

PDI was calculated using the formula = $(Y / X) \times 100$

Where, Y = No. of diseased plants;

X = Total no. of plants plot⁻¹

The crop was harvested at maturity and seed yield plot⁻¹ was recorded.

Results and discussion

On the basis of pooled data over three years the study revealed that all the organic practices for the management of diseases and pest in fenugreek resulted in significantly low incidence of powdery mildew, downy mildew and aphid and significantly maximized seed yield and benefit: cost ratio over the check (Table 1 and figure 1). The pooled analysis of data further revealed that minimum incidence of powdery mildew (26.10%), downy mildew (18.60%) and aphid index (14.80%) and maximum seed yield (14.80 q ha⁻¹) and benefit : cost ratio (2.78) were recorded with soil application of neem cake @ 1.0 t ha⁻¹ + soil application of *Trichoderma viride* @ 2.5 kg ha⁻¹ + spray of neem seed kernel extract (NSKE) @ 5.0 percent followed by soil application of neem cake @ 2.0 t ha⁻¹ + soil application of *Trichoderma viride* @ 2.5 kg ha⁻¹ + spray of neem seed kernel extract (NSKE) @ 5.0 percent. Control treatment resulted in maximum incidence of powdery mildew incidence (72.50%), downy mildew (63.80%) and aphid index (60.00%) and minimum seed yield (9.80 q ha⁻¹) and minimum benefit: cost ratio (1.91). This study indicated that organic amendment of soil by adding neem cake was found effective in reducing powdery and downy mildew diseases incidence and aphid and increasing the yield in fenugreek. The use of *Trichoderma viride*, *Psuedomonas flourescens*, NSKE and neem cake to manage powdery and downy mildew diseases and aphid was reported by Chhata and Verma (2010). The application of neem cake to the field increased the multiplication of aerobic microorganisms. These microorganisms might have fixed the available nitrogen and utilized it for decomposition of organic matter. The use of bio-agent (*Trichoderma*) is able to stimulate growth of plants but suppress the pathogenic expression in leguminous crop (Azcon, 1989 and Muthulaxmi et

Table 1. Organic management of diseases and pest in fenugreek (Pooled data of over three year)

Treatment	Powdery mildew (PDI)	Downey Mildew (PDI)	Aphid Index	Yield (q ha ⁻¹)	B:C Ratio
Soil application of FYM @ 10.0 t ha ⁻¹ + <i>Trichoderma viride</i> @ 2.5 kg ha ⁻¹ + spray of <i>Pseudomonas fluorescens</i> @ 10.0 %	37.50 (37.75)*	27.30 (31.51)	42.50 (40.71)	12.27	2.77
Soil application of vermi-compost @ 3.5 t ha ⁻¹ + <i>Trichoderma viride</i> @ 2.5 kg ha ⁻¹ + spray of <i>Pseudomonas fluorescens</i> @ 10.0%	40.00 (39.22)	29.00 (33.17)	46.30 (42.86)	12.14	2.38
Soil application of neem cake @ 1.0 t ha ⁻¹ + <i>Trichoderma viride</i> @ 2.5 kg ha ⁻¹ + spray of neem seed kernel extract @ 5.0%	26.10 (30.71)	18.60 (25.54)	14.80 (22.65)	12.95	2.78
Soil application of neem cake @ 2.0 t ha ⁻¹ + <i>Trichoderma viride</i> @ 2.5 kg ha ⁻¹ + neem seed kernel extract @ 5.0%	29.90 (33.17)	21.00 (27.28)	17.40 (24.68)	12.41	2.64
Check	72.50 (58.40)	63.80 (53.03)	60.00 (50.79)	9.80	1.91
C D (P=0.05)	3.98	6.17	3.93	1.50	
C V	6.48	11.75	7.02	8.08	

*Data in parenthesis indicate angular transformation of percent values

al., 2010). Increased aerobic activity of micro-organism increased CO₂ concentration which in turn inhibits the growth of pathogen and helps to build up the crop health. These microorganisms also release some enzymes, which help to improve the crop health and check the growth of pathogenic fungi (Anonymous, 2002). The present findings clearly indicated the importance of bio-agents in combination with organic amended for the control of powdery and downy mildew diseases and aphid in fenugreek.

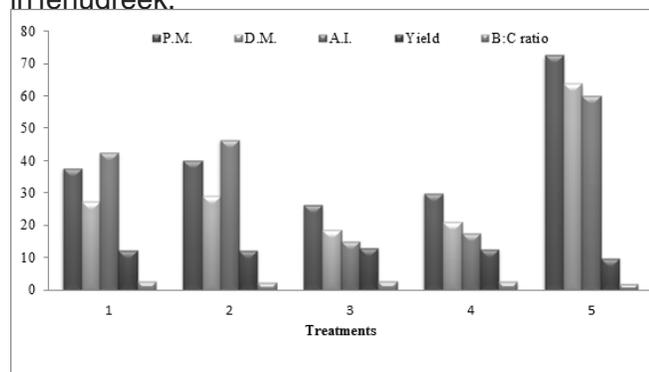


Fig 1: Relationship between powdery mildew, downy mildew, aphid index, yield and B:C ratio

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