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The Biology of the Buprestid Leaf Miner, *Trachys* sp a new pest on *Barleria cristata* Linn.*

by

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Synopsis: The biology of a Buprestid leaf miner, *Trachys* sp. (near *virescens* Kerr.) noted for the first time as a pest on *Barleria cristata* Linn. in South India is described in this article.

Introduction: The Buprestids are mainly wood boring beetles but a few are known as leaf miners of economic importance. Though some studies have been made on the wood boring species not much attention has been paid to the study of leaf miners in India. Subramaniam (1920) records *Trachys bicolor* Kerr, on *Butea frondosa* in Mysore State and Ramakrishna Ayyar and Krishna Ayyar (1934) record *Trachys virescens* Kerr. on Cotton and *bhendi*, *T. manscuta* K. on *Sida* and *Trachys* sp. on *Zizyphus jujuba* as leaf miners on the various hosts mentioned above. During the course of investigations on the pests of *Barleria cristata* Linn. (Acanthaceae) the authors noted a leaf mining beetle causing appreciable damage to the plants. The beetle has been identified as a species belonging to the genus *Trachys* (sp. near *virescens* Kerr.) which is evidently a new record on this plant. As the plant is valued much for its attractive flowers and is grown in most of the gardens, orchards and house compounds the occurrence of the insect on the plant is of interest. In view of the scanty information available on the biology of Buprestid leaf miners in India except for *Trachys bicolor* Kerr, on *Butea frondosa* by Subramaniam *(loc cit.)* it was thought worthwhile to investigate the biology of the species on *B. cristata* Linn. and the observations made are presented in this paper.

Nature of damage caused: The chief injury to the plants is caused by the grubs of the beetle which pass their life as leaf miners feeding on the leaf tissue and forming scorched up blotches which are likely to be mistaken for symptoms of deficiency diseases. The adult beetles feed on the tender shoots and sepals of the flowers in the inflorescence. Though the damage caused is light, occasionally during the peak period of occurrence i.e. from July to December it has been observed to inflict severe damage to the leaves of the plant as a consequence of which they look quite dry and result in poor yield of flowers.

LIFE-HISTORY

Copulation: The beetles have been found to mate freely, mostly in the early hours of the day as also during the other parts of the day. The male mounts on the female, bends its abdomen and inserts its aedeagus into the genital opening of

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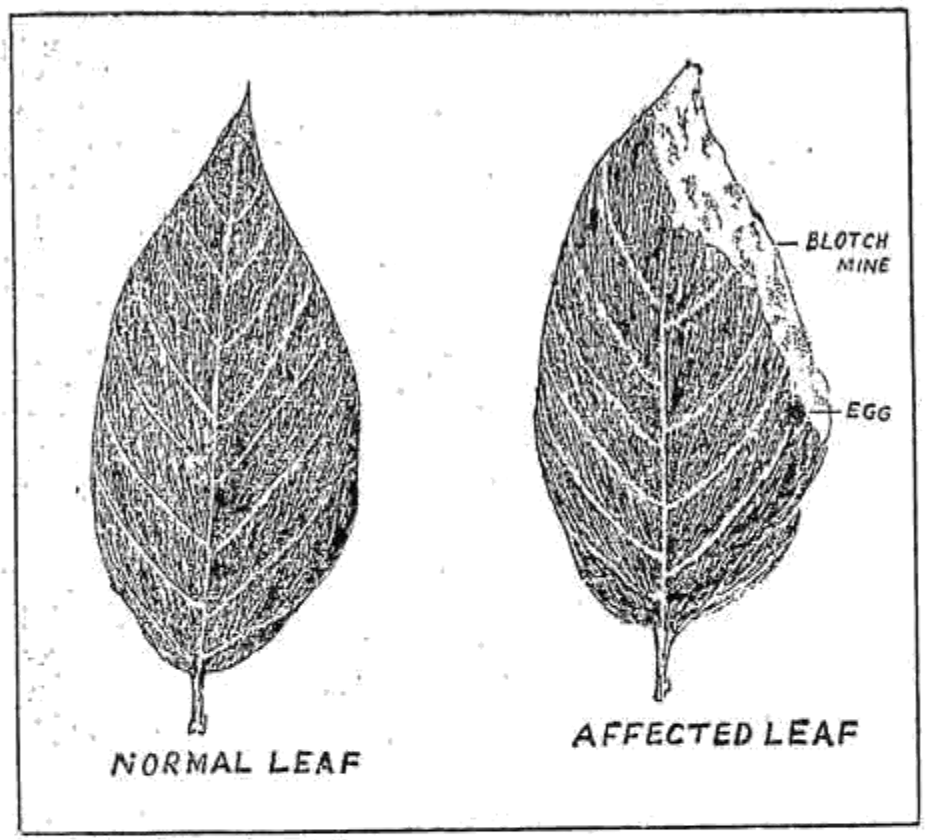
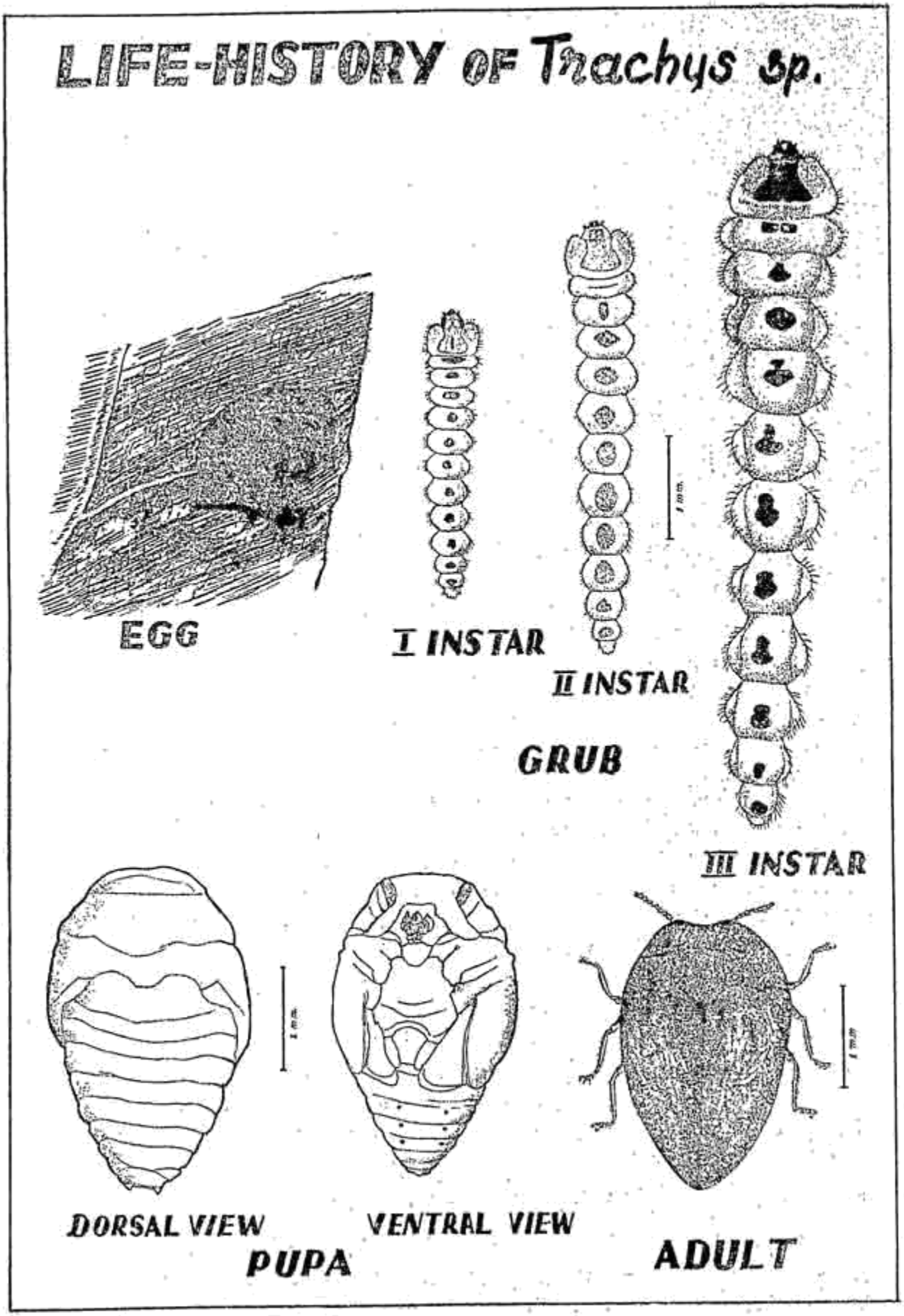
the female. In one instance the period of copulation lasted for about fifteen minutes. Mating takes place more than once at different intervals during the life span of the beetles. The preoviposition period is two days after which the beetle starts laying eggs.



Oviposition: Before laying, the female beetle moves about on the upper surface of the leaves and when a spot is selected on one of the veins near the periphery of the leaf, it first scrapes the epidermal hairs of the leaf with its mouth parts. While scraping the beetle raises the hind part of its body at an angle of about 45° by stretching the hind legs. It takes about ten minutes to scrape the portion of the leaf surface where the egg is to be deposited. During the course of this process the beetle turns round to feel, by drawing its ovipositor on the scraped surface, whether the spot is fit for egg laying. If not satisfied, it once again repeats scraping the epidermal hairs of the leaf. When the beetle is satisfied, it thrusts out its ovipositor and moves it back and forth like a paint brush over the leaf surface for about a minute and suddenly deposits the egg. The whole process of oviposition takes about eleven minutes. When the leaf examined seems to be entirely unsuited for oviposition the beetle moves on to another leaf. As soon as one egg has been deposited the beetle may go to another leaf and repeat the process.

Egg: The flattened oval eggs are laid singly on the upper surface of the leaves which are neither too old nor tender. Very rarely the eggs are laid on the under surface of the leaves. Two eggs are laid on a leaf occasionally but very rarely three on a leaf.


LIFE-HISTORY OF Trachys sp.
EGG
I INSTAR
II INSTAR
GRUB
III INSTAR
DORSAL VIEW
VENTRAL VIEW
PUPA
ADULT

The freshly laid egg is colourless, flat, oval and measures 1·24 to 1·38 mm. at its long axis and 0·92 to 1·07 mm. at its short axis. The egg gradually turns to a shining black colour after about 40 hours. When freshly deposited it flattens out on the leaf like a drop of viscid fluid with the margins extremely thin and thus gets attached very closely to the leaf surface from where it is not possible to remove the egg without the epidermis of the leaf being torn away. It is interesting to note that the egg membrane remains attached to the blotched burrow of the leaf which has been deserted. The incubation period is 6 to 9 days.

Larva : The grub hatches out from the ovum by eating its way through the side adhering to the leaf and passes directly into the leaf tissue without exposing itself to the exterior. Since the egg is firmly attached to the leaf the grub is able to obtain leverage as it eats through the epidermis. The grub thrusts its wedge shaped, flat front portion into the leaf tissue and consumes it by working gradually from side to side without in any way injuring the epidermal layers, thus forming a blotch mine which gives the leaf a blistered appearance. While feeding, its body including the prothorax remains stationery and the head moves from side to side until all the tissue between the two layers of the epidermis within the reach is devoured. Then the prothorax is pushed forward, forcing the two layers of epidermis apart and from this new position the process of eating all the tissues is repeated. The mode of mining by the larva immediately after hatching varies much. Some larvae begin to mine towards the tip, while others mine on the sides towards the base of the leaf. The completed mines usually extended from the midrib to the margin of the leaf. However, it is not uncommon to observe tender leaves in which the grub has crossed the midrib and continued to mine on the other side. Even if there are two or three larvae in the same leaf their mines get united into one and all complete their development successfully.

The larva moults twice and before each moulting it returns to the centre of the mine to moult, for, it is here that all of the casting and eventually the pupa is to be formed. A brief description of the different instars of the grub is rendered below.

First instar : The newly hatched out grub is 3·3 mm. long and 0·587 to 0·604 mm. broad at the broadest part viz., the prothorax. The head capsule is 0·281 to 0·287 mm. broad. The prothorax into which the head is retracted is broad in proportion to the rather slender abdomen. The grub is pale white in colour with distinct segmental constrictions having both on the dorsal and ventral sides peculiar dark brown markings. Small and thin hairs arise from the sides of the grub. The first moult occurs on the third or fourth day after hatching.

Second instar : The second instar grub is similar to that of first instar in colour and markings but it differs mainly in size. The grub measures 4·2 to 4·8 mm. long and 0·707 to 0·775 mm. broad at the broadest portion viz., the prothorax. The head is 0·304 to 0·305 mm. broad. The grub moults again on the third or fourth day after the first moult.

Third instar: The final instar grub is dull white in colour with a tinge of yellow and measures 7·8 to 8·1 mm. long and 1·138 to 1·139 mm. broad at the broadest part viz., the mesothorax. The prothorax is 1·080 to 1·081 mm. broad. The rectractable head capsule is 0·402 to 0·403 mm. broad. The third instar grub differs from the others in having a broader mesothorax. On all the segments both on the dorsal and ventral sides distinct dark brown markings are present. Minute thin hairs arise laterally from each segment.

The greatest amount of mining is done by the final instar grub. When the feeding ceases the grub crawls to the central part of the mine where, surrounded by the dried pellets of excreta, fixing itself at its posterior end with the exuvium, it pupates. The final instar period is three to four days.

The total larval period has been found to range from 9 to 11 days.

Pupa: The newly formed pupa is soft and white but in the course of a few hours it hardens and turns brown. The pupa does not move inside the mine until the emergence of the adult. The pupa resembles the adult in form and shape and is encased in hard chitin. All the appendages are so closely appressed to the body that the chitinous covering is continuous over the whole surface, with only convexities and depressions marking the position of the appendages. The prothoracic leg like the others is so folded that the tibia is posterior to the femur which is quite different to the condition in adult in which the prothoracic leg is folded anteriorly. The pupa measuses 3·3 to 3·5 mm. long and 1·9 to 2·1 mm. broad at the broadest part. The pupal period has been found to last from 6 to 9 days.

To make the emergence of the adult easy, the pupal case breaks medially from the anterior end of the prosternum on the ventral side, over the head and the prothorax to the anterior margin of the mesotergum. When the adult emerges the chitinous cover of the pupa rips open along the impressed lines outlining the legs, wings and thoracic segments, making the emergence of the adult less difficult. On emerging out from the pupa the adult beetle remains within the leaf blotch for a few hours after which it bites a hole mostly through the lower surface and escapes out.

The total life-cycle of the insect from egg to adult had been noted to be completed in 23 to 26 days during September-October 1962.

TABLE 1.

Details of Life-history of Trachys sp. on Barleria cristata Linn.

Sl. No.	Egg period in days	First instar in days	Second instar in days	Third instar in days	Total larval period in days	Pupal period in days	Total period in days
1.	6	3	4	3	10	7	23
2.	7	3	4	3	10	9	26
3.	7	4	3	3	10	6	23

TABLE 1 *(Contd.)*

Sl. No.	Egg period in days	First instar in days	Second instar in days	Third instar in days	Total larval period in days	Pupal period in days	Total period in days
4.	6	4	3	3	10	7	23
5.	6	4	3	4	11	7	24
6.	6	3	3	4	10	7	23
7.	6	3	3	4	10	7	23
8.	6	3	3	3	9	8	23
9.	6	3	3	4	10	7	23
10.	6	4	4	3	11	6	23
11.	6	3	3	4	10	7	23
12.	8	3	4	3	10	7	25
13.	9	3	3	3	9	7	25
14.	8	3	3	4	10	7	25
15.	7	3	3	3	9	7	23
16.	7	3	3	4	10	6	23
17.	7	3	3	4	10	7	24
18.	8	4	3	3	10	7	25
19.	8	3	4	3	10	7	25
20.	8	3	3	4	10	6	24

Adult: The beetle is small and wedge shaped, the head, thorax a elytra being of a bronzy colour having a shiny appearance. It measures 2·7 2·9 mm. lengthwise and 1·7 mm. at the broadest point. The adult beetle af emergence starts feeding on the tender leaves and sepals in the inflorescen cutting little notches which are sometimes very deep. It is capable of flyi rapidly when disturbed but seldom seems to have occasion to fly about as remains on the same plant for a considerable long period. The longevity of t adult has been observed to be about two months.

Food Plants: All the varieties of *Barleria cristata* Linn. having pink, blue, white and blue striped flowers are attacked by the insect. The insect has also been noted to breed freely throughout the year on the common weeds, *Ruellia patula* and *R. prostrata* Poir. which also belong to the family Acanthaceae. Though the yellow flowered *Barleria* viz., *B. prionitis* Linn. is commonly found along with *B. cristata* Linn. the insect has not been observed to attack the plant. When the beetles were confined to the plant under caged conditions they never laid any eggs.

Seasonal Occurrence: Though the beetles are found all through the year they are abundant on the plant from July to December.

Predators and Parasites: A small black ant, *Camponotus* sp. feeds on freshly laid eggs. Nymphs of an unidentified mantid and spiders account for the destruction of the grubs by puncturing the mines and dragging them out. Two unidentified Hymenopterous insects were noted to parasitise the grubs.

Summary: A Buprestid leaf miner, *Trachys* sp. (nr. *virescens* Kerr.) has been noted for the first time as a pest on *Barleria cristata* Linn. in South India and the biology of the insect has been worked out in detail.

The damage is caused by the beetles and their grubs. Adults cut deep notches on the leaves and sepals. The grubs mine into the leaf and cause scorched blotch mines on the leaves. Occasionally in cases of severe infestation the plants look quite dry. Though the beetle is prevalent throughout the year its peak period of occurrence is July to December.

The beetles have been observed to copulate mostly during the early hours of the day and the preoviposition period is two days. Before oviposition, the beetle selects the leaf, scrapes the epidermal hairs and then deposits the egg on the upper surface on the vein near the periphery of the leaf. The egg when freshly laid is colourless and turns shining black in about 40 hours. The small flat white grub haches out from the egg and mines into the leaf in between the epidermal layers without exposing itself to the exterior. It pupates inside the mine in the centre by fixing itself at the posterior end with the exuvium. The total life-cycle of the insect from egg to adult has been found to be completed in 23 to 26 days, the egg, larval and pupal periods being 6-9, 9-11 and 6-9 days respectively. The longevity of the adult has been noted to be about 2 months.

Apart from *B. cristata* Linn. it has been noted to breed on *Ruellia patula* and *R. prostrata*. A black ant, *Camponotus* sp. feeds on the egg. Unidentified Mantid and spiders and two species of Hymenopterous insects are predaceous and parasitic respectively on the grub.

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