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Survey record of lac insect *Kerria lacca* and its host plants in western plains of India

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Lac, a natural resin, is produced by lac insects mainly *Kerria lacca* (Kerr) belonging to family Tachardiidae (Homoptera). So far, nine genera and 99 species of lac insects reported from all over the world; whereas, 2 genera and 26 species are found in our country (Sharma and Ramani 1999, Ahmad *et al.* 2013). Potential of all lac insect species remains to be unexploited. Lac insects survive on more than 400 plant species (Kapur A 1954, Varshney and Teotia 1967, Sharma *et al*. 1997). Present study carried out with intent to record the lac insect occurrence and also to record the new or potential host plants. Host plants/lac insects recorded from this region will help to promote lac culture in other areas as well as bio-diversity of lac insect species will also remain conserved and maintained. Keeping in view above, present study was planned.

The investigations were carried out in the western plain of India during June-July and October-November of 2015 and 2016. Surveys were carried out in Gujarat, Haryana and Rajasthan under one of the co-operating centers (MPUAT, Udaipur) of ICAR funded Network Project on Conservation of Lac Insect Genetic Resources (implemented and executed by ICAR-IINRG, Ranchi). Lac insects were collected and maintained in the Lac Insect Field Gene Bank at Rajasthan College of Agriculture, Udaipur. Host plants collected were identified and confirmed from ICAR-INRG Ranchi. Relative abundance of hosts worked out.

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

Data collected on lac insects and its host plants revealed the lac insect occurrence in 47 locations during 2015 (Table 1) and 33 locations during 2016 (Table 2). Further analysis of the data revealed a total of 21 host plants under 14 genera from 6 families (Table 3). Of these, family Mimosaceae comprised highest number of species. During both the years *F. religiosa* was the most abundant host on which only *rangeeni* strain of lac insect was found which had both crimson and yellow colour mutants.

The findings of the present investigation are in conformity with the earlier work which recorded *A. auriculiformis* and *Peltophorum ferrugineum* from Ranchi and Jamshedpur, respectively (Kapur 1954). Surveyed Udaipur district, wherein thirteen plants recorded as host plants of *K. lacca* (Kumar *et al*. 2007). Enlisted 217 host plant species (Varshney and Teotia 1967). Reported 10 plant species as new host plants (Varshney 1968). Ranchi and its surrounding areas surveyed (Subbarayudu and Ram 1997) revealed host plants belong to 32 genera and 53 species. Findings of the study are in support of present investigation. Recorded lac insect on *A. tortilis* and *C. surinamensis* from Jodhpur (Ramani and Sharma 2010).

Plenty of host plants are available in this region which provides scope for commercial lac culture. Under the present study, good encrustation of lac observed in some of the host plants and occurrence of *rangeeni* lac insect only, indicates the climate suitability to *rangeeni* strain. Good encrustation of lac was seen on *Acacia auriculiformis*, *Annona reticulat*, *Calliandra calothyrsus*, *Ficus religiosa*, *F. racemosa*, *F. tsiela*, *Peltophorum ferrugineum*, *Pithecellobium dulce* and *Samanea saman.* Preliminary studies have shown a good performance of lac culture and opens up the scope for lac cultivation for which these host plants can be exploited in this region.

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SUMMARY

Lac produced mainly by *Kerria lacca* (Kerr), cultivated

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Table 1 Survey record of lac insect/ host plants in western plains of India during 2015

Date	District	GPS reading	Elevation	Host plants name	Strain color*
03-07-2015	Sirohi	N 24° 41.317' E 072° 6.824'	1045 ft	*Ficus benghalensis*	Yellow
03-07-2015	Sirohi	N 24° 41.317' E 072° 6.824'	1046 ft	*Annona reticulata*	Yellow
03-07-2015	Sirohi	N 24.99422' E 72.7183'	761 ft	*Pithecellobium dulce*	Yellow
03-07-2015	Sirohi	N 24.79222' E 73.03851'	1218 ft	*Annona reticulata*	Yellow
03-07-2015	Udaipur	N 24.581473' E 73.701474 '	1912 ft	*Polyalthia longifolia*	Yellow
03-07-2015	Udaipur	N 24° 44.630' E 073° 2.289'	2946 ft	*Ficus religiosa*	Yellow
03-07-2015	Sirohi	N 24° 45.776' E 073° 1.983'	1274 ft	*Ficus benghalensis*	Crimson & Yellow mix
23-07-2015	Rajsamand	N 25° 01.739' E 073° 51.595'	1868 f t	*Ficus religiosa*	Yellow
24-07-2015	Jodhpur	N 25° 15.578' E 073° 2.984'	1013 ft	*Ficus religiosa*	Yellow
24-07-2015	Jodhpur	N 25° 15.578' E 073° 42.984'	1018 ft	*Ziziphus mauritiana*	Yellow
24-07-2015	Nagaur	N 26° 20.025' E 073° 02.494'	1018 ft	*Ficus religiosa*	Crimson
25-07-2015	Ajmer	N 26° 28.875' E 074° 39.720'	1725 ft	*Ficus benghalensis*	Yellow
25-07-2015	Ajmer	N 26° 28.875' E 074° 39.720'	1725 ft	*Ficus religiosa*	Yellow
25-07-2015	Ajmer	N 26° 34.628' E 074° 50.327'	1731 ft	*Ficus religiosa*	Yellow
13-10-2015	Jaipur	N 24° 35.097' E 073° 0.794'	997 ft	*Ficus religiosa*	Crimson
13-10-2015	Jaipur	N 26° 49.386' E 075° 33.635'	1196 ft	*Ficus religiosa*	Yellow
13-10-2015	Sikar	N 27° 28.859' E 075° 23.215'	1542 ft	*Ficus religiosa*	Crimson
13-10-2015	Sikar	N 27° 29.071' E 075° 22.443'	1547 ft	*Ziziphus mauritiana*	Yellow
13-10-2015	Sikar	N 27° 37.704' E 075° 10.749'	1441 ft	*Ficus religiosa*	Yellow
14-10-2015	Jhunjhunu	N 28° 08.230’ E 075° 23.494’	1115 ft	*Ficus religiosa*	Yellow
14-10-2015	Hissar	N 28° 08.231` E 075° 23.493`	823 ft	*Ficus religiosa*	Crimson
14-10-2015	Hissar	N 29° 07.219` E 075° 42.021`	635 ft	*Ficus religiosa*	Crimson
15-10-2015	Hissar	N 29° 08.530` E 075° 42.618`	603 ft	*Ziziphus mauritiana*	Crimson
15-10-2015	Hissar	N 29° 08.530` E 075° 42.618`	603 ft	*Ficus religiosa*	Crimson

Cond.

Table 1 (*Concluded*)

Date	District	GPS reading	Elevation	Host plants name	Strain color*
15-10-2015	Hissar	N 29° 08.532` E 075° 42.625`	661 ft	*Delonix regia*	Crimson
15-10-2015	Hissar	N 29° 08.715` E 075° 42.721`	664 ft	*Albizia lebbeck*	Crimson
15-10-2015	Hissar	N 29° 09.097` E 075° 42.992`	664 ft	*Acacia auriculiformis*	Crimson
15-10-2015	Hansi	N 29° 05.633` E 075° 57.324`	743 ft	*Ziziphus mauritiana*	Crimson
15-10-2015	Hansi	N 29° 05.633` E 075° 57.324`	743 ft	*Ficus benghalensis*	Crimson
15-10-2015	Hansi	N 29° 05.633` E 075° 57.324`	743 ft	*Ficus religiosa*	Crimson
15-10-2015	Bhiwani	N 28° 47.986` E 076° 07.740`	796 ft	*Ficus racemosa*	Crimson
15-10-2015	Bhiwani	N 28° 47.986` E 076° 07.740`	796 ft	*Dalbergia sissoo*	Crimson
15-10-2015	Bhiwani	N 28° 47.986` E 076° 07.740`	796 ft	*Albizia lebbeck*	Crimson
15-10-2015	Bhiwani	N 28° 47.986` E 076° 07.740`	796 ft	*Ficus benjamina*	Crimson
15-10-2015	Bhiwani	N 28° 47.986` E 076° 07.740`	796 ft	*Prosopis cineraria*	Crimson
15-10-2015	Bhiwani	N 28° 46.897` E 076° 20.256`	718 ft	*Ziziphus mauritiana*	Yellow
16-10-2015	Jhajhhar	N 28° 36.143` E 076° 33.969`	641 ft	*Ficus religiosa*	Crimson
16-10-2015	Jhajhhar	N 28° 34.523` E 076° 40.202`	686 ft	*Ficus religiosa*	Crimson
16-10-2015	Rewari	N 28° 34.524` E 076° 40.199`	753 ft	*Ficus religiosa*	Yellow
16-10-2015	Rewari	N 28° 34.524` E 076° 40.199`	753 ft	*Ficus benghalensis*	Yellow
16-10-2015	Alwar	N 28° 18.853` E 076° 36.818`	1108 ft	*Ficus religiosa*	Yellow
27-10-2015	Ahmedabad	N 27° 53.517` E 076° 17.563`	242 ft	*Ziziphus mauritiana*	Yellow
27-10-2015	Ahmedabad	N 27° 53.517` E 076° 17.563`	228 ft	*Peltophorum ferrugineum*	Yellow
27-10-2015	Ahmedabad	N 27° 53.517` E 076° 17.563`	217 ft	*Ficus religiosa*	Crimson & Yellow mix
29-10-2015	Bhavnagar	N 21° 46.214` E 072° 8.812`	63 ft	*Ficus religiosa*	Yellow
29-10-2015	Bhavnagar	N 21° 45.606` E 072° 6.720`	136 ft	*Ziziphus mauritiana*	Yellow
29-10-2015	Bhavnagar	N 21° 45.036` E 072° 9.239`	85 ft	*Z. mauritiana*	Yellow

*Entire population belonged to only *rangeeni* strain

Table 2 Survey record of lac insect/ host plants in western plains of India during 2016

Date	District	Location	Elevation	Host	Strain color*
14-06-2016	Hissar	N 28° 04.219` E 073° 20.509`	1144 ft	*Ficus benghalensis*	Crimson
14-06-2016	Hissar	N 28° 04.219` E 073° 20.509`	1147 ft	*Dalbergia sissoo*	Crimson
15-06-2016	Alwar	N 27° 53.551` E 076° 17.439`	1361 ft	*Ziziphus mauritiana*	Yellow
15-06-2016	Alwar	N 27° 53.551` E 076° 17.439`	1361 ft	*Ficus religiosa*	Yellow
28-06-2016	Udaipur	N 24° 34.985` E 073° 43.467`	1912 ft	*Pithecellobium dulce*	Yellow
28-06-2016	Udaipur	N 24.56716 E 73.71434	1866 ft	*Peltophorum ferrugineum*	Yellow
28-06-2016	Udaipur	N 24.57942 E 73.70467	1875 ft	*Prosopis juliflora*	Yellow
28-06-2016	Udaipur	N 24.57291 E 73.70804	1874 ft	*Ficus palmata*	Yellow
28-06-2016	Udaipur	N 24.59287 E 73.72694	1885 ft	*Butea monosperma*	Yellow
03-07-2016	Sirohi	N24°52'47.1' E72°50'59.3'	964 ft	*Ficus racemosa*	Yellow
03-07-2016	Sirohi	N 24° 41.317` E 072° 6.824`	1045 ft	*Ficus tsiela*	Yellow
04-07-2016	Aravalli	N 24° 35.099` E 073° 40.792`	561 ft	*Ficus religiosa*	Crimson
04-07-2016	Anand	N 22° 42.292` E 073° 07.120`	338 ft	*Ficus religiosa*	Crimson
04-07-2016	Anand	N 22° 42.056` E 073° 06.695`	170 ft	*Ficus benghalensis*	Yellow
05-07-2016	Anand	N 22° 41.900` E 073° 06.582`	262 ft	*Samanea saman*	Crimson
05-07-2016	Vadodara	N 22° 23.687` E 073° 08.513`	305 ft	*Peltophorum ferrugineum*	Crimson
05-07-2016	Surat	N 21° 06.132` E 072° 51.888`	143 ft	*Peltophorum ferrugineum*	Yellow
05-07-2016	Surat	N 21° 06.130` E 072° 51.892`	74 ft	*Peltophorum ferrugineum*	Yellow
06-07-2016	Ahmedabad	N 21° 07.296 E 072° 51.449`	434 ft	*Ficus religiosa*	Yellow
20-10-2016	Chittorgarh	24.88863 N 74.62815 E	1311 ft	*Pithecellobium dulce*	Yellow
20-10-2016	Chittorgarh	24.88863 N 74.62815 E	1311 ft	*Ficus religiosa*	Yellow
21-10-2016	Jaipur	N 24° 35.102 E 073° 40.802`	1706 ft	*Ficus religiosa*	Yellow
21-10-2016	Jaipur	N 27° 31.618 E 076° 03.852`	1356 ft	*Ficus religiosa*	Yellow
22-10-2016	Karnal	N 27° 31.664 E 076° 03.872`	878 ft	*Ficus religiosa*	Yellow
22-10-2016	Karnal	N 29° 40.986 E 076° 59.616`	826 ft	*Calliandra calothyrsus*	Crimson

Cond.

Table 2 (*Concluded*)

Date	District	Location	Elevation	Host	Strain color*
22-10-2016	Kurukshetra	N 29° 57.714 E 076° 50.031`	865 ft	*Ficus religiosa*	Yellow
23-10-2016	Kaithal	N 29° 48.525 E 076° 24.471`	879 ft	*Ficus religiosa*	Crimson
23-10-2016	Kaithal	N 29° 48.527 E 076° 24.469`	889 ft	*Ficus religiosa*	Crimson
23-10-2016	Kaithal	N 29° 48.527 E 076° 24.469`	889 ft	*Acacia senegal*	Crimson
23-10-2016	Jind	N 29° 35.679 E 076° 07.625`	716 ft	*Ziziphus mauritiana*	Crimson
23-10-2016	Jind	N 29° 36.179 E 076° 07.568`	732 ft	*Ficus religiosa*	Crimson
24-10-2016	Bhiwani	N 28° 40.498 E 076° 10.531`	670 ft	*Ziziphus mauritiana*	Crimson
24-10-2016	Bhiwani	N 28° 31.034 E 076° 12.569`	724 ft	*Acacia senegal*	Crimson

*Entire population belonged to only *rangeeni* strain

Table 3 Analysis of the lac insects host plants collected from the western plains of India during 2015 and 2016.

2015					2016				
Host plant (s)	Family	Frequency of occurrence	Total host plants (Nos)		Host plant (s)	Family	Occurr.	Total host plants (Nos)	
			Genera	Species				Gen.	Sp.
P. longifolia Thw	Annonaceae	1 (2.13)	2 (18.18)	2 (14.29)	*D. sissoo* DC	Fabaceae	1 (3.03)	3 (30.0)	3 (21.43)
Annona reticulate L.		2 (4.26)			*B monosperma*		1 (3.03)		
Delonix regia Raf.	Caesalpiniacea	1 (2.13)	1 (9.09)	1 (7.14)	*P. ferrugineum* Heyne		4 (12.12)		
Dalbergia sissoo DC	Fabaceae	1 (2.13)	2 (18.18)	2 (14.29)	*P. juliflora* DC	Mimosaceae	1 (3.03)	5 (50.0)	5 (35.71)
P. ferrugineum Heyne		1 (2.13)			*A. senegal* D		2 (6.06)		
Ficus religiosa L.	Moraceae	21 (44.68)	1 (9.09)	4 (28.57)	*Calliandra calothyrsus* M.		1 (3.03)		
Ficus benghalensis L.		5 (10.64)			*Samanea saman* Merril		1 (3.03)		
Ficus racemosa L.		1 (2.13)			*P. dulce* B.		2 (6.06)		
Ficus benjamina L.		1 (2.13)			*F. religiosa* L.	Moraceae	12 (36.36)	1 (10.0)	5 (35.71)
Albizia lebbeck B.	Mimosaceae	2 (4.26)	4 (36.36)	4 (28.57)	*F. benghalensis* L		2 (6.06)		
Prosopis cineraria Druce		1 (2.13)			*F. racemosa* L.		1 (3.03)		
Acacia auriculiformis B		1 (2.13)			*F. tsiela* Roxb		1 (3.03)		
Pithecellobium dulce B.		1 (2.13)			*F. palmata* Fosk.		1 (3.03)		
Ziziphus mauritiana Lam.	Rhamnaceae	8 (17.02)	1 (9.09)	1 (7.14)	*Z. mauritiana*	Rhamnaceae	3 (9.09)	1 (10.0)	1 (7.14)
Total	6 families	47 locations	11	14		4	33	10	14

Figures in parentheses represent the percent equivalent.

on *palas, ber*, *kusum* and *semialata.* Establishment of these host plants takes quite long time for starting lac culture. Objectives of present study were to find out the occurrence of lac insect and new or potential host plants of lac insect in this region. Extensive surveys were carried out in Gujarat, Haryana and Rajasthan during 2015 and 2016. During the survey, lac insect observed in 80 locations and entire population belonged to *rangeeni* strain only. A total of 21 host plants reported under 14 genera from 6 families. Occurrence of *rangeeni* lac insect only, indicates the climate suitability to *rangeeni* strain. However, *Acacia auriculiformis* Benth, *Annona reticulate* L., *Calliandra calothyrsus* Meissn, *Ficus religiosa*, *F. racemosa*, *F. tsiela* Roxb, *Peltophorum ferrugineum* Heyne, *Pithecellobium dulce* Benth, *Samanea saman* Merril, and *Z. mauritiana* Lam. had good encrustation of lac and has potential to exploit as reservoir or culture of *rangeeni* lac insect in this region.

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