

"Further Notes on the Chalcidoid parasites of *Laccifer lacca*, Kerr."

By

P. M. GLOVER, B. Sc.,

*Entomologist.***Introduction.**

The Writer (1934) has already shown that the damage by *Chalcidoid* Parasites to the lac insect *Laccifer lacca*, Kerr. is small, based on a six years collection of statistical data. He has also shown that hyperparasites are of little value as controlling agents of the primary parasites, and are in addition themselves primary parasites of lac, based on a four year statistical investigation.

The present paper adds the results of a further years research to those already obtained. Tables I and II add the results for 1934-35 to Tables I and II in the Author's previous paper with which the present paper is intended to be read in conjunction. Table III has been revised to include the figures obtained from the four crops during the period 1934-35.

Control measures effective alike against Parasites, and Predators, which are the major enemies of lac, were recommended in the previous paper.

Calculations, measurements etc. are made exactly as in the first paper.

**Primary parasites of *L. lacca*.**

There are eight common parasites of *L. lacca* observed at Namkum all belonging to the *Chalcidoidea*. These are :—

*Eupelmus tachardiae*, How. (*Eupelmidae*).

*Tachardiacphagus tachardiae*, How. (*Encyrtidae*).

\**Tachardiacphagus somervilli*, Mahd. (*Encyrtidae*).

*Parechthrodryinus clavicornis*, Cam. (*Encyrtidae*).

*Erencyrtus dewitzi*, Mahd. (*Encyrtidae*).

*Coccophagus tschirchii*, Mahd. (*Aphelinidae*).

*Marietta javensis*, How. (*Aphelinidae*).

*Tetrastichus purpureus*, Cam. (*Eulophidae*).

These species have been described by Ferrière (1928 and 1935.)

Ferrière (1934) regards *T. somervilli* as a variety of *T. tachardiae*.

The chief point of interest during the year 1934-35 was the rather high average percentage hyperparasitism amounting to 8.8%, due largely to an unusually high percentage hyperparasitism of 36.1% in March 1935.

From Table II it will be seen that during the seven years under review, the average annual parasitism varied from a minimum of 2.6% in 1930-31 to a maximum of 7.2% in 1932-33. The average annual maximum percentage parasitism varied from 5.8% in 1930-31 to 13.9% in 1929-30.

\**Tachardiacphagus tachardiae* var. *somervilli* Mahd. [Ferrière 1935.]

From Table III it will be seen that the Baisakhi and Katki crops are more affected than the Aghani and Jethwi, the Baisakhi were slightly more affected than the Katki, and the Aghani crops were more affected than the Jethwi. The figures varied from 6.0% in the Baisakhi to 2.8% in the Jethwi, with average maxima 13.8% and 6.9% respectively. The average parasitism in individual crops varied from 8.9% in the Katki 1932 crop to 1.7% in the Jethwi 1929 crop.

The maximum percentage parasitism that occurred in any one month varied from 26.4% in the Baisakhi 1929-30 crop in July 1930 to 4.3% in November 1930 in the Aghani 1930-31 crop.

In the Baisakhi crop more males were parasitised than females, 45.0% of the cells parasitised were females. In the Katki and Aghani crops more females than males were parasitised, the percentages of females being 78.3% and 82.6%. In the Jethwi the numbers were practically equal, 52.1% of the parasitised cells being female. This has been explained (Glover 1934) as being correlated with the length of time for which the males are exposed to infection.

The average annual percentage of females parasitised was at a maximum of 79.8% in 1928-29 and a minimum of 48.9% in 1933-34. In the previous paper a fairly steady annual decrease in the percentage of females parasitised was pointed out. This has not been continued in 1934-35, when 60.6% of the cells parasitised were female.

The average percentage parasitism during the seven years under review was 4.8% the average maximum 9.9%. This is based on an examination of over five lakhs fifty thousand (5,50,000) host cells in over 5,000" of lac.

The figures for parasitism it will be observed are practically unaltered.

#### Hyperparasites of primary parasites of *L. lacca*.

The following species occur as hyperparasites. They are also in each case primary parasites of *L. lacca* and therefore not to be encouraged.

*Tetrastichus purpureus*, Cam. (*Eulophidae*).

*Eupelmus tachardiae*, How. (*Eupelmidae*).

*Marietta javensis*, How. (*Aphelinidae*).

Hyperparasitism has varied very considerably from year to year and crop to crop.

From Table II it will be seen that during the five years under review, the average annual hyperparasitism varied from a minimum of 0.4% in 1930-31 to a maximum of 8.6% in 1931-32. The average annual maximum hyperparasitism varied from 1.9% in 1930-31 to 17.9% in 1931-32.

From Table III the Jethwi crops would appear to be the most affected 4.1%. This is actually not the case, in the Jethwi 1932 crop hyperparasitism averaged as much as 21.2%, in other years however the percentages have been

1930, 0%; 1931, 0%; 1933, 2.6%; 1934, 0%; 1935, 0.9%.

The Baisakhi and Katki crops are more affected than the Aghani and Jethwi. The Baisakhi and Katki are about equally affected, 3.0% and 3.5%. The average percentage hyperparasitism in the Aghani crop was 2.6%. The average maximum percentage hyperparasitism varied from 12.7% in the Baisakhi crops to 7.6% in the Jethwi crops.

The average parasitism in an individual crop varied from 21.2% in the Jethwi 1932 crop to 0% in the Jethwi 1930, 1931 and 1934 crops. The maximum percentage hyperparasitism that occurred in any one month varied from 36.1% in March in the Baisakhi 1934-35 crop to 0% in the Jethwi 1930, 1931 and 1934 crops.

The average percentage hyperparasitism for the five years under review was 3.6%, the average maximum 10.1% based on an examination of over 41,000 host stages in over 4,400" of lac.

### Summary.

The conclusions formed by the Writer (1934) that parasites do little damage to the lac crops and that hyperparasites are of little value as controlling agents of parasites of *L. lacca* are further confirmed by reference to results obtained during 1934-35. Percentages of parasitism and of hyperparasitism are little affected by these results which are in this paper combined with those of previous years.

TABLE I,

*Parasitism and hyperparasitism in the individual lac crops during the period July 1934 to July 1935.*

Year.	Crop.	PARASITISM.					HYPERPARASITISM.		Strains and lengths examined.
		Host cells present.	Maximum % parasitism.	Average % parasitism.	% females parasitised.	Host cells present.	Maximum hyperparasitism.	Average hyperparasitism.	
July 1934 to July 1935.	Katki 1934.	8,024	14.7% (Oct.)	8.6%	69.3%	1,105	7.0% (Sept.)	2.8%	Ber × Khair 33" Ber × Palas 30" Total ... 63.0"
	Aghani 1934-35.	31,859	8.1% (Oct. and Dec.)	5.6%	80.5%	4,125	7.9% (Jan.)	3.4%	Kusum × Kusum 87" Kusum × Khair 84" Kusum × Palas 84" Total ... 255.0"
	Baisakhi 1934-35.	66,683	12.7% (Mar.)	6.7%	40.8%	4,595	36.1% (March)	8.8%	Palas × Palas 114" Palas × Ber 114" Ber × Ber 111" Ber × Palas 81" Total ... 420.0"
	Jethwi 1935.	11,113	6.7% (July).	3.3%	51.8%	310	3.7% (May)	0.9%	Kusum × Kusum 69" Total ... 69.0"

TABLE II.

*Parasitism and hyperparasitism during the years July 1928 to July 1935.*

Year.	PARASITISM.				HYPERPARASITISM.			Length examined.
	Host cells present.	Maximum % parasitism.	Average % parasitism.	% females parasitised	Hosts present.	Maximum % hyperparasitism.	Average % hyperparasitism	
1928-29 ...	14,638 +	7.9%	3.4%	79.8%	...	...	...	271.0"
1929-30 ...	42,386	13.9%	4.7%	72.5%	1,078 (on Baisakhi and Jethwi crops only on 255.75")	3.1%	0.9%	443.0"
1930-31 ...	72,772	5.8%	2.6%	70.9%	1,764	1.9%	0.4%	784.0"
1931-32 ...	61,879 +	8.4%	4.2%	58.9%	4,381	17.9%	8.6%	582.0"
1932-33 ...	1,21,238	12.3%	7.2%	59.9%	14,202	12.0%	3.4%	1,083.0"
1933-34 ...	1,38,878	10.1%	5.7%	48.9%	10,560	5.1%	1.6%	1,161.0"
1934-35 ...	1,17,679	10.6%	6.1%	60.6%	10,131	13.7%	4.0%	807.0"

TABLE III.

*Parasitism and hyperparasitism in the Katki Aghani Baisakhi and Jethwi crops during the period July 1928 to July 1935.*

Crop.	PARASITISM.				HYPERPARASITISM.			Length examined.
	Host cells present.	Maximum % parasitism.	Average % parasitism.	% females parasitised.	Hosts present.	Maximum % hyperparasitism.	Average % hyperparasitism.	
Katki ...	1,00,699 +	10.15%	5.6%	78.3%	9,698	9.4% (5 crops)	3.0% on 925.0"	1,007.25" only.
Aghani ...	1,14,670 +	8.5%	4.8%	82.6%	11,524	7.9% (5 crops)	2.6% on 1,080.0"	1,263.0" only.
Baisakhi ...	2,80,916 +	13.8%	6.0%	45.0%	19,069	12.7% (6 crops)	3.8% on 2,109.75"	2,202.75" only.
Jethwi ...	73,185 +	6.9%	2.8%	52.1%	1,825	7.6% (6 crops)	4.1% on 538.0"	658.0" only.

**Bibliography.**

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