Indian lac insect, *Kerria lacca*, as an important source of honeydew

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Scale insects are notorious pests but humans have successfully exploited some of them to their advantage. The Indian lac insect, *Kerria lacca* (Homoptera) is one such insect which is purposely cultured in some Asian countries such as India, Thailand, China and Vietnam for its various products of commercial importance (resin, wax and dye).

Lac insects belong to the group of sap-sucking insects which have specialized mouthparts capable of piercing tender twigs of the host-plant to feed on the sap. Much of the ingested sap is not digested, but passes through a special filter chamber and is excreted as honeydew, which bees collect. Honeydew flows from sap-sucking insects are major sources of honey in some parts of the world[9].

A total of 48 genera, of which 21 are from the order Hymenoptera, have been observed to visit lac insects[4]. Of these, 15 species belong to the Formicidae, two to Vespidae and one each to Mutilidae, Sphecidae, Chalcididae and Apidae (*Apis florea*). The Indian honey bee, *Apis cerana indica*, has also been observed gathering honeydew from lac insects (KKS, personal observation). It is evident that some sort of mutualism exists between the lac insects and the insects visiting it for honeydew, without necessarily implying obligate dependence or interdependence, as mutual benefits are derived by both.

Lac insects start excreting honeydew after settling on suitable shoots of host-plants (fig. 1). The amount of honeydew excreted varies from 2.08 to 3.30 droplets per hour. A mature female excretes from 0.3 to 1.2 mm^3 of honeydew per hour[12]. It has been shown in aphids that ant solicitation can double or treble the normal rate of uptake of phloem sap and hence the rate of excretion of honeydew[2]. Whether that is true in the case of lac insects also, remains to be discovered. The honeydew produced is not merely a solution of sugars, but is a complex mixture of nutrients including amino acids, amides and minerals. Seventeen amino acids have been reported to be present in lac insect honeydew[10]. No proteins or peptides have been detected. However, marked differences occur in the amino acid composition of the honeydew and that of the sap of the host-plant leading to the inference that certain peptides must have been present in the plant sap which are hydrolysed by enzymes possibly present in the insect gut. The honeydew of female lac insects feeding on *Flemingia* (*Moghania*) *macrophylla* and three species of *Ficus* have different compositions of free amino acids showing the influence of the host plant[5].

Lac insects are gregarious in habit and initially 150–250 young ones settle per cm^2 in

TABLE. 1. Important host-plants of various lac insects, *Kerria* spp. (modified after Varshney, 1986).

Family/host plants	Lac insect (*Kerria*)
Apocyanaceae	
Landolphia sp.	*K. albizziae*
Caesalpiniaceae	
Peltophorum inermis	*K. fici fici*
Combretaceae	
Quisqualis sp.	*K. rangoonensis*
Dipterocarpaceae	
Shorea roxburghii	*K. lacca mysorensis*
Euphorbiaceae	
Croton caudatum	*K. albizziae*
Malvaceae	
Kydia calycina	*K. chinensis kydia*
Mimosaceae	
Acacia fernesiana	*K. nagoliensis*
Albizzia chinensis	*K. albizziae*
A. lucida	*K. brancheata*
Samanea saman	*K. fici fici*
= *Albizia saman*	
Moraceae	
Ficus beng(h)alensis	*K. fici fici*
	K. lacca lacca
F. carica	*K. fici fici*
F. drupacea var. *pubescens*	*K. communis*
F. elastica	*K. ebracheata*
F. lucescens	*K. fici fici*
F. religiosa	*K. fici fici*
	K. lacca lacca
F. rumphii	*K. fici fici*
F. virens	*K. chamberlini*
Papilionaceae; Fabaceae	
Butea monosperma	*K. fici fici*
	K. lacca lacca
	K. pusana
Cajanus cajan	*K. chinensis chinensis*
Moghania macrophylla	*K. chamberlini*
= *Flemingia macrophylla*	*K. lacca*

Rhamnaceae	
Ziziphus mauritiana	*K. ebracheata*
	K. fici fici
	K. fici jhansiensis
	K. indicola
	K. lacca lacca
	K. pusana
Sapindaceae	
Litchi chinensis	*K. albizziae*
	K. nepalensis
Schleichera sp.	*K. chinensis chinensis*
S. oleosa	*K. brancheata*
	K. lacca lacca
	K. nagoliensis
Sterculiaceae	
Theobroma cacoa	*K. albizziae*
Theaceae	
Thea chinensis = *Camelia sinensis*	*K. rangoonensis*
Jheolia? (botanical name not traceable)	*K. lacca ambigua*

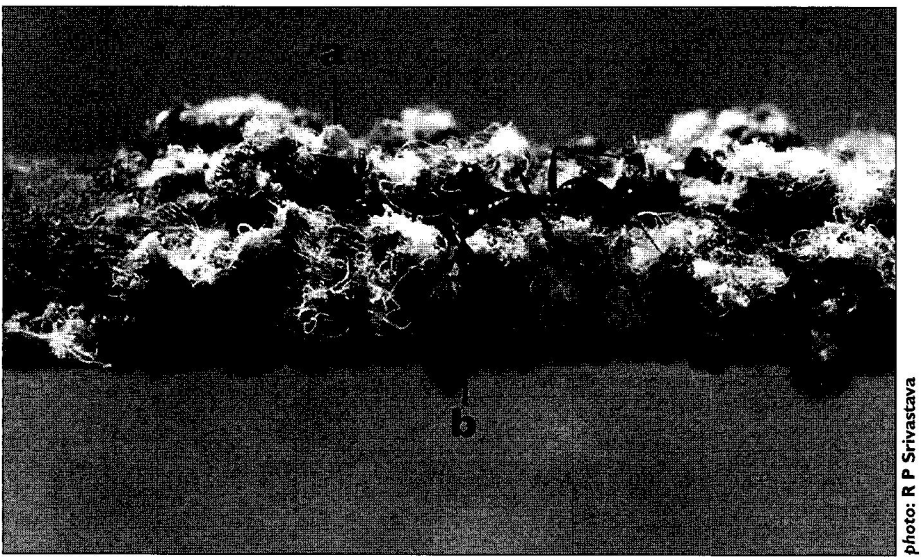

photo: R P Srivastava

FIG. 1. Honeydew excretion by Indian lac insect, *Kerria lacca*. (a), a droplet of freshly excreted honeydew; (b), ant collecting honeydew from lac insect. White threads seen are waxy filaments secreted by the lac insect. The bees collect honeydew from the insect as well as from the droplets fallen under the tree.

close proximity. After fertilization, due to the vigorous rate of growth of female insects, resin secreted by them coalesces to form a continuous encrustation round the shoot, which can extend several metres on a single tree. The settlement density decreases with time and at crop maturity it varies between 20–50 insects per cm^2. Lac insects are deliberately introduced on to a large number of trees over a vast area mainly for lac resin production. Being highly fecund, the insects are capable of building up large populations over a short time-span. The area of lac cultivation can be extended by cutting the branches bearing gravid female lac insects and tying these to new host trees. The sedentary nature of lac insects is an added advantage because it serves as a fixed source of honeydew over a period.

Different species of *Kerria* reported from India and their important host-plants are listed in table 1 (modified after Varshney[13]). Since lac insects are known to thrive on more than 400 plant species, there is a tremendous scope for utilizing them in apiculture, as copious amounts of honeydew are available almost throughout the year, especially during March to June and August to November, in India.

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