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Bio efficacy of insecticide molecules against lac insect (*Kerria lacca*) Predator *Eublemma amabilis* Moore

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Abstract
Bio efficacy of different doses of Emamectin benzoate (0.001, 0.002 and 0.003 per cent), Indoxacarb (0.001, 0.002 and 0.003 per cent) and Rynaxypyr (0.001, 0.002 and 0.003 per cent) were evaluated by dipping of brood lac in different insecticidal formulations for 5, 10 and 15 minute time period against the predator of lac insect *Eublemma amabilis* in aghani lac crop in host plant *Flemingia semialata* at DKS CARS, Bhatapara, Chhattisgarh during 2019. Overall impact of different doses of insecticides, Emamectin benzoate @ 0.003 per cent at 15 minute time period was found very much effective in suppression the population of lac insect predator *Eublemma amabilis* Moore over control with minimum 0.66 numbers insect per 30 cm lac stick with 92.07 per cent reduction. Treatment of broodlac in insecticidal formulations for 5, 10 and 15 min durations exerted significant reduction in the population of lepidopteron predators, *Eublemma amabilis* Moore (Noctuidae).

Keywords: *Eublemma amabilis* Moore, Emamectin benzoate, Indoxacarb, Rynaxypyr

Introduction
Lac is hard resinous, non toxic, tasteless, biodegradable substance which is secreted by resin gland of lac insect, *Kerria lacca* (Kerr), which comes under order- Hemiptera, suborder– Homoptera, super family- Coccoidea and family-Tachardiidae.
Two strains of lac insect are Rangeeni and Kusmi. The crop cycle of kusmi lac insect is January-February to June-July (summer) and June-July to January-February (winter), known as jethwi and aghani crop, respectively (Singh *et al*., 2018) [6].
Indigenous host plant for lac insect are Kusum (*Schleichera oleosa* Oken), Palas (*Butea monosperma* Taub) and Ber (*Ziziphus mauritiana* Lam) etc. These plant species take long time for establishment whereas bushy host plant *Flemingia semialata* Roxb. (Family: Fabaceae) found to be more suitable than other tree species and it can be utilized for lac cultivation after one year of planting.
Major two factors which are responsible for reduction in yield of lac crop *viz*: Biotic and abiotic factors. Biotic factor includes Predators and Parasitoids while abiotic factor includes weather factors. Predators are main factor that affect lac cultivation. Among major predators of lac insect *Eublemma amabilis* cause 35 to 40 percent loss to the lac crop. (Glover, 1937) [1].

Materials and Methods
Field experimentation was carried out at Rajadhar industrial farm, DauKalyan Singh Collage of Agriculture and Research Station, Bhatapara, Chhattisgarh during 2019. This site is located at 21˚ 7 N latitude and 81˚ 93 E longitude and is at an elevation of 261 m above mean sea level (MSL).The harvested broodlac was treated by dipping in different insecticidal formulations for 5,10 and 15 minute time period and the kusmi broodlac were inoculated in *Flemingia semialata* plant during July.
The different doses insecticides Emamectin Benzoate 5% SG @ (0.001, 0.002% and 0.003%), Indoxacarb 14.7% SC @ (0.001, 0.002% and 0.003%) and Rynaxypyr 20% SC @ (0.001, 0.002 and 0.003% a.i. equivalent to a quantity ranging from 0.2 to 0.15 g or ml/L with check insecticide Ethefenprox 10% EC @ 0.02% as check and water as control.
The bio-efficacy potential was assessed on the basis of reduction in population of insect predator *Eublemma amabilis* from treated broodlac. There were 11 treatments including check and control with three replications for kusmi. Randomly selected broodlac weighing 25 g each bundle was treated and assessed for safety on lac insect as reported by Jaiswal *et al* (2017) [5]. The bags containing kusmi broodlac were inoculated on plants of *Flemingia semialata* plant.

The quantification of living and dead lac insect was carried out 30 days after inoculation (DAI) The 60 mesh net bags used as broodlac container were removed from host plant and it was keep it in the laboratory under well aerated condition. These bags were opened after two months of treatment and number of adult lepidopteron predator emerged from treated broodlac were quantified. Per cent reduction in emergence over control was calculated for each treatment toassess the bio- efficacy potential of different insecticide on predator (*Eublemma amabilis*) of lac insect. Statistical analysis was carried out using standard analysis of variance (ANOVA) in randomized block design. Treatment means were compared at $p < 0.05$ level of significance.

Results and Discussion

Bio efficacy of different doses of Emamectin benzoate (0.001.0.002 and .003 per cent) Indoxacarb (0.001, 0.002 and 0.003 per cent) and Rynaxypyr (0.001, 0.002 and 0.003 per cent) were exposed in brood lac dipping method @ 5, 10 and 15 minute against the predator/parasitoid of aghani lac crop in host plant *Flemingia semialata* during the present investigation.

The kusmi strain broodlac was treated for 5 minute time period and inoculated in semialata plant there after incidence of *Eublemma amabilis* was recorded which are presented in table 4.1. Found that all concentrations of insecticides were effective against the *Eublemma amabili*s as compared to the check insecticide Ethefenprox.

In the entire treatments minimum *Eublemma amabilis* incidence was noticed in Emamectin benzoate @ 0.003 per cent having 1.33 mean populations during the aghani crop 2018. It showed significance from the remainder of the doses of insecticides but found at par with Emamectin benzoate @0.002 percent which received mean number of 1.66 with 77.35 per cent reduction. Other treatments were less effective but discovered superior as compared to control. Population Reduction of *Eublemma amabilis* was noticed in Emamectin benzoate @ 0.003 per cent at tune of 81.85 per cent over control. Other doses of insecticides showed less effective with the population varied from 2.00 to 3.33 as compared to control which was noticed mean *Eublemma amabilis* population of 7.33 numbers and percent reduction over control with tune of range between 45.42 to 72.71 per cent. Check insecticide Ethefenprox treated broodlac showed at par with Emamectin benzoate @ 0.001 per cent, Indoxacarb @ 0.002 per cent and Rynaxypyr @ 0.003 per cent

Broodlac treated for 10 minute time period and inoculated in semialata plant after that *Eublemma amabilis* incidence was recorded. All concentrations of insecticides were found effective against the *Eublemma amabilis* as compared to the control.

Minimum *Eublemma amabilis* incidence was noticed in Emamectin benzoate @ 0.003 per cent having minimum population of 1.00 during the aghani crop 2018 and differed significantly from the rest of the doses of insecticides but it was found at par with Emamectin benzoate @0.002 per cent which received mean number of 1.33 with reduction percent of 82.63 during the crop period. Other treatments were least effective but found superior as compared to control. Reduction of population of *Eublemma amabilis* was noticed the tune of 86.94 percent in Emamectin benzoate @ 0.003 percent over control. Rest of the insecticides showed least effective with the population varied from 2.00 to 3.33 as compared to control which was recorded mean *Eublemma amabilis* population of 7.66 numbers and percent reduction over control with tune of range between 56.52 to 73.89 percent. Then broodlac was treated for 15 minute time period and inoculated in semialata plant there after incidence of *Eublemma amabilis* was recorded during aghani crop 2018 and found that all concentrations of insecticides were quite effective against the predators as compared to the untreated crop.

In all the treatments minimum *Eublemma amabilis* incidence 0.66 was noticed in Emamectin benzoate @ 0.003 per cent during the aghani crop 2018. Thus showed its significance from the rest of the doses of insecticides but it was found at par with Emamectin benzoate @0.002 per cent which received mean number of 1.00 during with reduction percent 87.09 during the crop period. Other treatments were less effective but found superior as compared to control. Reduction of population of *Eublemma amabilis* was noticed the tune of 92.07 per cent in Emamectin benzoate @ 0.003 percent over control. Rest of the insecticides showed least effective with the population varied from 1.33 to 2.66 as compared to control which was recorded mean *Eublemma amabilis* population of numbers 8.33 and per cent reduction over control with tune of range between 63.98 to 84.03 per cent. Check insecticide Ethefenprox exhibited 68.21 per cent population of among the treatments the best group for reducing the incidence of *Eublemma amabilis* was found to be Emamectin benzoate @0.003 per cent and Emamectin benzoate @ 0.002 per cent which was reduced over control with tune of 87.99 and 92.07 per cent respectively. Thus showed its significance from the rest of the insecticides which received reduction percent tune varied from 63.98 to 84.0.

Present investigation agreed with the finding of Jaiswal *et al*., (2017) [5] that Emamectin benzoate 0.003 was best insecticide at 15 minute time period with reduction per cent of 92 .7 for the management of lac insect *Kerria lacca* predator *Eublemma amabilis* as compared to control.

Table 1: Effect of different concentration of insecticides by brood lac dipping method on lac insect predator *Eublema amabilis*

			Population of *Eublemma amabilis* at					
Treatments	**Insecticide**	**Conc.**	**5 minute dipping**	**% Reduction over control**	**10 minute dipping**	**% Reduction over control**	**15 minutes dipping**	**0/0 Reduction over control**
T1	Emamectin benzoate 5% SG	0.001%	2.33(1 48)	68.21	2.00(1.82)	73.89	1.33(1.71)	84.03
T2	Emamectin benzoate 5% SG	0.002%	1.66(1.55)	77.35	1.33(1.65)	82.63	1.00(1.62)	87.99
T3	Emamectin benzoate 5% SG	0.003%	1.33(1.69)	81.85	1.00(1.27)	86.94	0.66(1.45)	92.07
T4	Indoxacarb 14.7% SC	0.001%	3.33(1.27)	54.57	2.33(1.23)	69.58	2.66(1 55)	68.06
T5	Indoxacarb 14.7% SC	0.002%	2.33(2.07)	68.21	2.00(1.82)	73.89	1.66(1.91)	80.07
T6	Indoxacarb 14.7% SC	0.003%	2.00(1.74)	72.71	2.00(1.76)	73.89	1.33(1.68)	84.03
T7	Rynaxypyr 20.0% SC	0.001%	4.00(1.71)	45.42	3.33(1.82)	56.52	3.00(1.45)	63.98
T8	Rynaxypyr 20.0% SC	0.002%	3.66(1.82)	50.06	3.33(1.76)	56.52	2.66(1.55)	68.06
T9	Rynaxypyr 20.0% SC	0.003%	2.33(2.15)	68.21	2.33(2.07)	69.58	2.00(1.90)	75.99
T10	Ethefenprox	0.20%	2.33(2.13)	68.21	2.00(2.25)	73.89	1.66(2.05)	80.071
T11	Control	-	7.33(1.82)	0.00	7.66(1.98)	0.00	8.33(2.02)	0.00
	CD		0.30		0.29		0.41	
	CV		12.89		9.42		11.05	
	S.Em±		0.10		0.10		0.14	

Conclusion

Bio efficacy of different doses of Emamectin benzoate (0.001.0.002 and .003 per cent) Indoxacarb (0.001, 0.002 and 0.003 per cent) and Rynaxypyr (0.001, 0.002 and 0.003 per cent) were exposed in brood lac dipping method @ 5, 10 and 15 minute against the predator/parasitoid of aghani lac crop in host plant *Flemingia semialata* during the present investigation. In all the treatments minimum *Eublemma amabilis* incidence 0.66 was noticed in Emamectin benzoate @ 0.003 per cent during the aghani crop 2018. Thus showed its significance from the rest of the doses of insecticides but it was found at par with Emamectin benzoate @0.002 per cent which received mean number of 1.00 during with reduction percent 87.09 during the crop period. Other treatments were less effective but found superior as compared to control. Reduction of population of *Eublemma amabilis* was noticed the tune of 92.07 per cent in Emamectin benzoate @ 0.003 percent over control. Rest of the insecticides showed least effective with the population varied from 1.33 to 2.66 as compared to control which was recorded mean *Eublemma amabilis* population of numbers 8.33 and per cent reduction over control with tune of range between 63.98 to 84.03 per cent. Check insecticide Ethefenprox exhibited 68.21 per cent population of among the treatments the best group for reducing the incidence of *Eublemma amabilis* was found to be Emamectin benzoate @0.003 per cent and Emamectin benzoate @ 0.002 per cent which was reduced over control with tune of 87.99 and 92.07 per cent respectively. Thus showed its significance from the rest of the insecticides which received reduction percent tune varied from 63.98 to 84.0.

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