Indian J. Appl. Ent. **33**(1) : 43–46 (2019)

SURVEY FOR THE OCCURRENCE OF NATURAL ENEMIES OF LAC INSECT, *KERRIA LACCA* (KERR) IN SOUTHERN RAJASTHAN

VIKRAM*, LEKHA, HEMANT SWAMI AND H. K. JAIN

Department of Entomology, RCA, MPUAT, Udaipur
*Corresponding author E-mail: vikramkumawat305@gmail.com

ABSTRACT

Investigation on "survey for the occurrence of natural enemies of lac insect *Kerria lacca* (Kerr) in southern Rajasthan" was carried out in the Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur, during 2018 under Network Project on Conservation of lac Insect Genetic Resources (NP-CLIGR) with a view to record fauna associated with lac insect in the seven districts of Southern Rajasthan. Fauna associated with lac insect represented by *Eublemma amabilis*, *Pseudohytopa pulverea*, *Chrysopa sp*; primary parasitoid belonging to families Encyrtidae, Eulophidae and Hyper parasitoid belonging to family Braconidae. The maximum natural enemies were recorded from family Encyrtidae. Predator *E. amabilis* had maximum mean relative density among all predators, whereas, parasitoids belonging to family Encyrtidae was established parasitoid among all. Maximum total mean number of individual of natural enemies per meter of stick lac emerged from the samples collected from Banswara district whereas minimum individuals of natural enemies emerged from the samples collected from Chittorgarh district Predators, *E. amabilis* and *P. pulverea* emerged till the sixth week of sample storage whereas *Chrysopa sp.* was recorded only during second and third week. Primary parasitoids were recorded to emerge from the samples till the fourth week of the storage.

Keywords: Natural enemies, Fauna, Predator, Parasitoid

INTRODUCTION

Lac insect *Kerria lacca* (Kerr) is a minute scale insect (Tachardiidae (Kerriidae) :Hemiptera) it secrets a resin known as "Lac" which is considered as one of the most valued gift of natural world. Lac insect flourish on more than 400 plant species generally growing naturally in the forests which have been reported by various workers Kapur (1954). Its life cycle begins with the crawlers which are a I instar larval stage, this stage after finding a suitable tender parts, settles down by piercing its proboscis into phloem of shoot of the host and nourish on sap of plants and secretes a resinous material (lac) over the body. India is the major producer of lac, contributing more than 5 per cent of the total world production from this about 70 per cent of the national lac production is exported to foreign countries; export of lac and its value added products in 2015-2016 is 272462.21 tons (IINRG Statistics, 2016-17). Jharkhand, Chhattisgarh, Madhya Pradesh, Maharashtra and West Bengal are the major lac producing states, which contribute around 96 per cent to the total national lac production. Lac production is limited because of environmental factors *viz*., biotic (predators and parasitoids) and abiotic (adverse climatic factors) causing hinderance in lac production. *Eublemma amabilis* Moore (Noctuidae; Lepidoptera), *Psuedohypatopa pulverea* Meyr (Blastobesidae; Lepidoptera), *Chrysopa lacciperda* Kimmins and *Chrysopa madestes* Banks (Chrysopidae; Neuroptera) are the major predators of regular occurrence causing severe losses to lac production (Sharma *et al*., 2006).

MATERIALS AND METHODS

The studies on the occurrence of the natural enemies of lac insect were carried out by conducting a detailed survey in Seven district *viz*., Banswara, Bhilwara, Chittor, Dungarpur, Rajsamand, Pratapgarh and Udaipur of Southern Rajasthan during maturity season June- July 2018. The various natural hosts were surveyed for the occurrence of lac insect and the prevailing population of lac insect on these hosts. The random samples of different host bearing natural lac populations were collected from different locations of each of the seven districts. The lac bearing twigs of 10 cm length were collected from various locations of the region and these samples were kept in 60-mesh nylon net

bags for the emergence of natural enemies. The wet cotton swab was tied on both ends of twigs in Lac Laboratory to maintain the turbidity of samples and for maintaining the lac insects. The mouth of these bags were tied and kept under room temperature for the emergence of natural enemies from the samples. The nylon bags containing samples of different locations of seven districts were kept separately, district wise and were observed at regular intervals for the emergence of natural enemies. The observation on the population of natural enemies both predators and parasitoid were recorded from the initiation and upto completion of emergence.

Observations:

The emerged population of predators and parasitoids were separated and counted. The emerged natural enemies were identified with the help of "Lac insect and associated fauna: A practical Manual" by Mohanasundaram *et al.,* 2016 and proper record of natural enemies population was maintained.

Table 1. Lac associated fauna emerged from the collected and stored samples from Southern Rajasthan during 2018

S.No.	Trophic level states	Fauna	Order	Family
1	Predators	*Eublemma amabilis* Moore	Lepidoptera	Noctuidae
	Pseudohypatopa pulverea Meyr.		Lepidoptera	Blastobasidae
	Chrysopa sp		Neuroptera	Chrysopidae
2	Primary parasitoid	-	Hymenoptera	Eulophidae
			Encyrtidae	
3	Hyperparasitoid	-	Hymenoptera	Braconidae

Table 2. Numerical abundance of fauna associated with lac insect in southern Rajasthan during 2018.

Entomophagystates	Trophic level states						Total
	Predators (Mean/m lac stick)			Primary parasittoids (Mean/m lac stick)		Hyperparasitoid (Mean/m lac stick)	
Location	Eublemma amabilis	Peudohyp-atopa pulverea	Chrysopasp	Eulop-hidae	Encyr-tidae	Braco-nidae	
Banswara	5.00 (4.31)	1.33 (1.15)	–	38.33 (33.05)	70.00 (60.35)	1.33 (1.15)	115.99
Bhilwara	4.33 (3.88)	1.66 (1.49)	–	43.00 (38.51)	61.66 (55.22)	1.00 (0.90)	111.65
Chittargarh	5.66 (7.68)	1.00 (1.36)	1.00 (1.36)	21.00 (28.51)	45.00 (61.09)	0.00 (0.00)	73.66
Dungarpur	6.60 (6.54)	1.00 (0.99)	–	36.66 (36.33)	56.66 (56.14)	0.00 (0.00)	100.92
Pratapgarh	11.66 (11.86)	3.66 (3.72)	–	24.33 (24.75)	57.00 (57.98)	1.66 (1.69)	98.31
Rajsamand	6.60 (8.36)	2.00 (2.53)	–	30.00 (38.01)	40.33 (51.10)	0.00 (0.00)	78.93
Udaipur	7.00 (7.55)	4.00 (4.32)	1.66 (1.79)	24.00 (25.90)	55.00 (59.36)	1.00 (1.08)	92.66
Total	46.85 (6.97)	14.65 (2.18)	2.66 (0.40)	217.32 (32.33)	385.65 (57.38)	4.99 (0.74)	672.12

Figures in the parentheses represent Relative Density of total population.

The following mathematical analyses were adopted for estimating the species richness and abundance:

(i) Mean density:

$$\text{Mean density} = \frac{\sum Xi}{N}$$

Where,

Xi = No. of insects or natural enemies in i^{th} sample

N = Total No. of plants sampled (No of locations)

(ii) Relative density:

$$\text{Relative density (RD \%)} = \frac{\text{Number of individual of one species}}{\text{Total number of individual of all species}} \times 100$$

(iii) Shannon-Weiner diversity index (H'):

Shannon-Weiner diversity index (H') = - $\sum$ p*i ln pi*; where, p*i* = the decimal fraction of individuals belonging to i^{th} species.

RESULTS AND DISCUSSION

To record the lac associated fauna on the natural population of lac insect on the prevailing hosts in the seven districts of Southern Rajasthan *viz*., Banswara, Bhilwara, Chittor, Dungarpur, Rajsamand, Pratapgarh and Udaipur a survey was conducted during the month of June- July 2018.

The results of the studies clearly showed the existence of three species of predators *i.e.*, *Eublemma amabilis* (Noctudae; Lepidoptera), *Pseudohytopa pulverea* (Blastobisidae; Lepidoptera) and *Chrysopa sp*.(Chrysopidae; Neuroptera) with the natural populations of lac insect in the region. Primary parasitoid and hyper parasitoid belonging to three families *viz*; Encyrtidae, and Eulopidae and Braconidae of order Hymenoptera were also recorded from seven districts of Southern Rajasthan. The findings of the present investigation are also supported with the findings of Sah and Gupta (1983), Chiu *et al*. (1985).

Further, the present results are in full agreement with the findings of Meena *and Sharma* (2018) who recorded three families of predator species representing *E. amabilis* (Noctuidae; Lepidoptera), *P. pulverea* (Blastobasidae; Lepidoptera) and *C. zastrowi* (Chrysopidae; Neuroptera); two families of primary parasitoids *A. purpureus* (Eulophidae: Hymenoptera), *T. tachardiae, T. clavicornis* and *E. dewitzi* (Encyrtidae: Hymenoptera) and three families of hyper parasitoids representing *Apanteles fakhrulhajiae, B. greeni* (Braconidae; Hymenoptera), *E. tachardiae* (Eupelmidae; Hymenoptera) and *B. tachardiae* (Chalcididae; Hymenoptera) from western plains of India.

Numerical abundance of fauna associated with lac insect, *Kerria lacca* (Kerr) during *Katki* season 2018 from Southern Rajasthan

The studies on numerical abundance of fauna associated with lac insect, *Kerria lacca* during *Katki* season (2018), revealed that among three predators *viz; E. amabilis*, *P. pulverea, Chrysopa sp*. recorded in the seven district of Southern Rajasthan, the population of *E. amabilis* was recorded maximum in all the seven districts *viz*; Banswara, Bhilwara, Chittor, Dungarpur, Rajsamand, Pratapgarh and Udaipur with total relative density 6.97, whereas the populations of *P. pulverea* and *Chrysopa spp* exhibited the total relative density of 2.18 and 0.40 respectively. The numerical abundance of primary parasitoid shows that individual of Encyrtidae, and Eulophidae exhibited relative density of 57.38 and 32.33 individuals in seven district of Southern Rajasthan. However small population of hyper parasitoid belonging to family Braconidae was also record in the sample collected from the region. The present study also revealed that highest number of genera as well as species belong to family Encyrtidae, followed by Braconidae, Eupelmidae, Chalcididae, Noctuidae, Blastobasidae, Chrysopidae, and Eulophidae in descending order.The results of this study are in full agreement with the findings of Meena and Sharma (2018) who recorded that maximum number of genera as well as species represented the family Encyrtidae (27.27 %), Braconidae (18.18 %) and 9.09 per cent each to Eupelmidae, Chalcididae, Noctuidae, Blastobasidae, Chrysopidae and Eulophidae. Whereas, *A. purpureus*and *T. tachardiae*

Table 3. Relative abundance of natural enemies associated with lac insect during 2018

Natural enemies	Seasonal Mean	Mean Density	Relative Density (%)
Eublemma amabilbis	6.69	0.14	6.90
Peudohypatopa pulverea	2.09	0.04	2.16
Chrysopa sp	1.33	0.03	1.37
Eulophidae	31.05	0.63	32.02
Encyrtidae	55.09	1.12	56.81
Braconidae	0.71	0.01	0.74
Shannon Index (H')	0.95		

were reported as the most abundant parasitoid constituting 55.82 per cent and 28.37 per cent, respectively of the total population of parasitoids by Sharma *et al*. (1997) observed that *A. purpureus* alone caused 7.8 and 11.8 per cent parasitization, respectively. Sah and Das Gupta, 1983: Sah, 1988 who found *A. tachardiae* and *A. fakhrulhajiae* most abundant in M.P. *E. dewitzi* was found most dominant as compared to all fauna associated with *K. lacca* (Kerr).

The relative abundance of natural enemies associated with lac insect during *Katki* season, 2018 showed that predators (*Eublemma sp.*, *Pseudohypatopa sp*. and *Chrysopasp*) represents 10.42 per cent, primary parasitoids (Encyrtidae and Eulophidae) represents 88.83 per cent and hyper parasitoids (Braconidae) represents 0.74 per cent relative density of the recorded fauna associated with the natural population of lac insect during *Katki*, 2018. Whereas, Sharma *et al*, (2008) recorded 68.0, 29.60 and 2.40 per cent emerged population of predators, primary parasitoids and hyper parasitoids, respectively.

REFERENCES

Chiu, S., Chou, L. and Chou, K. 1985. Sourvey of the natural enemies of the lac insect, *Kerrialacca*, in Taiwan. *Biological Control of Crop Pests in Taiwan*, **1**:9-11.

Kapur, A. P. 1954. Some unrecorded hosts plants of the lac insect, Lacciferlacca (Kerr), (Homoptera: Lacciferidae). *Journal of Bombay Natural History Society,***52**: 645-647.

IINRG *Statistics Annual Report for the year 2016-17*, Indian Institute of Natural Resins and Gums, Namkum, Ranchi. 92.

Meena, S.C and Sharma, K.K 2018. Species composition and richness of entomo-fauna associated with lac insect, *Kerrialacca* Kerr in western plains of India. *Journal of Entomology and Zoology Studies*, **6**: 684-690.

Mohanasundaram, A., Monobrullah, Md., Sharma, K.K. and Meena, S.C. 2016. Lac insect and associated fauna – A Practical Manual. ICAR Indian Institute of National Resins and Gums, Ranchi (Jharkhand). 01-42pp.

Sah, B.N. and Das Gupta, J.M. 1983. Ecological studies taken up at Dharamjaigharh (M.P). In: Annual report. Indian lac Research Institute, Ranchi, 8-12.

Sah, B.N.1988. Ecological studies taken up at Dharamjaigharh (M.P.): In: *Annual report*. Indian lac Research Institute, Ranchi, 8-12.

Sharma, K.K., Jaiswal, A.K., Bhattacharya, A., Mishra, Y.D. and Sushil, S.N. 1997. Emergence profile and relative abundance of parasitoids associated with Indian lac insect, *Kerrialacca* (Kerr.). *Indian Journal of Ecology*, **24**: 17-22.

Sharma, K.K., Monobrullah, Md., Singh, J.P. and Ramani, R. 2006. Pre-summer mortality in *rangeeni* lac-insects. *ICAR News,* **16**: 1-16.

Received: 28.03.2019 Accepted: 06.06.2019