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Effect of different pigeon pea intercropping systems on root rot diseases and yield of Safed musli

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Abstract

Safed musli (*Chlorophytum borivilianum*) is important medicinal herbaceous plant belongs to the family Liliaceae. The field experiment was carried out during 2014-15 at Nagarjuna Medicinal and Aromatic Plant Garden, Dr. P.D.K.V., Akola to see the different treatments of pigeon pea intercropping systems on incidence of root rot diseases and yield on safed musli. The root rot disease of safed musli is caused by *Rhizoctonia bataticola*, *Fusarium solani*, *Sclerotium rolfsii*. Lowest incidence of root rot was observed in treatment T₂ of 3:1 intercropping system (safed musli + pigeon pea) at 62 DAS, 69 DAS, 83 DAS. The highest number of total and healthy bunches were obtained in the treatment T₁ of 2:1 intercropping (safed musli + pigeon pea) and roots in T₂ of 3:1 intercropping system (safed musli + pigeon pea) respectively.

Keywords: safed musli, intercropping, incidence, root rot, pigeon pea

Introduction

Safed musli (*Chlorophytum borivilianum*) belonging to family Liliaceae. It is an eminent medicinal plant of India and considered as a 'White gold' or Divya aushad' in Indian systems of medicine. The roots are widely used as a natural "sex tonic" and is an integral part of more than 100 herbal drug formulations (Oudhia 2001) [6]. The major constituents of Safed Musli as: carbohydrates (42%), proteins (8.9%), root fiber (3-4%) and saponin (2-17%) Bordia *et al.* (1990) [2].

The intercropping of pigeon pea and bottle gourd with musli was advantageous in terms of overall yield, land use efficiency (LER), monetary advantage and economic return. Equal or more yield of Musli under intercropping with pigeon pea indicate that these crops do not compete with Musli for underground resources such as nutrients and moisture and a certain degree of shade (30-40%) is helpful for the growth and root production of Musli (Singh *et al.* 2010) [10]. The root rot fungus *viz.*, *Fusarium solani*, *Rhizoctonia bataticola* (Taub.) Butler, *Rhizoctonia solani*, *Sclerotium rolfsii* Sacc. and *Phythium* spp. are responsible for damage of the crop. The damage recorded was about 52% (Mandal *et al.* 2004.) [4]. The root rot (*Sclerotium rolfsii* Sacc.) caused 10-15% losses in the field (Singh *et al.* 2007) [7]. However, integration of Safed musli and pigeon pea intercropping system found effective in yield improvement of Safed musli as compared to sole Safed musli (control). In present study, objective was to know the role of different pigeon pea intercropping systems on root rot and yield of Safed musli.

Material and Methods

A. Experimental details

Crop and variety: Safed musli (Local) and Pigeon pea (AKT 8811).

Spacing: Safed musli- 30 x 10cm (High density), Pigeon pea: 45 x 30 cm.

Date of sowing- 18th July 2014.

Design: Randomized Block Design (RBD) with five treatments and four replications.

B. Treatment details

T₁ - Safed musli + Pigeon pea (2:1), T₂ - Safed musli + Pigeon pea (3:1), T₃ - Safed musli + Pigeon pea (2:2), T₄ - Safed musli + Pigeon pea (1:2), T₅ - Sole Safed musli (control).

C. Observations

Observations on per cent disease incidence of root rot disease were recorded periodically. Incidence was calculated by following formula.

$$\text{Per cent Disease Incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants}} \times 100 \text{ (Ingle et al., 2014).}$$

Results and Discussion

Infected roots of Safed musli were collected from the field of Nagarjun Medicinal and Aromatic Plant Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola and constantly observed for disease occurrence during 2014-2015. The fungus viz. *Rhizoctonia bataticola*, *Fusarium solani*, *Sclerotium rolfsii*. Were found associated with root rot of Safed musli. The root rot disease was observed on 18th September, after 62 days after sowing (DAS). To know the severity of root rot observations were recorded at 62, 69, 76 and 83 days after sowing.

1. Effect of different treatments on incidence of root rot diseases-

Table 1: Effect of different pigeon pea intercropping systems on incidence of root rot diseases of Safed musli

Treatments*	% Incidence at **			
	62 DAS	69 DAS	76 DAS	83 DAS
T1 (2:1)	2.77 (1.66)***	5.77 (2.40)	7.41 (2.72)	9.54 (3.08)
T2 (3:1)	2.35 (1.53)	4.94 (2.22)	6.93 (2.63)	9.10 (3.01)
T3 (2:2)	2.61 (1.61)	5.53 (2.35)	7.36 (2.71)	9.47 (3.07)
T4 (1:2)	2.96 (1.71)	6.16 (2.48)	7.59 (2.75)	9.68 (3.11)
T5 (sole Safed musli)	3.49 (1.86)	6.86 (2.62)	7.88 (2.80)	10.31 (3.21)
F Test	NS	Sig	NS	NS
SE(m)±	-	0.03	-	-
CD at 5%	-	0.11	-	-

*: Intercropping ratio of Safed musli with pigeon pea, **: mean of four replications

***: Figure in parentheses are square root values

Table 2: Effect of different pigeon pea intercropping systems on bunches per row and roots per net row at harvesting.

Treatments	Bunches/Row *			% Root rot**	Roots/Row *			roots per plant/ Bunch	% Incidence
	Total	Healthy	Infected		Total	Healthy	Infected		
T1 (2:1)	42.19	38.25	3.88 (1.96)***	9.19 (3.02)	240.39	229.77	10.63 (3.24)	5.70	4.42 (2.09)
T2 (3:1)	40.38	37.85	2.65 (1.62)	6.20 (2.48)	256.38	247.93	8.75 (2.95)	6.57	3.41 (1.84)
T3 (2:2)	39.19	36.44	2.75 (1.62)	6.99 (2.61)	239.82	227.99	11.82 (3.42)	6.12	4.95 (2.21)
T4 (1:2)	41.38	38.25	3.13 (1.74)	7.51 (2.70)	253.49	241.26	12.19 (3.48)	6.13	4.86 (2.20)
T5 (sole Safed musli)	37.50	33.54	3.95 (1.98)	10.55 (3.23)	221.64	208.51	13.08 (3.61)	5.92	5.90 (2.43)
F Test	Sig	Sig	NS	Sig	NS	NS	Sig	NS	Sig
SE(m)±	0.30	0.34	-	0.15	-	-	0.11	-	0.07
CD at 5%	0.93	1.07	-	0.47	-	-	0.35	-	0.33

*: mean of four replications, **: Figure in parentheses are square root values

b) Roots per row

The results (Table 2) on total and healthy roots per row were statistically non-significant but infected roots per row were statistically superior over control, lowest number of infected roots (8.75) were obtained in the treatment T₂ of 3:1 intercropping (Safed musli + pigeon pea), followed by T₁

Statistical analysis (Table 1) revealed that, treatments were statistically superior over control (T₅) at 69 DAS, the lowest disease incidence (4.94%) was observed in treatment T₂ of 3:1 intercropping (Safed musli + pigeon pea), followed by T₃ (5.53%), T₁ (5.77%) and T₄ (6.16%), as compared to control T₅ of sole Safed musli (6.86%). Naik *et al.* (1996)^[5] reported that wilt incidence in sorghum- intercropped pigeon pea plots was significantly lower than in sole pigeon pea plots. Karthikeyan and Bhaskaran (2001)^[3] reported that growing intercrops in basal stem rot affected coconut plantations reduced the incidence of *Ganoderma lucidum*.

2. Effect of treatments on root rot disease incidence, bunches and roots per row at the time of harvesting.

a) Bunches per row

Results (Table1) on total number of bunches per row were statistically significant over control, the highest total number of bunches (42.19) were obtained in the treatment T₁ of 2:1 intercropping (Safed musli + pigeon pea), followed by T₄ (41.38), T₂ (40.38) and T₃ (39.19), as compared to control T₅ of sole Safed musli (37.50).

The number of healthy bunches per row were highest (38.25) in the treatment T₁ of 2:1 intercropping (Safed musli + pigeon pea) which were also same in T₄, followed by T₂ (37.85) and T₃ (36.44), as compared to control T₅ of sole Safed musli (33.54). The results of number of infected bunches per row were statistically non-significant.

The results on per cent incidence of root rot were statistically significant. The lowest root rot incidence (6.20%) was observed in treatment T₂ of 3:1 intercropping (Safed musli + pigeon pea), followed by T₃ (6.99%), T₄ (7.51%) and T₁ (9.19%) respectively, as compared to control T₅ of sole Safed musli (10.55%).

(10.75), T₃ (11.82) and T₄ (12.19), as compared to control T₅ of sole Safed musli (13.08).

The results (Table 2) on per cent root rot incidence were statistically significant. The lowest disease incidence (3.41%) was observed in treatment T₂ of 3:1 intercropping (Safed musli + pigeon pea), followed by T₁ (4.42%), T₄ (4.86%) and T₃ (4.95%), as compared to control T₅ of sole safed musli

(5.90%). Solanki (2014) conducted an experiment to determine effect of fly ash on diseases of Safed musli and found similar level of root rot incidence, also similar results were also concluded at Nagarjun Medicinal and Aromatic Plant Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Anonymous 2012-13) ^[1].

Conclusion

The fungus viz. *Rhizoctonia bataticola*, *Fusarium solani*, *Sclerotium rolfsii*. Were found associated with root rot of Safed musli in Vidarbha region. Among the all tested pigeon pea intercropping systems, intercropping in proportion of 3:1(Safed musli + pigeon pea) was found beneficial in disease suppression as well as yield improvement of Safed musli followed by 2:1 intercropping system as compared to sole Safed musli.

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