STUDIES ON NATURAL ENEMY COMPLEX ON SUITABLE BUSHY HOST PLANTS OF LAC

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ABSTRACT

Lac insects belong to the super-family *coccoidea* (Hemiptera: Sternorrhyncha), commonly known as scale insects or *coccoids*, which comprises of about 7,500 species under variable number of families (20 and above). Globally, ninety species of Tachardiidae have been reported under nine genera. Twenty-one species of *Kerria* have been reported so far. Out of the 14 species of *Kerria* reported in India, only a few are exploited for commercial lac production. Tree-hosts, depending upon their habit, 15-20 years to reach the stage of lac inoculation and hence, do not find favour with the lac growers for raising systematic plantations to grow lac. To cultivate lac on plantation basis, some short stature, fast growing perennial shrubs have been identified for systematic plantation raising and/or integrating with agricultural crops. *Flemingia semialata* Roxberg and *Flemingia macrophylla* Willd have shown great promise for lac production due to its fast growth, tender shoots and suitably for intensive lac cultivation. Among pest control tactics against exotic pests, biological control using indigenous natural enemies is most promising. Collections were conducted in open-field and protected crops as well as in wild flora. In this study, seven parasitoids *viz., Anicetus dodonia* Ferriere, *Bracon greeni* Ferriere, *Euplemus tachardiae* Howard, *Eurymyiocnema aphelinodies* Ferriere, *Mariettta javensis* Howard, *Trachardiaphagus tachardiae* Howard, *Aprostocetus (=Tetrastichus) purpureus and six predators of K. lacca which comprised of Eublemma amabilis* Moorei, *Psudohytopa (=Holocera) pulverea, Cryptoblabes ephestialis* Hampson, *Chrysopa madestes* Mishrasush, *Phyllodromia humbertiana* Kamy, *Ischonoptera fulvastrata* was identified.

Key Words: Tachardiidae, *Kerria lacca*, Parasitoid, Predator, *Flemingia semialata*, *Flemingia macrophylla*

I. INTRODUCTION

Lac insects come under the super-family *Coccoidea* (Hemiptera: Sternorrhyncha), commonly known as scale insects or *coccoids*, which comprises of about 7,500 species under variable number of families (20 and above) (Resh and Carde, 2009).The lac insects are mainly distributed in the tropical and sub-tropical regions between the latitudes 40 N and 40 S. Globally, ninety species of Tachardiidae have been reported under nine genera. Twenty-one species of *Kerria* have been reported so far. Out of the 14 species of *Kerria* reported in India, only a few are exploited for commercial lac production,(Sharma and Ramani, 1997).

Lac cultivation has been traditionally carried out on naturally occurring tree-hosts. Palas (*Butea monosperma Lamk),* Ber *(Ziziphus mauritiania lam)* and Kusum (*Schleichera oleosa* Lour) are considered major lac-hosts of all India importance, as about 90% of the lac produced in our country comes from these 3 hosts. Besides these 3, there are some other important tree species belonging to Acacia, *Albizia, Ficus* which are utilized for commercial production of lac. However, these hosts lie scattered in the forests leading to difficulties in efficient utilization for production of lac. To make matter worse, population of these host-trees is decreasing also, that too rapidly due to deforestation and unawareness of their economic potential. Tree-hosts, depending upon their habit, 15-20 years to reach the stage of lac inoculation and hence, do not find favour with the lac growers for raising systematic plantations to grow lac. Moreover, lac culture operations have to be carried out by climbing on to the tree which is cumbersome in the absence of mechanized methods. Lack of skilled man-power in the changing socio-economic scenario is further adding to the woes of lac development. Therefore, to address the above issues and to cultivate lac on plantation basis, some short stature, fast growing perennial shrubs have been identified for systematic plantation raising and/or integrating with agricultural crops. *Flemingia semialata* Roxberg and *Flemingia macrophylla* Willd have shown great promise for lac production due to its fast growth, tender shoots and suitably for intensive lac cultivation. Identification of *semialata* as a potential kushmi lac –host especially for growing winter season (Aghani) lac crop, has come as boon to farmers who do not have lac-hosts but are interested in lac cultivation.

About 22 predators have been reported to be closely associated with lac insects (Varshney, 1957), of which three are major predators *viz.* Lac predatory moth *Eublemma amabilis* Moorei, *) pulverea* Moth, *Psudohytopa pulverea* Meyr and green lace wing, *Chrysopa* spp. The first two cause on an average 35-40% damage to lac crop .These lepidopterous predators cut a hole in the lac and feed on the insect from inside by making a tunnel.*Chrysopa*, through a sporadic pest , sometimes causes havoc particulary in culture of *kusmi* strain.

30 different parasites of lac insects have been reported by Varshney (1976). They lay eggs into the lac cell through the anal tubercle in or on the body of the lac insect. The grub that hatches feeds only on lac insect and not on lac. Extent of parasitisation and relative/seasonal abundance of parasites associated with lac insect have been studied by various workers (Srivastava *et al*., 1984; Sharma *et al*., 1997). In certain years and localities it was high as 50%. *Rangeeni* strain is more vulnerable to pest attack than *kusmi* and damage is more in rainy season crop.

II. MATERIALS AND METHODS

COLLECTION OF PARASITIODS AND PREDATORS

ACTIVE METHOD (Net sweeping)

The net used in the present study was designed according to Noyes (1982) where the perimeter of the net was 1.2 m with a sub – triangular fame. The handle size was about 1.0 m long and slightly narrowing to the round bottom. The sides of the frame measured 48x48 cm and the handle measured about 1.1 m. The net bag was made up of durable white cotton cloth with fine mesh permitting easy passage of air but at the same time prevented escape of smaller insects of less than I mm. The specimens consisting of parasitoids and predators from the net was sucked up by an aspirator and then transferred into 70 per cent alcohol.

PASSIVE METHODS

Malaise trap are tent like traps made of the mesh materials and used primarily for the collection of flies (Diptera) and wasps (Hymenoptera), although, they trap many other flying insects. Collections of parasitoids were made throughout the cropping period without hindrance. The malaise trap was stitched 6x3 feet with one side opening and 4 feet at the back (Townes, 1972). The trap was erected with support of wooden poles at each corner and at the peak in front. Parasitoids and other insects hit the wall, fly upward to the peak of the trap eventually find their way in to a jar with killing agent, 75 per cent ethyl alcohol.

Yellow pan trap

This is excellent method of collecting chalcids, notably small insects as well as other group of insects. It works on the principle, that many insects are attracted to yellow colour .The trap consists of a shallow tray, painted bright yellow on the inside and some natural colour, such as black on the outside. They were sunk in to a suitable habitat, such as leaf litter. Later the tray was filled with saturated salt solution or with a 50/50 mix of ethylene glycol and water plus a few drops of detergent to brake the surface tension. Pans containing the water or salt solution were kept for 24hrs/2 days. After two days, the trap content was sieved through a fine mesh sieve retaining only the insects. The retained specimen were thoroughly washed with running water to remove the last traces of soap. The specimens were then inverted over a petriplate containing 70 per cent alcohol and sorted out under a stereo zoom microscope for recording various parasitoids.

III. RESULTS

Parasitoids and predators of *kerria lacca*

In the present study, seven parasitoids *viz., Anicetus dodonia* Ferriere, *Bracon greeni* Ferriere, *Euplemus tachardiae* Howard, *Eurymyiocnema aphelinodies* Ferriere, *Mariettta javensis* Howard, *Trachardiaphagus tachardiae* Howard, *Aprostocetus (=Tetrastichus) purpureus and six predators of K. lacca which comprised of Eublemma amabilis* Moorei, *Psudohytopa (=Holocera) pulverea, Cryptoblabes ephestialis* Hampson, *Chrysopa madestes* Mishrasush, *Phyllodromia humbertiana* Kamy, *Ischonoptera fulvastrata* was identified.

List of incidence of lac insect parasitoids on the bushy hosts

Sl. No.	Name of the parasitoid	Order	Family
1.	*Anicetus dodonia Ferriere*	Hymenoptera	Encyrtidae
2.	*Bracon greeni* Ferriere	Hymenoptera	Braconidae
3.	*Euplemus tachardiae*	Hymenoptera	Eupelmidae
4.	*Eurymyiocnema aphelinodies* Ferriere	Hymenoptera	Aphelinidae
5.	*Trachardiaphagus tachardiae* Howard	Hymenoptera	Encyrtidae
6.	*Mariettta javensis* Howard	Hymenoptera	Aphelinidae
7.	*Aprostocetus (=Tetrastichus) purpureus*	Hymenoptera	Eulophidae

List of incidence of lac insect predators on the bushy hosts

SL.No.	Name of the Predator	Order	Family
1.	*Eublemma amabilis* Moorei	Lepidoptera	Noctuidae
2.	*Psudohytopa (=Holocera) pulverea*	Lepidoptera	Blastobasidae
3.	*Cryptoblabes ephestialis* Hampson	Lepidoptera	Blastobasidae
4.	*Chrysopa madestes* Mishrasush,	Neuropteran	Chrysopidae
5.	*Phyllodromia humbertiana* Kamy	Dictyoptera	Blatellidae
6.	*Ischonoptera fulvastrata*	Dictyoptera	Blatellidae

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