Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-7: 732-737

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-7 pp. 732-737**
Journal homepage: http://www.ijcmas.com

Original Research Article

Management of Prevalence of Natural Enemy, *E. amabilis* (Moore) by Novel Insecticides at Korba District of Chhattisgarh, India

Y. K. Meshram*, P. K. Bhagat and Payal Devi

College of Agriculture and Research Station, Janjgir Champa Chhattisgarh-495668, India
**Corresponding author*

A B S T R A C T

Management of prevalence of natural enemy, *E. amabilis* (Moore) was studied during year 2014-15 and 2015-16 at Korba District of Chhattisgarh. Overall impact of insecticidal application, emamectin benzoate @ 0.002 per cent was found very much effective in suppression the population of lac predator, *E. amabilis* (Moore) over control with minimum 1.11 and 0.88 insect/30 cm of lac stick at first spray 30 day after BLI and second spray 60 day after BLI, respectively and relatively suffer or less toxic for lac cultivation fallowed by indoxacarb @ 0.02 per cent, spinosad @ 0.02 per cent, indoxacarb @ 0.005 per cent, fipronil @ 0.005 per cent, fipronil @ 0.02 per cent, spinosad @ 0.005 per cent, spinosad @ 0.0025 per cent, fipronil @ 0.0025 per cent growers practice ethofenprox @ 0.02 per cent and indoxacarb @ 0.003 per cent accept fipronil 0.02 per cent.

Keywords

Natural enemy, *E. amabilis* (Moore) and Emamectin benzoate

Introduction

Production and trade of lac in India dates back to the *Vedic* period as it finds a mention in the *Atharaveda* and *Mahabharat*. There are some findings that lac production and trade in China is almost 4000 years and developed along with silk (Singh, 2006). Lac is a natural, biodegradable, non-toxic, odourless, tasteless, hard resin and non-injurious to health. Lac is one of the most valuable gifts of nature and only resin of animal origin secreted by a tiny scale insect, *Kerria lacca* (Kerr.) belonging to the family Lacciferidae (Kerriidae), superfamily Coccoidea and order Hemiptera (Pal, 2009 and Mohanta *et al.*, 2012). Lac is an export oriented commodity, cultivated in the states of Jharkhand, Chhattisgarh, West Bengal, Madhya Pradesh, Odisha, Maharashtra, parts of Uttar Pradesh, Andhra Pradesh, Gujarat and NEH region. Majority of the tribal households of lac growing regions carry out lac cultivation as a subsidiary occupation to agriculture. Lac cultivation generates employment opportunities, particularly in the off agricultural season (Pal *et al.*, 2012). The better lac production depends on suitable host plant, cultivation techniques and management of bio-agent timely during cultivation. It has been estimated that on an average, up to 30-35% of the lac cells are destroyed by natural enemies of lac crop. At times, the enemy attack can be so serious as to result in crop failures. The lac insect is prone to attack by insect predators and parasitoids. Among them, two Lepidopteron predators, *Eublemma amabilis* Moore (Lepidoptera: Noctuidae) are key pests causing a loss of around 30-40% to lac

production (Glover, 1937, Narayanan, 1962, Jaiswal *et al.*, 2008). Chhattisgarh is of one the major lac cultivated area in India. It would be better to take precautions for management of lac insect fauna. Korba is the major lac cultivated area in Chhattisgarh. The total area of the district is 7, 14, 544 sqkms out of this 2, 83,457 sqkms area is under forests or notifies as 'forest' (chote/bade jhaadke jungle).So we need to have identified lac associated fauna and take precaution for management of lac insect fauna. Keeping this in viewmanagement of prevalence natural enemiey associated with lac insect *Kerria lacca* Kerr. was studied at Korba District of Chhattisgarh.

Materials and Methods

For the management of natural enemies of lac insect with insecticides which comparatively safer to lac insect was studied during year 2014-15 and 2015-16 at Korba District of Chhattisgarh.. Different concentrations of insecticides were applied on first and second instar larvae (30 and 60 days after BLI) of lac insect in both the years in *Rangeeni Baisakhi* (summer) season.

The experiment was laid in randomized block design (RBD) with twelve treatments including untreated control, replicated three times. The quantity of each insecticide was determined for a plant size. Before and after spraying of insecticides, sprayer and measuring cylinder was thoroughly washed with clean water. 10 days after spray the observations were recorded from each tree on number of live and dead cell to see the effect of insecticides on lac insect. At maturity the 30 cm length matured lac encrustation was recorded along with density of major predators to see the impact of spraying on lac insect and survival of lac insect and natural enemies.

Results and Discussion

Observation on *E. amabilis* Moore incidence was recorded from randomly selected 30 cm lac sticks of each treatment. The insecticidal treatments were applied two times, first at 30 days of brood lac inoculation (BLI) and second 60 days of brood lac inoculation (BLI). After first spray among the treatments, emamectin benzoate @ 0.002 per cent was recorded statistically significant over control with the minimum *E. amabilis* population 1.00 insect/30 cm of lac stick which was at par with indoxacarb @ 0.02 per cent, spinosad @ 0.02 per cent, fipronil @ 0.02 per cent, growers practice ethofenprox @ 0.02 per cent and fipronil @ 0.005 per cent with 1.33, 1.44, 1.66, 2.00 and 2.00 insect/30 cm of lac stick in 2014-15, respectively. The maximum population of *E. amabilis* was found under the untreated control i.e. 7.00 insect/30 cm of lac stick (Table 1).

Regarding per cent reduction of the population of *E. amabilis* in different doses of insecticides, it varied from 47.71 to 85.71 per cent over control. Among the treatment, emamectin benzoate @ 0.002 per cent was the best treatment with maximum reduction 85.71 per cent. Other treatments were superior as compared to control but less effective than best one during the year 2014-15.

Similarly, during 2015-16 emamectin benzoate @ 0.002 per cent was recorded statistically significant over control with the minimum *E. amabilis* population 1.22 insect/30 cm of lac stick which was at par with indoxacarb @ 0.02 per cent, spinosad @ 0.02 per cent, fipronil @ 0.02 per cent, growers practice ethofenprox @ 0.02 per cent, spinosad @ 0.005 per cent and fipronil @ 0.005 per cent with 1.33, 1.66, 2.00, 2.00, 2.33 and 2.33 insect/30 cm of lac stick,

respectively. The maximum population of *E. amabilis* was found under the untreated control i.e. 7.33 insect/30 cm of lac stick. The per cent reduction of the population of *E. amabilis* in different doses of insecticides, it varied from 45.43 to 83.36 per cent over control. Among the treatment, emamectin benzoate @ 0.002 per cent was the best treatment with maximum reduction 83.36 per cent. Other treatments were superior as compared to control but less effective than best one the year 2015-16.

On the basis of pooled mean, emamectin benzoate @ 0.002 per cent was found superior 1.11 insect/30 cm of lac stick as compared all of the treatments. The population of *E. amabilis* was varied from 1.11 to 7.16 insect/30 cm of lac stick. The per cent reduction of the population of *E. amabilis* in different doses of insecticides, it varied from 46.57 to 84.54 per cent over control. Among the treatment, emamectin benzoate @ 0.002 per cent was the best treatment with maximum reduction 84.54 per cent.

After second spray among the treatments, emamectin benzoate @ 0.002 per cent was recorded statistically significant over control with the minimum *E. amabilis* population 0.88 insect/30 cm of lac stick which was at par with indoxacarb @ 0.02 per cent, spinosad @ 0.02 per cent, fipronil @ 0.02 per cent, growers practice ethofenprox @ 0.02 per cent and fipronil @ 0.005 per cent with 0.89, 1.00, 1.00, 1.11 and 1.67 insect/30 cm of lac stick in 2014-15, respectively.

The maximum population of *E. amabilis* was found under the untreated control i.e. 7.66 insect/30 cm of lac stick. Regarding per cent reduction of the population of *E. amabilis*in different doses of insecticides, it varied from 56.53 to 88.51 per cent over control. Among the treatment, emamectin benzoate @ 0.002 per cent was the best treatment with maximum reduction 88.51 per cent. Other treatments were superior as compared to control but less effective than best one during the year 2014-15.

Similarly, during 2015-16 emamectin benzoate @ 0.002 per cent was recorded statistically significant over control with the minimum *E. amabilis* population 0.88 insect/30 cm of lac stick which was at par with indoxacarb @ 0.02 per cent, spinosad @ 0.02 per cent, fipronil @ 0.02 per cent, growers practice ethofenprox @ 0.02 per cent, spinosad @ 0.005 per cent and fipronil @ 0.005 per cent with 0.99, 1.00, 1.22, 1.66, 2.00 and 2.00 insect/30 cm of lac stick, respectively. The maximum population of *E. amabilis* was found under the untreated control i.e. 8.00 insect/30 cm of lac stick.

The per cent reduction of the population of *E. amabilis* in different doses of insecticides, it varied from 58.38 to 89.00 per cent over control. Among the treatment, emamectin benzoate @ 0.002 per cent was the best treatment with maximum reduction 89.00 per cent. Other treatments were superior as compared to control but less effective than best one the year 2015-16.

On the basis of pooled mean, emamectin benzoate @ 0.002 per cent was found superior 0.88 insect/30 cm of lac stick as compared all of the treatments. The population of *E. amabilis* was varied from 0.88 to 7.83 insect/30 cm of lac stick.

The per cent reduction of the population of *E. amabilis* in different doses of insecticides, it varied from 57.46 to 88.76 per cent over control. Among the treatment, emamectin benzoate @ 0.002 per cent was the best treatment with maximum reduction 88.76 per cent.

Table.1 Bio-efficacy of insecticide for the management of *Eublema amabilis* as major predator of lac during year 2014-15 and 2015-16

SN.	Insecticide	Dose	First spray (Number of insect /30 cm lac sticks) 30 DABLI			Reduction %		Pooled	Second spray (Number of insect /30 cm lac sticks) 60 DABLI			Reduction %		Pooled
			2014-15	2015-16	Pooled	2014-15	2015-16		2014-15	2015-16	Pooled	2014-15	2015-16	
1	Indoxacarb (14.5% SC)	0.003%	3.66 (2.14)	4.00 (2.22)	3.83 (2.18)	47.71	45.43	46.57	3.33 (2.07)	3.33 (2.06)	3.33 (2.07)	56.53	58.38	57.46
2	Indoxacarb (14.5% SC)	0.005%	3.33 (2.07)	3.00 (1.98)	3.17 (2.02)	52.43	59.07	55.75	3.00 (1.98)	2.66 (1.91)	2.83 (1.95)	60.84	66.75	63.80
3	Indoxacarb (14.5% SC)	0.020%	1.33 (1.51)	1.33 (1.52)	1.33 (1.51)	81.00	81.86	81.43	0.89 (1.37)	0.99 (1.40)	0.94 (1.39)	88.38	87.63	88.01
4	Spinosad (2.5%SC)	0.0025%	3.00 (1.98)	3.67 (2.15)	3.33 (2.06)	57.14	49.93	53.54	2.66 (1.90)	3.00 (1.98)	2.83 (1.95)	65.27	62.50	63.89
5	Spinosad (2.5%SC)	0.005%	2.33 (1.81)	2.33 (1.80)	2.33 (1.80)	66.71	68.21	67.46	2.00 (1.71)	2.00 (1.71)	2.00 (1.72)	73.89	75.00	74.45
6	Spinosad (2.5%SC)	0.020%	1.44 (1.56)	1.66 (1.61)	1.55 (1.58)	79.43	77.35	78.39	1.00 (1.41)	1.00 (1.39)	1.00 (1.41)	86.95	87.50	87.23
7	Fipronil (5% SC)	0.0025%	2.55 (1.87)	3.33 (2.07)	2.94 (1.97)	63.57	54.57	59.07	2.33 (1.82)	2.66 (1.91)	2.50 (1.87)	69.58	66.75	68.17
8	Fipronil (5% SC)	0.005%	2.00 (1.72)	2.33 (1.81)	2.16 (1.76)	71.43	68.21	69.82	1.67 (1.62)	2.00 (1.71)	1.83 (1.67)	78.20	75.00	76.60
9	Fipronil (5% SC)	0.020%	1.66 (1.63)	2.00 (1.72)	1.83 (1.67)	76.29	72.71	74.50	1.00 (1.41)	1.22 (1.47)	1.11 (1.45)	86.95	84.75	85.85
10	Emamectin benzoate (5 SG)	0.002%	1.00 (1.39)	1.22 (1.48)	1.11 (1.43)	85.71	83.36	84.54	0.88 (1.36)	0.88 (1.36)	0.88 (1.37)	88.51	89.00	88.76
11	Growers practice (Ethofenprox 10% EC)	0.020%	2.00 (1.71)	2.00 (1.71)	2.00 (1.71)	71.43	72.71	72.07	1.11 (1.43)	1.66 (1.63)	1.39 (1.53)	85.51	79.25	82.38
12	Untreated control	Water	7.00 (2.81)	7.33 (2.88)	7.16 (2.84)	0.00	0.00	0.00	7.66 (2.94)	8.00 (2.99)	7.83 2.97)	0.00	0.00	0.00
SEm±			**0.13**	**0.13**					**0.10**	**0.13**				
CD (P= 0.005)			**0.39**	**0.38**					**0.31**	**0.39**				

Note: Figures in parentheses are root square transformed value, DABLI= Day after brood lac inoculation.

On the basis of overall impact of insecticidal application, emamectin benzoate @ 0.002 per cent was found very much effective in suppression the population of lac predators viz. *E. amabilis* (Moore) and *Pseudohypatopa puverea* (Mayrick) and parasitoid, *Tachardiaephagous tachardiae* (How) and relatively suffer or less toxic for lac cultivation fallowed by indoxacarb @ 0.02 per cent, spinosad @ 0.02 per cent, fipronil @ 0.02 per cent, indoxacarb @ 0.005 per cent, fipronil @ 0.005 per cent, spinosad @ 0.005 per cent, spinosad @ 0.0025 per cent, fipronil @ 0.0025 per cent growers practice ethofenprox @ 0.02 per cent and indoxacarb @ 0.003 per cent. There were number of published document found regarding the effectiveness of emamectin benzoate, indoxacarb, spinosad and fipronil against harmful biotic fauna associated with lac insect in *rangeeni* strain.

The present study evidenced by Jaiswal *et al.*, (2017) evaluated the safety of emamectin benzoate against lac insect *K. lacca* Kerr and bioefficacy against associated lepidopteran predators in lac culture. Seven concentrations of emamectin benzoate (5% SG) ranging from 0.00025 % *a.i.* (0.05 g/L) to 0.0030 % *a.i.* (0.6 g/L) were evaluated by dipping of brood lac (functional seed of lac culture) in insecticidal formulation for 5, 10 and 15 min durations. Various treatments and control on survival of settled second instar larvae and adult female lac insect clearly indicated the safety of insecticide on lac insect. Treatment of brood lac in insecticidal formulations (0.00025, 0.0005, 0.0010, 0.0015, 0.0020, 0.0025 and 0.0030 % *a.i.*) for 5, 10 and 15 min durations exerted significant reduction in the population of both key lepidopteran predators, *E. amabilis* Moore and *P.pulverea* Meyr harboring brood lac. The treatment of *rangeeni* brood lac with 0.00025 % a.i. emamectin benzoate for 10-15 min and *kusmi* brood lac with 0.0005 % a.i. for 5-10 min duration provides effective tool for the management of both major lepidopteran predators of lac insects. This novel insecticide can be safely and effectively integrated in IPM programme of lac production system.

Acknowledgement

The first author expresses his heartfelt gratitude to Dr. (Smt) J. L. Ganguli, Associate Professor, College of Agriculture, IGKV, Raipur, (C.G.) for his full support, constant enthusiasm and motivation. A special thanks to Bhupeshjoshi, Ph.D. scholar, Department of Entomology for giving me help during thesis writing.

References

Glover, P. M. 1937. Entomological aspects of lac research in India, p 261-266

Jaiswal, A.K., Bhattacharya, Kumar, A.S. and Singh, J.P. 2008. Evaluation of *Bacillus Thuringiensis* Berliner subsp. Kurstaki for management of lepidopteron pests of lac insect. *Entomon*, Vol. 33, pp: 1-5.

Jaiswal. A.K., Singh, J.P. and Patamajhi, P. 2017. Emamectin benzoate Anovel second generation avermectin derivetives for management of biotic stress in lac culture through treatment of broodlac. Indian Journal of Agricultural Sciences, 87 (9): 1190-1195.

Mohanta, J., Dey, D.G. and Mohanty, N. 2012. Performance of lac insect, Kerrialacca Kerr in conventional and non-conventional cultivation around Similipal Biosphare Reserve, Odisa, India, *Bioscan*, 7:237-240.

Naraynan, E.S. 1962. Pest of lac in India. In: Mukhopadhyay, B., Muthana, M.S. (Eds.). A monograph on lac. *Indian*

Lac Research Institute, Ranchi, India. PP: 90-113.

Pal Govind, Jaiswal, A.K., Bhattacharya, A. and Yogi, R. K. 2012. Lac Statistics at a glance, *Indian Institute of Natural Resin and Gum* (Formerly Indian Lac Research Institute, Ranchi Jharkhand, p-26.

Pal, G. 2009. Impact of scientific lac cultivation training on lac economy: A study in Jharkhand. *Agric. Econ. Res. Rev*., 22: 139-143.

Singh R. 2006. Applied Zoology lac culture. *Department of Zoology* Udi Pratap Autonomus Collage Varanasi, pp 2.