

## SURVEY OF THE NATURAL ENEMIES OF THE LAC INSECT, *KERRIA LACCA*, IN TAIWAN

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The lac insect [*Kerria lacca* (Kerr)] was introduced purposely into Taiwan from Thailand around 1940 for commercial shellac production. At that time it was a promising enterprise. However, after World War II, due to the development of synthetic shellac, there was no demand for the natural product. The lac insects, not properly managed, then escaped and became an important orchard pest of litchi, sugar apple, longan, and other fruits.

Although this pest can be effectively controlled by dimethoate, azodrin, antio and sumithion during the nymphal stages, it cannot be controlled in the adult stage because it secretes a thick wax layer over its body. Furthermore, it is difficult to spray when the trees are tall and planted in mountain areas. Therefore, biological control appears to be the best method of control.

### METHOD OF STUDY

Samples of lac insect infested branches of host plants were collected two or three times per month. They were kept in laboratory until the emergence of parasitoids. The emerged parasitoids were prepared as dry specimens and preserved for identification and further study. Samples were collected from the northern part of Taiwan and the Pingtung areas of southern Taiwan during August to September 1981. In addition, general surveys of the natural enemies of the lac insect were conducted in Taichung, Nantou, Changhua, Chiayi, Kaohsiung and Pingtung from September 1981 until June 1982.

### RESULTS

The results of surveys conducted during August 1981 to May 1982 in northern Taiwan are given in Table 1. The total number of parasitoids obtained from the whole survey was over 550. Because the identification of the parasitic insects are not yet complete, the species obtained are not reported in this paper. However, from Table 1 it is apparent that the ubiquitous banyan tree (*Ficus retusa*) is the most favorite host plant of the lac insect. This tree is also the preferred habitat of the natural enemies of the lac insect.

Table 1. Summary of survey data of lac insect obtained in northern Taiwan during 1981–1982 (NTU)

Locality	Date	Host plant	Parasitoid emergence
Taipei	11 Aug. 1981	<i>Albizzia</i> sp.	+
		<i>Ficus retusa</i>	++
Mucha	20 Aug. 1981	"	++
Sanshia	22 Aug. 1981	"	+
		<i>Mangifera indica</i>	+
Mucha	28 Aug. 1981	<i>Ficus retusa</i>	+
		<i>Mangifera indica</i>	++
Shintien	28 Aug. 1981	<i>Ficus retusa</i>	+
		<i>Euphoria longana</i>	+
Taipei	5 Sep. 1981	<i>Ficus retusa</i>	+
Hsichih	8 Sep. 1981	"	+
Shintien	11 Sep. 1981	"	+
		<i>Euphoria longana</i>	+
Chuwei	24 Sep. 1981	<i>Ficus retusa</i>	+
Panchiao	28 Sep. 1981	"	+
Shintien	12 Oct. 1981	"	+
Panchiao	14 Oct. 1981	"	++
Mucha	2 Nov. 1981	"	+
Neihu	18 Nov. 1981	"	+
Shintien	7 Mar. 1982	"	++
Kueishan	11 Mar. 1982	"	+
Shinchung	24 Mar. 1982	"	+
Panchiao	6 Apr. 1982	"	+
Nunshuchia	19 Apr. 1982	"	+
Taishan	29 Apr. 1982	"	++
Shintien	11 May 1982	"	++
Shengkeng	25 May 1982	"	+

From the samples taken from Taichung, Nantou, Changhua, Chiayi, Kaohsiung and Pingtung, a total of five parasitoids were obtained. They were *Eupelmus tachardiae* (Eupelmidae), *Parechthrodyinus* sp., *Tachardiaephagus* sp., and *T. tachardiae* (Encyrtidae), and *Tetrastichus purpureus* (Eulophidae). In addition to the parasitoids, five predators were obtained. They were *Chrysopa* sp. (Chrysopidae), *Eublemma conspersa* and *E. roseonivea* (Noctuidae), *Telsimia chujoii* (Coccinellidae), and an oligotomid. The densities of those natural enemies are given in Table 2. It was observed that none of those parasitoids and predators were controlling the lac insects. The *T. tachardiae* was only recorded in southern Taiwan (Kaohsiung and Pingtung) by Chiu *et al.* (1981), but was first recorded in central Taiwan (Yuanlin, Changhua) in this study.

**Table 2. Numbers of natural enemies reared from lac stick per meter from Takangshan, Kaohsiung (TARI)**

Natural enemies	Month									
	1981				1982					
	9	10	11	12	1	2	3	4	5	6
<i>Eupelmus tachardiae</i>	0	0	0	0.05	0	0	0	0	0	0.3
<i>Parechthrodyinus</i> sp.	0.04	0.2	0	0	0	0	0	0	0	0
<i>Tachardiaephagus</i> sp.	0	0	0	0.2	0	0.03	0	0.02	0	0
<i>T. tachardiae</i>	0	6.2	7.0	18.3	0	0	0	0.05	10.1	0
<i>Tetrastichus purpureus</i>	0.3	12.6	2.4	0.8	0.3	1.0	10.5	30.5	23.2	25.3
<i>Chrysopa</i> sp.	0	0.1	0.2	0.1	0.1	0.07	0.1	0	0	0
<i>Eublemma conspersa</i>	0.2	0.3	0.2	0.1	0	0	0.05	0.2	0.1	0.3
<i>Eublemma roseonivea</i>	0.1	0.3	0.7	0.6	0	0	0	0	0.6	0.5
<i>Telsimia chujoii</i>	0	0.06	0	0	0	0	0	0	0	0

## DISCUSSION

Preliminary data obtained from northern Taiwan indicated host tree preference by the lac insect and its natural enemies. Further studies are needed because it is possible that biological control of this pest may be successful on certain trees but not in others.

Two predators, *E. amabilis* and *Holcocera pulverea*, were reported to destroy 35 per cent of the lac insect population in India. However, because these two species are lepidopterous insects, which are generally plant feeders, the hazards of their importation into Taiwan should be given serious consideration.

This study showed that there are five species of parasitoids and predators that attack the lac insect. None of these species can be considered effective. Efforts should be made to locate related species in other parts of the world and to import them into Taiwan.