Madras Agric. J., 98 (10-12): 390-392, December 2011
https://doi.org/10.29321/MAJ.10.100321

Short Note

Field Evaluation of Biocontrol Agents for the Management of Major Insect Pests of Coleus

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A field experiment was laid at Agricultural College and Research Institute, Madurai during June – November 2009 to evaluate the efficacy of various bio-control agents individually and in different combinations for the management of major insect pests of coleus. Five releases of *Chrysoperla carnea* (50,000 eggs/ha) at monthly interval were effective in reducing the incidence of thrips (*Scirtothrips dorsalis*), recording the mean population of 8.2 nos./sq.cm with 60.0 per cent reduction over untreated check. Single release of *C. carnea* on 30 Days after Planting (DAP), *Trichogramma chilonis* on 60 DAP, single spray of *Beauveria bassiana* on 90 DAP and two rounds of spray of *Bacillus thuringiensis* on 120 and 150 DAP were effective against defoliator (*Orphanostigma abruptalis*), recording the lowest mean population of 2.6 nos./five plants with a reduction of 69.4 per cent over untreated check and the highest yield of 20,643 kg wet tubers/ha.

Key words: Bio-control agents, *Coleus forskohlii,* defoliator, thrips.

Coleus (*Coleus forskohlii* Briq.) is a perennial herb with fleshy, fibrous roots. The tuberous roots are found to be a rich source 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.) 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 are with chemical control which is against the concept of using medicinal plants for curing several ailments of human beings. Using bio-control agents to manage major pests of agricultural and horticultural crops is the best alternative to chemical control. No systematic experimentation is done to assess the efficacy of bio-control agents on the management of major pests of coleus.

Materials and Methods

A field experiment was conducted at Agricultural College and Research Institute, Madurai during June – November 2009 (34.8 ± 1.8°C and 75.0 ± 2.7% RH) to evaluate the efficacy of various bio-control agents individually and with different combinations against major insect pests of coleus. There were eight treatments with three replications as given in Table 1. Field experiment with bio-control agents was conducted in a randomized block design with plot size of 5 x 4m^2. *Bacillus thuringiensis*, *Chrysoperla carnea*, *Trichogramma chilonis* and *Beauveria bassiana* were released or sprayed once in a month starting from 30 DAP. The control plots were maintained 25 m away from other treatments to avoid the movement of bio-control agents to control plot. Thrips population was recorded at fortnightly interval on 45, 60, 75, 90, 105, 120, 135, 150 and 165 DAP using a card-board template of size 1cm^2. Defoliator count was recorded on 60, 90, 120 and 150 DAP, as number of larvae/5 plants. Yield of wet tubers was recorded at harvest.

Results and Discussion

Field release/Spray of various bio-control agents individually and in different combinations at monthly interval starting from 30 DAP for the management of major insect pests of coleus indicated that five releases of *C. carnea* at monthly interval was effective in reducing the population of thrips, recording the population of 8.2 nos./sq.cm with a reduction over untreated check of 60.0 per cent (Table 1). The efficacy of various bio-control agents on thrips was in the order of five releases of *Chrysoperla carnea* (T1) > *Chrysoperla carnea* + *Trichogramma chilonis* + *Beauveria bassiana* + *Bacillus thuringiensis* (2 sprays) (T5) > *B. thuringiensis* + *C. carnea* + *T. chilonis* + *B. bassiana* (2 sprays) (T7) > *B. thuringiensis* + *C. carnea* + *T. chilonis* + *B. thuringiensis* (2 sprays) (T6).

Bio-control agents like *C. carnea*, *T. chilonis*, *B. thuringiensis* and *B. bassiana* when used individually were effective in suppressing a single

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Table 1. Population of *Scirtothrips dorsalis* on coleus, as influenced by bio-control agents

Treatment	Pre treatment count	No. of thrips/sq.cm at fortnightly interval*									Mean	% reduction over control
		45 DAP	60 DAP	75 DAP	90 DAP	105 DAP	120 DAP	135 DAP	150 DAP	165 DAP		
T_1 - *Chrysoperla carnea* @	38.2	12.1	11.5	10.4	9.2	8.5	7.4	6.2	4.4	4.1	8.2	60.0
50,000 eggs/ha (5 releases)		(3.54)^{a}	(3.46)^{a}	(3.30)^{a}	(3.11)^{a}	(3.0)^{a}	(2.81)^{a}	(2.58)^{a}	(2.21)^{a}	(2.14)^{a}		
T_2 - *Trichogramma chilonis* @	39.8	22.5	22.1	20.2	19.2	18.0	15.8	14.7	13.4	12.9	17.6	14.1
6.25 cc/ha (5 releases)		(4.79)^{e}	(4.75)^{f}	(4.54)^{f}	(4.43)^{g}	(4.30)^{g}	(4.03)^{g}	(3.89)^{f}	(3.72)^{e}	(3.66)^{f}		
T_3 - *Bacillus thuringiensis* 750 g/ha (5 sprays)	40.7	20.4	18.3	17.0	15.4	14.1	12.3	11.2	10.9	10.5	14.4	29.7
		(4.57)^{d}	(4.33)^{d}	(4.18)^{e}	(3.98)^{e}	(3.82)^{e}	(3.57)^{e}	(3.42)^{d}	(3.37)^{d}	(3.31)^{e}		
T_4 - *Beauveria bassiana* 2 g/lit (5 sprays)	41.4	21.2	20.2	19.3	17.4	16.3	14.4	13.3	12.8	12.2	16.3	20.4
		(4.65)^{d}	(4.54)^{e}	(4.44)^{f}	(4.23)^{f}	(4.09)^{f}	(3.86)^{f}	(3.71)^{e}	(3.64)^{e}	(3.56)^{f}		
T_5 - *C.c* (one release) + *T.c.*(one release) +	37.8	13.8	12.7	11.8	10.4	9.3	8.8	7.5	6.3	5.1	9.5	53.6
B.b. (one spray) + *B.t.* (2 sprays)		(3.78)^{b}	(3.63)^{b}	(3.50)^{b}	(3.30)^{b}	(3.13)^{b}	(3.04)^{b}	(2.82)^{b}	(2.60)^{b}	(2.36)^{b}		
T_6 - *B.t.* (one spray) + *C.c.* (one release) +	39.7	16.3	14.4	14.0	13.2	12.3	11.4	9.7	8.3	7.2	11.8	42.4
T.c. (one spray) + *B.t.* (2 sprays)		(4.09)^{c}	(3.86)^{c}	(3.80)^{d}	(3.70)^{d}	(3.57)^{d}	(3.44)^{d}	(3.19)^{c}	(2.96)^{c}	(2.77)^{d}		
T_7 - *B.t.* (one spray) + *C.c.* (one release) +	40.5	16.1	14.2	13.1	12.3	11.4	10.2	9.8	7.8	6.3	11.2	45.3
T.c. (one spray) + *B.b.* (2 sprays)		(4.07)^{c}	(3.83)^{c}	(3.68)^{c}	(3.57)^{c}	(3.44)^{c}	(3.27)^{c}	(3.20)^{c}	(2.88)^{c}	(2.60)^{c}		
T_8 - Untreated check	41.6	25.5	24.7	23.4	22.3	20.8	18.6	17.6	16.3	15.6	20.5	—
		(5.47)^{f}	(5.01)^{g}	(4.88)^{g}	(4.77)^{h}	(4.61)^{h}	(4.37)^{h}	(4.25)^{g}	(4.09)^{f}	(4.01)^{g}		
SEdCD 5%		0.04	0.05	0.04	0.05	0.05	0.05	0.06	0.06	0.07	—	—
		0.10	0.11	0.10	0.11	0.12	0.12	0.13	0.14	0.15		

*Mean of three replications; DAP: Days after planting; Each release/spray at monthly interval starting from 30 days after planting; *C.c.*: *Chrysoperla carnea*; *T. c.*: *Trichogramma chilonis*; *B. b.*: *Beauveria bassiana*; *B. t.*: *Bacillus thuringiensis* Figures in parentheses are square root transformed values In a column, means followed by same letter(s) are not significantly different by DMRT (P=0.05)

pest but sequential release/spray of bio-control agents was useful to manage various insect pests which occurred in various growth stages of crop, as well demonstrated by Dhandapani *et al.*(1991), Murali Baskaran *et al*. (2000) and Balakrishnan *et al.* (2005) on cotton and Kalyanasundaram *et al*. (1991) on groundnut in which release of either *C. carnea* or *T. chilonis*, followed by spraying of NPV was reported to be effective against pests of cotton and groundnut rather than using them individually. Sequential release/spray of *C. carnea, T. chilonis* and *B. thuringiensis* was effective against sucking pests, recording the lowest mean leaflet damage of 4.2 per cent for thrips and 5.0 per cent for aphids in

Table 2. Population of *Orphanostigma abruptalis* and yield of wet tubers in coleus, as influenced by bio-control agents

Treatment	Pre treatment count	No. of larvae/5 plant*				Mean	% reduction over control	Wet tuber yield (kg/ha)
		60 DAP	90 DAP	120 DAP	150 DAP			
T_1 - *Chrysoperla carnea* @ 50,000eggs/ha (5 releases)	7.6	5.5	5.1	3.9	3.2	4.4	48.2	20,105^{c}
		(2.44)^{c}	(2.36)^{c}	(2.09)^{b}	(1.92)^{c}			
T_2 - *Trichogramma chilonis* @ 6.25 cc/ha (5 releases)	8.4	7.9	7.7	6.6	5.5	6.9	18.8	17,075^{f}
		(2.89)^{de}	(2.86)^{e}	(2.66)^{d}	(2.44)^{d}			
T_3 - *Bacillus thuringiensis* 750 g/ha (5 sprays)	9.2	7.1	6.3	5.1	4.8	5.8	31.7	18,112^{d}
		(2.75)^{d}	(2.60)^{d}	(2.36)^{c}	(2.30)^{d}			
T_4 - *Beauveria bassiana* 2 g/lit (5 sprays)	8.3	7.6	6.8	5.7	4.4	6.1	28.2	17,454^{e}
		(2.84)^{d}	(2.70)^{de}	(2.48)^{cd}	(2.21)^{d}			
T_5 - *C. c* (one release) + *T. c.* (one release) +	7.1	3.9	3.3	2.1	1.3	2.6	69.4	20,643^{a}
B.b. (one spray) + *B. t.* (2 sprays)		(2.09)^{a}	(1.94)^{a}	(1.61)^{a}	(1.34)^{a}			
T_6 - *B. t.* (one spray) + *C. c.* (one release) +	8.2	4.6	4.2	3.1	2.2	3.5	58.8	20,455^{ab}
T.c. (one spray) + *B. t.* (2 sprays)		(2.25)^{ab}	(2.16)^{b}	(1.89)^{b}	(1.64)^{b}			
T_7 - *B.t.* (one spray) + *C. c.* (one release) +	7.8	5.0	4.8	3.3	2.5	3.9	54.1	20,283^{bc}
T. c. (one spray) + *B. b.* (2 sprays)		(2.34)^{bc}	(2.30)^{bc}	(1.94)^{b}	(1.73)^{bc}			
T_8 - Untreated check	9.2	8.8	9.1	8.5	7.6	8.5	—	12,256^{g}
		(3.04)^{e}	(3.09)^{f}	(3.00)^{e}	(2.84)^{e}			
SEd	0.08	0.09	0.09	0.11	—	—		0.33
CD 5%	0.17	0.19	0.21	0.25				1.32

*Mean of three replications; DAP: Days after planting; Each release/spray at monthly interval starting from 30 days after planting; *C.c.*: *Chrysoperla carnea*; *T. c.*: *Trichogramma chilonis*; *B. b.*: *Beauveria bassiana*; *B. t.*: *Bacillus thuringiensis* Figures in parentheses are square root transformed values In a column, means followed by same letter(s) are not significantly different by DMRT (P=0.05)

senna (Senthil Kumaran, 2008). Since the incidence of thrips was noticed during initial stage of coleus crop, using *C. carnea* alone as the first release was effective in suppressing the population of thrips.

Similarly, single release of *C. carnea* and *T. chilonis* on 30 and 60 DAP, single spray of *B. bassiana* on 90 DAP and two sprays of *B. thuringiensis* on 120 and 150 DAP was found to be effective against defoliator (*O. abruptalis*), recording lowest mean population of 2.6 nos./five plants with a reduction of 69.4 per cent (Table. 2) over untreated check, as suggested in groundnut (Murali Baskaran *et al*., 2000) wherein the sequential release/spray of *T. chilonis* and NPV was reported to be effective against *Spodoptera litura*, resulting in the highest cost benefit ratio of 1:2.53.

Single release of *C. carnea* and *T. chilonis* on 30 and 60 DAP, single spray of *B. bassiana* on 90 DAP and two rounds of spray of *B. thuringiensis* on 120 and 150 DAP recorded the highest yield of 20,643 kg wet tubers/ha, while in untreated check, it was 12,256 kg wet tubers/ha (Table 2).

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Received: July 10, 2011; Accepted: December 16, 2011