

**The Biology and Control of *Saccharicoccus sacchari* Ckll. (Hom: Pseudococcidae)
the Pink Mealy Bug of Sugar Cane in Sri Lanka**

by

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INTRODUCTION

Among the insects recorded on sugar cane, the pink mealy bug *Saccharicoccus sacchari* Ckll. appears to be of great economic importance at Kantalai and Gal Oya. *S. sacchari* live in colonies just below the nodes and concealed within the leaf sheath. Two other species occurring at Kantalai include *Aclerda takahashii* Kuwana, (Rajendra, 1968), and *Pseudococcus saccharifolii* (Green.) Agarwal and Siddiqi (1964) described about a dozen species of mealy bugs found on the Indian sub-continent. The worldwide distribution of the mealy bugs on sugar cane is listed by Box (1953). The mealy bugs which have sugar cane as an important host include species such as *Saccharicoccus sacchari* and *Trionymus radicolica* (Dick, 1969).

BIOLOGY

The males of *Saccharicoccus sacchari* are very rare. The female bugs are wingless and are in abundance. They are sedentary in habit and not capable of movement on their own. *S. sacchari* therefore depends on symbiotic ants for defence and transportation, and in turn provides the ants with honey-dew that exudes from the body. When the leaf sheaths covering the colonies are disturbed, the ants in the neighbourhood immediately give protection and carry the bugs to adjacent nodes or stalks. Dick (1969) describes in detail the mode of reproduction in the mealy bugs and summarises the studies carried out by several authors. The local species is observed to be mainly parthenogenetic. The eggs are covered with a waxy filamentous exudation. Several hundred eggs are laid by a single female. The height of reproductive activity is observed to be during the months of June to August, when drought conditions prevail. The incubation period of *S. saccharifolii* lasts 5 to 6 days while that of *Dysmicoccus boninsis* lasts 10 days (Dick, 1969).

SPREAD OF THE MEALY BUG

Commercially, the sugar cane crop is raised by vegetative propagation from cane pieces which are referred to as seed cane or setts. The main source of carry-over of *S. sacchari* is through seed cane. It is an accepted agronomical belief that the top setts germinate better than the bottom setts because of the softness of the eye buds and higher concentration of glucose. The nymphs which are capable of independent movement are attracted towards the tender top portions of the cane stalk soon after hatching. The dispersion is therefore widespread during the process of planting. Spread of the nymphal population in young cane is also noted to be through irrigation water. During the South West Monsoon season the tiny nymphs get wafted by the wind. The spread of the adult population, which takes place with the assistance of the ants, is more common in lodged cane. Lodging in cane is common when stalk elongation takes place or during the rainy season when the soil becomes loose.

NATURE OF DAMAGE

S. sacchari sucks the sap from the nodes. Dick (1969) is of opinion that when the infestation is high considerable loss of sugar is experienced. It causes death of young cane shoots and can also affect adversely the sugar content of millable cane. Although the actual losses have not been measured, the mechanical injury caused while sucking the sap could lead to the entry of viruses and other disease-causing organisms. Several authors have failed to find *S. sacchari* acting as a vector of any disease of sugar cane; but it is known that *P. saccharifolii* is a vector of the spike disease (Dick, 1969).

CONTROL

As the pest lives concealed beneath the leaf sheath the use of chemicals to control an outbreak yields poor results. The use of chemicals in preventive seed treatment is possible but is not considered economical. Effective control could be achieved through cultural practices. The mealy bug problem at Kantalai has been effectively reduced below levels of economic injury by means of natural enemies present locally.

CULTURAL CONTROL

Use of pest-free seed cane is an essential pre-requisite for the prevention of the spread of the mealy bug. The practice of hot water treatment of seed cane at 50°C for 3 hours, to prevent diseases of sugar cane, completely controls carry-over of the mealy bug. Dick (1969) recommends the removal of trash and stubble for effective control and for preventing the carry-over of the pest into new fields.

CHEMICAL CONTROL

Agarwal and Siddiqi (1964) described in detail the use of BHC, Aldrin, Dieldrin, Endrin, Parathion, Follidol and Malathion for the control of mealy bugs in India. In view of the economic importance of the pink mealy bug, an experiment to evolve its control method was conducted in 1965. Three kinds of seed material, namely the heavily infested seed, completely mealy bug free seed, and the normal seed cane comprising infested and pest free cane, were used for planting. Each kind of seed was dipped in 0.1 % Gamma B. H. C. emulsion before planting. Untreated seed of each kind was also planted in the replicated trial. The experiment had thus six treatments replicated four times in randomised plots of 25' by 20' (1/87 acre).

The variate analysed was the proportion of affected internodes in each plot.

TABLE I - % Internodes Affected by the Pest

	Heavily Infected Seed Replicate (Dipped)	Heavily Infected Seed (No Dipping)	Healthy Seed (Dipped)	Healthy Seed (No Dipping)	Normal Seed (Dipped)	Normal Seed (No Dipping)
1	21.9	9.9	1.7	2.9	15.6	24.2
2	18.9	5.5	2.8	15.1	4.6	1.3
3	25.7	5.1	11.2	3.9	5.9	7.1
4	12.8	8.1	9.6	4.8	3.1	7.5

In order to validate the analysis of variance the above percentage was subjected to the inverse sine transformation ($\theta = \sin^{-1} \sqrt{P}$) where P is the percentage of internodes affected.

Analysis of variance was carried out with the treatment effect split into its factorial components, i.e.

- 1) due to degree of prior infestation.
- 2) due to insecticide.
- 3) due to interaction between degree of infestation and insecticide. The latter shows whether the response to insecticide is different at different levels of prior infestation.

TABLE II-RESULTS

Source	df	SS	MS	f
Blocks	3	61.72	20.57	—
Prior infestation	2	209.04	104.52	2.74
Insecticide	1	45.76	45.76	1.20
Interaction	2	194.71	97.35	2.55
Error	15	573.19	38.21	
Total	23	1084.42		

None of the treatment effects are significant, i.e.

- 1) There is no significant difference in the incidence of the pest among the planting material which differed in its degree of prior infestation.
- 2) There is no significant response to insecticide.
- 3) There is no significant difference in response to insecticide between material with different degree of prior infestation.

Conclusion

The use of 0.1 per cent BHC did not bring about adequate control of the mealy bug pest when used as a pre-treatment at planting time.

BIOLOGICAL CONTROL

The most effective form of control of *S. sacchari* has been afforded by parasites and predators. Several species of such beneficial insects have been recorded at Kantalai. The most important predators are *Carpophilus marginellus* Mots and *Gitona perspicax* Knab. Five species of *Microterys* are recorded as parasites of the mealy bug. These insects have controlled the pest to a remarkable degree.

The life cycle of the *Microterys* sp. was fully investigated in the Entomology Laboratory at Kantalai. The parasite affords adequate control of the pest.

The techniques adopted were similar to those described by Chen (1959). Field collections of the parasitized mealy bugs were kept in a petri dish covered by a glass trough. This prevents the tiny parasites that emerge from escaping. The parasites that emerge were carefully collected in tubes, 3" x 1". The mouths of these tubes were plugged with cotton wool to allow aeration. These parasites were fed on bees' honey diluted in water and kept soaked in cotton wool. The parasites become active and by constantly agitating them mating was promoted. About 5 female parasites were placed in a trough kept inverted over a petri dish containing healthy adult mealy bugs which were fed on sugar cane juice. Several such media were prepared to propagate the parasites. The parasitized bugs were then transferred into 3" x 1" glass tubes kept closed by cotton plugs for day to day observations. In about 5 days the mealy bugs began to shrink and showed signs of drying. The developing parasites within the mealy bug killed the bug by devouring the body contents of the host. About 9 to 13 parasites have been recorded emerging from a single mealy bug. It takes about 21 days for the parasite to complete its life cycle in the host.

Carpophilus marginellus Mots is the most prominent of the predators of the mealy bug. The grub is present on most infested stalks. When moist conditions prevail a dipterous larval predator, *Gitona perspicax* Knab, has been recorded among the mealy bugs. A secondary parasite *Signiphora* sp. has been recorded on *G. perspicax*.

A list of local parasites and predators of the mealy bug that were identified by the Commonwealth Institute of Entomology, London, is given in Table III.

TABLE III—List of Local Parasites and Predators of the Mealy Bug

NAME OF INSECT	HABITAT/NATURE OF DAMAGE	PARASITES/PREDATORS RECORDED
<i>Saccharicoccus sacchari</i> Ckll	Live in colonies concealed underneath the leaf sheath. Suck sap at the nodes. Adults sedentary	PREDATORS
		<i>Carpophilus marginellus</i> Mots
		— NITIDULIDAE
		<i>Carpophilus mutilatus</i> ER
		— NITIDULIDAE
		<i>Haptontus luteolus</i> ER
		— NITIDULIDAE
		<i>Oryzaephilus</i> sp
		— CUCUJIDAE
		<i>Gitona perspicax</i> Knab
		— DROSOPHILIDAE
		<i>Megaselia</i> sp
		— PHORIDAE
		PARASITES
		Gen. Nr. <i>Microterys</i> spp. (5)
— ENCYRTIDAE		
<i>Archisporophagus</i> sp		
— ENCYRTIDAE		
<i>Astymachus</i> sp. japonicus Howard		
— ENCYRTIDAE		
<i>Tetrastichus</i> sp		
— EULOPHIDAE		
<i>Eriaporus aphelinoides</i>		
— PTEROMALIDAE		
SECONDARY PARASITES		
<i>Signiphora</i> sp.		
— THYSANIDAE		
(On <i>Gitona perspicax</i> Knab)		

The cane field rats are yet another group of natural enemies predated upon the mealy bugs. Their identity has been established to be *Millardia meltada meltada*. They have been recorded at Kantalai as frequenting the fields by night and are seen in most fields. The rats gnaw through the lower dry leaf sheaths and devour the mealy bugs that are at the nodes. Several authors have recorded rats attacking sugar cane in most cane growing countries (Bates, 1969). The indigenous species in Kantalai however are not found damaging cane.

SUMMARY

Saccharicoccus sacchari Ckll., the pink mealy bug of sugar cane, and two other species of mealy bugs of lesser importance, are recorded. The habitat of the pest and its relationship with symbiotic ants are described. The mode of reproduction of the local species is by parthenogenesis. The spread of the pest is mainly during the nymphal stage and is carried over through seed cane, irrigation water and wind. The symbiotic ants help spread the adults in lodged cane. The nature of damage and loss caused to sugar cane are discussed. Various methods of control of the pest are described. The use of pest-free seed cane and the removal of trash and stubbles are found to be economical. The use of Gamma BHC as a seed dip is found to be ineffective.

The promising natural enemies found locally are described. The life cycle of a parasite of importance is described. Predatory insects and rats also play an important role in controlling the pest.

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