Field evaluation of biointensive module for the management of major insect pests of coleus

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ABSTRACT

A field experiment was conducted to evaluate the efficacy of a biointensive module including organic nutrients, botanicals and bio-control agents against major insect pests of coleus (*Coleus forskohlii* Briq.). The results of the study revealed that biointensive module for coleus (BIMC) II was effective in reducing the incidence of major pest of coleus, recording the mean leaf damage of 5.6 per cent with a reduction of 68.8 per cent for thrips (*Scirtothrips dorsalis*), 3.4 per cent with a reduction of 63.8 per cent for scale insects (*Orthezia insignis*) and 7.0 per cent with a reduction of 65.8 per cent over full dose of NPK for defoliator (*Orphanostigma abruptalis*). Same module recorded the natural enemy activity equal to untreated check and recorded the highest yield of 25,623 kg wet tubers/ha.

Key words: Defoliator, forskolin, medicinal plant, scale insects, thrips

INTRODUCTION

Coleus (*Coleus forskohlii* Briq.) is a perennial herb with fleshy fibrous roots. The tuberous roots are rich sources of forskolin which is being developed as a drug for hypertension, glaucoma, asthma, congestive heart failures and certain types of cancers. Murali Baskaran *et al*. (2007) reported two species of sucking insects *viz.,* thrips (*Scirtothrips dorsalis* Hood) and scale insect (*Orthezia insignis* Browne) and one defoliator (*Orphanostigma abruptalis* Wlk.) which were found infesting the leaves of coleus. Pest management in medicinal plants is only in primitive stage in India. Though few attempts were made on pest management in coleus, all were with chemical control which is against the concept of using medicinal plants for curing several ailments of human beings. Hence the present investigation was carried out to find out the efficacy of a biointensive module against major insect pests of coleus.

MATERIALS AND MATERIALS

A field experiment was conducted at Agricultural College and Research Institute, Madurai during October 2009 to March 2010 (32.3 ± 1.6^{0}C and 78.5 ± 2.4% RH) to evaluate the efficacy of a biointensive module against major insect pests of coleus. The details of modules tested are: TI- Biointensive Module for Coleus I (BIMC I) - Vermicompost 2 t/ha + Neem cake 250 kg/ha + Biofertilizers 2 kg/ha in each + NPK (20:60:50 kg/ha); *Chrysoperla carnea* 50,000 eggs/ha (3 releases on 15, 30 and 105 DAP); *Trichogramma chilonis* 6.25 cc/ha (2 releases on 45 and 60 DAP); *Bacillus thuringiensis* 750 g/ha (3 sprays on 50, 80 and 140 DAP); Fish oil rosin soap 25 g/lit (5 sprays on 35, 55, 75, 95 and 115 DAP); T II- Biointensive Module for Coleus II (BIMC II) - Vermicompost 2 t/ha + Karanj cake 250 Kg/ha + Biofertilizers 2 Kg/ha in each + NPK (20:60:50 Kg/ha); *Chrysoperla carnea* 50,000 eggs/ha (3 releases on 15, 30 and 105 DAP); *Trichogramma chilonis* 6.25 cc/ha (2 release on 45 and 60 DAP); *Bacillus thuringiensis* 750 g/ha (3 sprays on 50, 80 and 140 DAP); Fish oil rosin soap 25 g/lit (5 sprays on 35, 55, 75, 95 and 115 DAP); T III- NPK alone (40:60:50 kg / ha) and T IV- untreated check.

Coleus seedlings were planted in ridges and furrows with a spacing of 60 x 30 cm. All the agronomic practices were followed uniformly in all the plots, measuring 5 x 4 m^2. Each treatment was replicated six times and compared with full dose of NPK and untreated check. All treatments involving organic sources of nutrients were included with half a dose of N and full dose of P and K. Vermicompost 2 t/ha, biofertilizers 2 kg/ha and NPK (20:60:50 kg/ha) were applied basally during main field preparation. Oil cakes, neem and karanj cakes were applied @ 125 kg/ha in each as basal and another 125 kg/ha in each cake were applied as top dressing in two equal splits at 50 days interval on 50 and 100 days after planting. Per cent leaf damage by thrips, scale insects and defoliator were recorded at fortnightly interval in five randomly selected plants in each replication on 45, 60, 75, 90, 105, 120, 135, 150 and 165 DAP. Population of natural enemies like coccinellids and spiders were recorded in five randomly selected plants in each

replication on 30, 60, 90 and 120 DAP. Yield of wet tubers was recorded during harvest.

RESULTS AND DISCUSSION

Field efficacy of biointensive modules for the management of major insect pests of coleus indicated that biointensive module for coleus II (BIMC II) was effective in reducing the incidence of major insect pests of coleus, recording the mean leaf damage of 5.6 per cent with a reduction of 68.8 per cent for thrips, 3.4 per cent with a reduction of 63.8 per cent for scale insects and 7.0 per cent with a reduction of 65.8 per cent over full dose of NPK for defoliator (Table 1-3), followed by biointensive module for coleus I (BIMC I) recording the mean leaf damage of 8.7, 4.4 and 9.8 per cent for thrips, scale insects and defoliators (Table 1-3). Activity of natural enemies was equal in both modules which were on a par with full dose of NPK and untreated check (Table 4).

In the present study three releases of *C. carnea* (15, 30 and 105 DAP) and two releases of *T. chilonis* (45 and 60 DAP) were responsible to suppress the population of thrips and eggs of defoliator, respectively. Three sprays of *B. thuringiensis* (50, 80 and 140 DAP) and five sprays of fish oil rosin soap 25 g/lit. (35, 55, 75, 95 and 115 DAP) were able to manage various stages of defoliator and scale insects.

Several such location specific modules have been developed elsewhere in India, in which various organic inputs were mixed up judiciously for the management of key pests including *H. armigera* on cotton (Srinivasan *et al.*, 2007; Sabry and El-sayed, 2011; Jorjani *et al*., 2011), key pests of groundnut (Kalyanasundaram *et al*., 1991), *H. armigera* on tomato (Amutha, 2005), key pests of brinjal (Elanchezhyan, 2007), key pests of senna (Senthil kumaran, 2008), cutworm on potato (Borah *et al.*, 2009), thrips and cutworm of onion (Suresh *et al.*, 2010) etc.

Biointensive module for coleus II recorded the highest yield of 25,623 kg wet tubers/ha, followed by biointensive module for coleus I, when compared to full dose of NPK and untreated check (Table 4).

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Table 1. Per cent leaf damage by *Scirtothrips dorsalis*, as influenced by biointensive modules (n=6)

Treatment	% leaf damage by *Scirtothrips dorsalis* at fortnightly interval									Mean	% reduction over NPK
	45 DAP	60 DAP	75 DAP	90 DAP	105 DAP	120 DAP	135 DAP	150 DAP	165 DAP		
BIMC I	10.5^{b}	12.4^{b}	11.4^{b}	9.1^{b}	8.3^{b}	8.4^{b}	6.4^{b}	6.2^{b}	5.8^{b}	8.7	51.6
BIMC II	7.2^{a}	7.8^{a}	6.5^{a}	5.6^{a}	6.5^{a}	5.4^{a}	4.3^{a}	3.8^{a}	3.4^{a}	5.6	68.8
NPK (40:60:50 kg/ha)	20.4^{d}	21.9^{c}	20.5^{c}	19.5^{d}	20.1^{c}	18.6^{c}	14.8^{c}	13.4^{d}	13.2^{d}	18.0	--
Untreated check	18.8^{c}	21.0^{c}	19.8^{c}	17.6^{c}	19.9^{c}	17.6^{c}	13.8^{c}	10.9^{c}	10.8^{c}	16.7	--
SEd	0.43	0.36	0.42	0.53	0.38	0.48	0.50	0.42	0.41	--	--
CD 5%	0.91	0.78	0.91	1.15	0.82	1.02	1.08	0.90	0.88		

DAP-Days after planting; In a column, means followed by same letter(s) are not significantly different by DMRT (P=0.05)

Table 2. Per cent leaf damage by *Orthezia insignis* on coleus, as influenced by biointensive modules (n=6)

Treatment	% leaf damage by *O. insignis* at fortnightly interval									Mean	% reduction over NPK
	45 DAP	60 DAP	75 DAP	90 DAP	105 DAP	120 DAP	135 DAP	150 DAP	165 DAP		
BIMC I	7.1[b]	6.3[b]	5.8[b]	4.7[b]	4.2[b]	3.5[b]	3.1[b]	2.7[b]	2.2[b]	4.4	53.1
BIMC II	5.4[a]	5.1[a]	4.6[a]	3.9[a]	3.6[a]	2.7[a]	2.3[a]	1.8[a]	1.2[a]	3.4	63.8
NPK (40:60:50 kg/ha)	15.4[d]	13.8[d]	12.6[d]	10.3[d]	9.4[d]	7.7[d]	6.0[d]	5.4[d]	4.7[d]	9.4[d]	--
Untreated check	14.2[c]	12.1[c]	11.0[c]	8.5[c]	7.9[c]	5.8[c]	5.4[c]	4.7[c]	4.4[c]	8.2[c]	--
SEd	0.24	0.28	0.27	0.30	0.31	0.34	0.38	0.49	0.42	--	--
CD 5%	0.53	0.59	0.58	0.65	0.67	0.73	0.82	0.89	0.90		

DAP-Days after planting; In a column, means followed by same letter(s) are not significantly different by DMRT (P=0.05)

Table 3. Per cent leaf damage by *Orphanostigma abruptalis*, as influenced by biointensive modules (n=6)

Treatment	% leaf damage by *O. abruptalis* at fortnightly interval									Mean	% reduction over NPK
	45 DAP	60 DAP	75 DAP	90 DAP	105 DAP	120 DAP	135 DAP	150 DAP	165 DAP		
BIMC I	15.6[b]	14.1[b]	12.2[b]	10.6[b]	9.3[b]	8.1[b]	6.7[b]	6.2[b]	5.6[b]	9.8	52.1
BIMC II	10.4[a]	10.2[a]	8.4[a]	8.3[a]	6.7[a]	5.8[a]	5.4[a]	5.1[a]	3.4[a]	7.0	65.8
NPK (40:60:50 kg/ha)	22.6[c]	21.6[d]	22.8[d]	21.2[c]	23.7[d]	19.7[c]	17.6[c]	18.6[d]	17.8[d]	20.5	--
Untreated check	22.7[c]	20.5[c]	21.3[c]	20.8[c]	22.7[c]	19.8[c]	17.8[c]	16.6[c]	15.5[c]	19.8	--
SEd	0.28	0.24	0.31	0.28	0.31	0.36	0.34	0.30	0.33	--	--
CD 5%	0.61	0.52	0.67	0.61	0.66	0.76	0.74	0.65	0.71		

DAP-Days after planting; In a column, means followed by same letter(s) are not significantly different by DMRT (P=0.05)

Table 4. Population of natural enemies and yield of wet tubers in coleus, as influenced by biointensive modules

Treatment	Coccinellids/5 plants				Spiders/5 plants				Tubers yield (Kg/ha) (wet basis)
	30 DAP	60 DAP	90 DAP	120 DAP	30 DAP	60 DAP	90 DAP	120 DAP	
BIMC I	5.5	8.4	8.2	4.9	2.3	2.6	2.1	1.8	22,970[b]
BIMC II	5.4	8.5	8.1	5.1	1.9	2.4	2.4	2.1	25,623[a]
NPK (40:60:50 Kg/ha)	5.6	8.6	8.0	5.0	2.2	2.5	2.0	1.9	15,642[d]
Untreated check	5.5	8.5	8.3	4.8	2.0	2.6	2.3	2.2	12,415[c]
Mean	5.5	8.5	8.1	5.0	2.1	2.5	2.2	2.0	--
SEd	NS	NS	NS	NS	NS	NS	NS	NS	0.49
CD 5%									1.06

DAP-Days after planting; In a column, means followed by same letter(s) are not significantly different by DMRT (P=0.05)

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