Research Paper :

Integrated management of root-knot nematode, *Meloidogyne incognita* infesting okra [*Abelmoschus esculentus* (L.) Moench]

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SUMMARY

The micro plot experiment was conducted for the integrated management of root-knot nematode, *M. incognita* infesting okra with thirteen treatments including an untreated control. All the treatments were significantly superior over an untreated control in reducing the root-knot nematode population, number of root-gall and gall index and increasing length, fresh and dry weights of root and shoot and yield of okra at termination. However, soil application of carbofuran 3G @ 2 kg a.i./ha was found to be most effective in reducing root-knot nematode population (59.49 %), number of root galls (69.57 %) and gall index (39.33 %) and increasing the length of root (64.28 %) and shoot (71.37 %), fresh weight of root (93.41) and shoot (83.67 %), dry weight of root (103.13 %) and shoot (87.58 %) and the fruit yield of okra (32.94 %) in micro plots.

Key words : Rust disease, *Puccinia penniseti*, Bajra, Ahmedpur

The root-knot nematodes, *Meloidogyne* spp. are basically parasites of roots cause root galls or knots as a below ground symptoms. The above ground symptoms, hence, are those of slow debility of roots in its function of nutrient and water uptake and translocation. The plants may be dwarfed, yellowish with smaller foliage and poor and fewer fruits. The symptoms are often mistaken for macro or micro nutrient deficiency or moisture stress. Nematodes in addition to their own pathogenic effects may also play a role with other disease causing agencies like fungi, bacteria and viruses acting as incitants or vectors thus helping other organisms to be more effective in causing diseases. Nematodes themselves are also capable of breaking disease resistance.

MATERIALS AND METHODS

The experiment was conducted in root knot nematode sick microplots (1.8x1.1m size) of AICRP on nematodes, Department of Entomology, Mahatma Phule Krishi Vidyapeeth, Rahuri during *Rabi*, 2008. There were thirteen treatments accommodated in a randomized block design with three replications. Okra (CV.ARKA ANAMIKA) sown at 30x15 cm spacing was grown by following recommended agronomic practices. The bioagents *P. fluorescens*, *T. viride*, *P. lilacinus* and *T. plus* were applied as seed treatment (5 g/kg seed) and soil application (5 kg/ha).The nematicides, Carbosulfan 25 DS and Abamectin 400 FS as seed treatment at 3 % w/w and 1 ml /kg seed, respectively. and soil application of Carbofuran 3G at 2 kg a.i./ha.were given before sowing. Similarly, the neem cake at 2 t/ha was applied in soil 15 days before sowing.

The observations pertaining to initial root knot nematode population before sowing, final root knot nematode population, number of root galls and egg masses/plant, gall index/plant were recorded at the time of termination of experiment.Similarly,the fruit yield of okra was recorded and incremental cost benefit ratio of treatment was worked out.

RESULTS AND DISCUSSION

All the treatments were significantly superior over an untreated control in reducing root-knot nematode population, number of root galls and gall index and increasing the length, fresh and dry weights of root and shoot and yield of okra at termination. However, soil application of carbofuran 3G @ 2 kg a.i./ha was found to be most effective in reducing root-knot nematode population (59.49 %), number of root galls (69.57 %) and gall index (39.33 %) and increasing length of root (64.28 %) and shoot (71.37 %), fresh weight of root (93.41 %) and shoot (83.67 %), dry weight of root (103.13 %) and shoot (87.58 %) and the yield

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Table 1 : Effect of different treatments on mean root knot nematode, *M. incognita* population, root galls and gall index, root and shoot length, fresh weight of root and shoot, dry weight of root and shoot and fruit yield of okra and their incremental cost benefit ratio for the integrated management of root knot nematode, *M. incognita* in okra

Sr. No.	Treatments	Decline (%)			Increase (%)							
		Nematode population/ 200ml of soil	Root galls / plant	Gall index / plant	Root length /plant	Shoot length/ plant	Fresh wt. Root	Fresh wt. Shoot	Dry wt. Root	Dry wt. Shoot	Yield/ha	ICBR
1.	Seed treatment with *P. fluorescens* at 5 g/kg of seed	32.53	44.76	18.67	16.09	25.35	31.32	33.50	70.75	43.06	11.91	1 : 4.98
		(34.76)*	(41.98)*	(25.34)*	(23.61)	(29.41)*	(33.97)*	(35.34)*	(57.27)*	(40.99)*	(12.29)**	
2.	Seed treatment with *T. viride* at 5 g/kg of seed	32.09	43.82	9.67	12.23	7.36	9.75	13.24	61.75	21.67	11.69	1 : 3.98
		(34.45)	(41.46)	(18.01)	(20.46)	(15.51)	(18.20)	(21.32)	(51.80)	(27.24)	(10.13)	
3.	Seed treatment with *P. lilacinus* at 5 g/kg of seed	34.21	46.43	20.00	20.22	25.47	35.16	34.77	72.85	45.51	12.01	1 : 5.46
		(35.79)	(42.94)	(26.45)	(26.70)	(29.96)	(36.21)	(35.99)	(58.61)	(42.37)	(13.28)	
4.	Seed treatment with *T. plus* at 5 g/kg of seed	30.23	43.08	7.00	10.80	4.13	8.56	11.58	48.94	20.19	11.80	1 : 4.68
		(33.34)	(41.00)	(14.91)	(19.18)	(11.51)	(16.85)	(19.88)	(44.39)	(26.22)	(11.25)	
5.	Seed treatment with carbosulfan 25 DS @ 3 % w/w	38.82	49.05	25.33	22.07	31.11	44.09	35.42	75.62	52.31	12.56	1 : 2.01
		(38.53)	(44.45)	(30.21)	(27.16)	(33.58)	(41.60)	(36.42)	(60.64)	(46.35)	(18.10)	
6.	Seed treatment with abamectin @ 1 ml per kg seed	38.66	48.83	22.67	20.82	30.22	40.81	35.39	73.87	50.58	12.25	1 : 3.92
		(38.41)	(44.33)	(28.41)	(26.72)	(32.83)	(39.43)	(36.50)	(59.34)	(45.38)	(15.26)	
7.	Soil application with *P. fluorescens* at 5 kg/ha	45.34	55.76	29.33	31.01	41.13	65.53	47.79	86.76	57.70	13.30	1 : 0.54
		(42.30)	(48.33)	(32.72)	(33.69)	(39.77)	(54.22)	(43.69)	(69.93)	(49.67)	(25.42)	
8.	Soil application with *T. viride* at 5 kg/ha	45.23	55.47	28.67	30.14	36.23	64.77	46.02	86.69	53.61	13.00	1 : 0.37
		(42.25)	(48.15)	(32.32)	(33.29)	(36.93)	(54.17)	(42.69)	(68.62)	(47.08)	(22.57)	
9.	Soil application with *P. lilacinus* at 5 kg/ha	47.89	58.10	30.67	38.47	43.87	67.66	55.30	88.37	59.13	13.50	1 : 0.65
		(43.74)	(49.67)	(33.59)	(38.32)	(41.45)	(55.64)	(48.09)	(70.50)	(50.34)	(27.30)	
10.	Soil application with *T. plus* at 5 kg/ha	44.56	53.97	26.67	29.54	35.14	49.03	44.36	84.68	51.85	12.77	1 : 0.76
		(41.84)	(47.28)	(31.08)	(32.89)	(36.20)	(44.37)	(41.49)	(67.63)	(46.08)	(20.47)	
11.	Soil application with carbafuran 3G @ 2 kg a.i./ha	59.49	69.57	39.33	64.28	71.37	93.41	83.67	103.13	87.58	14.10	1 : 4.38
		(50.42)	(56.55)	(38.83)	(53.31)	(57.84)	(76.39)	(67.10)	(87.57)	(69.97)	(32.94)	
12.	Soil application with neem cake @ 2 t/ha	57.14	68.23	38.00	58.95	65.49	88.66	76.17	99.06	83.17	13.77	1 : 0.78
		(49.08)	(55.71)	(38.05)	(50.16)	(54.19)	(70.66)	(61.19)	(83.10)	(66.42)	(29.87)	
13.	Untreated control	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.60	
	S.E. ±	3.73	1.49	1.72	2.30	3.71	4.42	3.83	2.83	4.12	0.78	
	C.D. (P=0.05)		4.35	5.06	6.86	11.00	12.85	11.26	8.38	12.18	2.28	

Figures in parentheses are arcsin transformed values
** Increase in yield

of okra (32.94%) at termination

The reduction in nematode population as a result of soil application of carbofuran 3G may be due to inhibition of root-knot nematode. This is in conformity with that of reported by Poornima and Vadivelu (1990) and Singh (2006) in bringal, mung and cauliflower, respectively. The effectiveness of carbofuran 3 G for the control of root-knot nematode was also reported by Mahajan (1982) in brinjal. Ravichandra and Reddy (2008) in tomato and Shevale *et al.* (2006) in mung,.

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