

BIOLOGY OF *TREATIA INDICA* KRANTZ AND KHOT
(ACARINA : PHYTOSEIIDAE),
A MITE PARASITE OF THE RED-COTTON BUG IN INDIA

BY

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INTRODUCTION

A group of mites was found heavily parasitizing the red cotton bugs (*Dysdercus koenigii* (Fab.), in New Delhi, India. This mite was subsequently described by KRANTZ and KHOT (1962) as *Treatia indica* (Acarina : Otopheidomenidae). TREAT (1965) transferred *T. indica* to *Hemipteroseius* as *H. indicus* (KRANTZ & KHOT). However, WAINSTEIN (1972) synonymised *Hemipteroseius* to *Treatia* and transferred it to the family Phytoseiidae. Since its discovery from India, *T. indica* has also been reported from lygaeid and pyrrhocorid bugs from Congo and Israel (COSTA, 1968 ; RAMSAY, 1973).

The red cotton bugs are occasionally known to assume pest status by attacking cotton, okra and other malvaceous plants in different parts of the world. During November, 1973, *T. indica* was found to attack the red cotton bugs for the first time in the Punjab State. Since no biological study of this mite parasite was done anywhere, it was felt desirable to study the biology of this parasite so that the informations could be utilized in the biological control of this pest.

METHODS AND MATERIALS

The biology was studied in the insectary during 1974 where temperature and humidity remained $30.9 \pm 4.8^{\circ}\text{C}$ and $63.0 \pm 7.0 \%$ respectively. The potted cotton seedlings of about 4-6 inches length were selected and glass chimney cages of 20.3 cm. length that had one end covered with muslin cloth for air passage were used in the experiment (Fig. 1). A regular supply of infested and uninfested host material was collected from hollyhock (*Althea rosea* L.), an alternate host plant. One female mite was released on the dorsal side of abdomen below the wings on each uninfested host. Thus 70 cages were prepared for the observations. After 24 hours the female mites were removed from the host when the eggs were found laid. The eggs were observed every 24 hours till they hatched and reached the adult stage. Moults were removed from the host with the help of a fine needle.

To study the number of eggs laid per day per female, single mite was maintained separately on 10 hosts in cages as mentioned above. The hosts were observed every day and the eggs whenever found laid were removed from the host. The observations on the number of eggs laid per day was maintained only for 5 hosts for 5 days.

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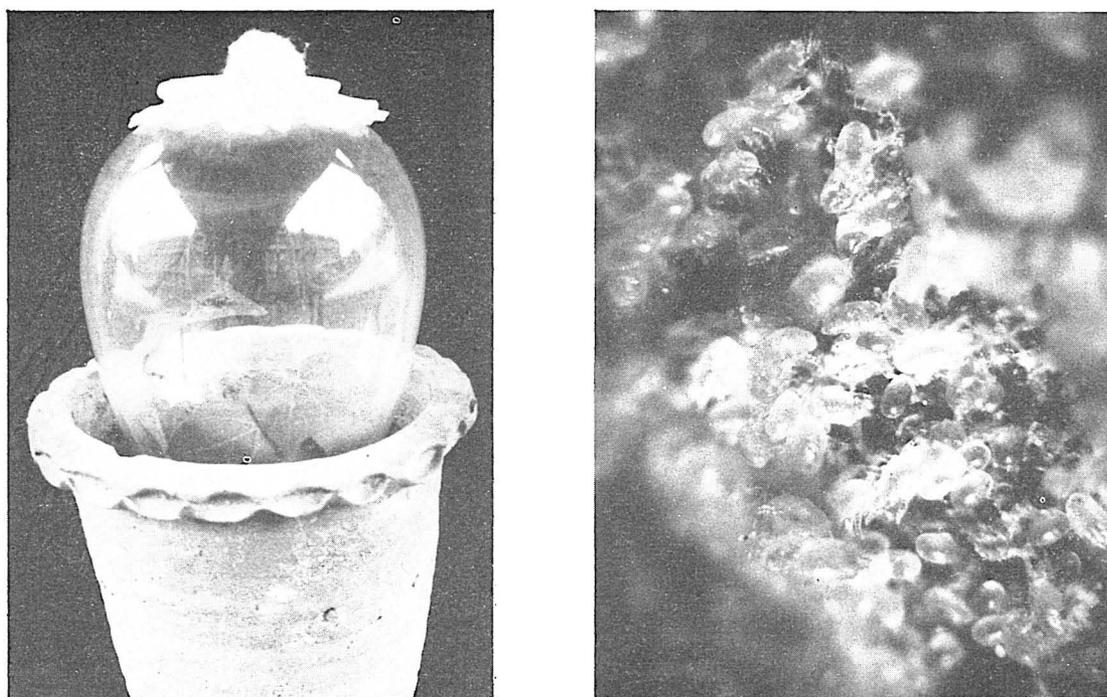


FIG. 1 and 2 : 1) Glass Chimney cage ;
2) Different life stages of *Treatia indica* Krantz & Khot on the dorsal abdomen of *Dysdercus koenigii* (Fab.)

The intensity of infestation was studied by collecting the red cotton bugs every month. The hosts were examined for mites and the number of infested and uninfested hosts was recorded.

Ten cages (5 for infested and 5 for uninfested hosts) were used to study the mortality rate. Ten moderately infested hosts (5 males and 5 females), each with 10-15 mites per host, were released in 5 cages. Ten uninfested hosts (5 males and 5 females) per cage were released in 5 other cages. At the end of 15 days the total number of live and dead hosts was counted to find out the mortality rate.

All the observations on the biology were taken under a binocular microscope using 105-225 × magnifications. The hosts were examined one at a time. The head of the red cotton bug was caught between the fingers of the left hand and, using the right hand, all the wings were raised towards head with the help of a long needle. For removing eggs or the mite from the host, help of another person was taken to lift the wings.

RESULTS

The life stages of *T. indica* includes egg, larva, protonymph, deutonymph and sexually mature adult male and female. The females were large and possessed a broader opisthosoma than the males.

(1) *Egg stage* : The females laid only one egg at a time. The eggs were laid on dorsal side of abdomen below the wings, under the pronotum, on metathorax and at the wing base. The

dorsal abdomen and metathorax. Ist abdominal segment were most favourable places for the egg laying. The eggs seemed to be lightly glued with the host's integument. The females deposited up to 3 eggs per day per female (averaging 1.8) (Table I). The eggs were laid in same place side by side or slightly away from each other. No fixed pattern for egg laying was found. The eggs were white and slightly kidney shaped. The length and width of the eggs measured 198 and 112 μ in slide prepared specimens ².

TABLE I. — Number of eggs laid per day by a female *T. indica* during May 1974.

Mite Number	Days					Total	Av.
	1	2	3	4	5		
1	2	2	2	3	1	10	2.0
2	3	0	2	1	2	8	1.6
3	2	2	2	2	2	10	2.0
4	1	1	3	2	2	9	1.8
5	1	1	1	2	2	7	1.4
Total	9	6	10	10	9	44	8.8
Av.	—	—	—	—	—	—	1.8

(2) *Larval stage* : After 1-3 days (averaging 1.8 days) the eggs hatched into the hexapod larval stage. Larvae were least mobile. Usually they were found on the same place where the eggs were laid by the female and moved slightly if touched with the needle. No parental care of eggs or larvae was noticed. The newly hatched larva was white in colour. It measured 172 and 98 μ in length and width respectively ³.

(3) *Protonymphal stage* : After 1-3 days (averaging 1.5 days) the larvae moulted into eight legged protonymphal stage. The protonymphs were large, white and more active than the larvae. Occasionally, they were found wandering around on abdomen and ventral side of the wings. They measured 194 and 128 μ in length and width respectively.

(4) *Deutonymphal stage* : The protonymphs moulted into eight legged deutonymphal stage after 2-3 days (averaging 2.3 days) of the protonymphal period. They were large, white and very active. They measured 240 and 152 μ in length and width respectively.

(5) *Adult stage* : After 3-4 days (averaging 3.5 days) the deutonymphs moulted into sexually mature eight legged adult stage. The total period from egg to adult was 7-13 days (averaging 9.1 days) (Table II). The females were large and possessed more posteriorly pointed opisthosoma than the males. The male measured 242 and 160 μ and female measured 304 and 172 μ in length and width. The sex ratio from female to male was 5 : 1.

2. Five specimens were measured for all the life stages. These were prepared in Hoyer's medium on 7.6 × 2.5 cm glass slides.

3. The length and width of idiosoma were measured at the longest and widest points.

TABLE II. — Duration of immature stages of *T. indica* in days during May 1974.

Stage	Range	Mean	S. D.
1. Egg(65) *	1-3	1.8	0.5
2. Larvae (43)	1-3	1.5	0.7
3. Protonymph (19)	2-3	2.3	0.4
4. Deutonymph(6)	3-4	3.5	0.5
Total	7-13	9.1	2.1

* Numbers in brackets represent the number of sets or replicates studied.

(6) *Preoviposition, oviposition, longevity and mating* : Because of high mortality in the host and disappearance of mites from the host during summer, the experiment on preoviposition, oviposition and longevity could not be continued. No mating was observed and it could not be ascertained if the eggs were produced parthenogenetically too.

(7) *Feeding* : Nymphs and adults were found feeding on the host but apparent symptoms of feedings were not seen.

(8) *Incidence* : The percentage of infestation of the red cotton bugs varied from 28 per cent in May to 0 per cent in June. Occasionally, one to over 200 mites, excluding eggs were seen on single infested host. However, with moderate infestation, no significant mortality difference was found between infested and uninfested hosts. Occasionally, no mites were seen on abdomen but there were hundreds of mites (all stages) under the pronotum. Rarely, a few mites were found attached on the legs of the host.

DISCUSSIONS

Treatia indica, in some cases, heavily parasitizes the red cotton bugs in the Punjab State. However, it does not seem to cause heavy mortality in the hosts with moderate infestations. No apparent feeding symptoms were seen on the host. It is possible that the mites feed mainly by scrapping the integument as they possess saw-like chelicerae. In case of heavy infestations, hosts may suffer discomfort, weight loss and other direct or indirect losses. COSTA (1968) has reported *Hemipteroseius* species in Israel feeding on the cero-integument of their hosts which apparently suffer no harm.

The mites carry and lay only one large egg at a time which is true with other members of the Phytoseiidae. It is not known at this time if *T. indica* produces also parthenogenetically. In general, the members of the subfamily Phytoseiinae are predators, occasionally feed on their own immature stages during the periods of lack of food (PRASAD, 1974) and frequent matings are essential for continued production of the eggs (PRASAD, 1967). The members of the subfamily Tritinae are ectoparasites, do not feed on their immatures and frequent matings may not be essential for continued egg laying. It is possible, as is the case with many parasitic mites, that the eggs in *T. indica* are also laid parthenogenetically.

T. indica is a colonial mite. All the stages of the parasite are found on the same host (Fig. 2). They prefer to be in hidden places. It was tried several times to localise an adult mite on the

open side of the host's body but each time the mite moved below the wings. Also, the mites preferred colonial living than the individual livings. When 4-5 adults were released on a single host and their eggs not removed, all were found colonized but when single mite was introduced on the host and eggs removed, invariably the mites left the host.

The above mite has so far been recorded only from Congo, India and Israel from lygaeid and pyrrhocorid bugs. The same hosts are also present in several other countries, especially in the Asian continent. It is believed that *T. indica* is widely distributed in many other countries.

The red cotton bugs during winter were absent from the plants. As such no mites could be found on them. During June (summer), even though hosts were present in small numbers, no mites could be found from field collected hosts. What happens to these mites during high summer or winter? How do they acquire host? Do the other mites follow any chemical trail? What is the effect of chemicals on these mites? These are some of the questions that need further investigations.

SUMMARY

The biology of *Treatia indica* Krantz and Khot (Acarina : Phytoseiidae), an ectoparasite of the red cotton bug, *Dysdercus koenigii* (Hemiptera : Pyrrhocoridae) is reported from India. The life stages include egg, larva, protonymph, deutonymph and adult male and female. At a temperature and humidity of $30.9 \pm 4.8^{\circ}\text{C}$ and $63.0 \pm 7.0\%$ in the insectary, the female mites laid an average of 1.8 eggs per day/female. The average durations of the life stages were : egg, 1.8 ± 0.5 days ; larva, 1.5 ± 0.7 days ; protonymph, 2.3 ± 0.4 days ; and deutonymph, 3.5 ± 0.5 days. The female-male sex ratio was found to be 5 : 1 but no mating was observed. Only protonymph, deutonymph and adults were found feeding on the skin of the host but no feeding punctures were seen. It is presumed that they feed by scraping the skin. As many as 200 mites, excluding hundreds of eggs, were occasionally found on a single host under pronotum and on the dorsal side of abdomen below the wings. With moderate infestations no significant mortality was found in the hosts.

RÉSUMÉ

La biologie de *Treatia indica* Krantz et Khot (*Phytiseiidae*), ectoparasite de l'Hémiptère *Pyrrhocoridae* : *Dysdercus Koenigii* est étudiée. Le développement comprend l'œuf, la larve, la protonympe et l'adulte.

A une température de $30,9 \pm 4,8^{\circ}$ et une humidité de $63,0 \pm 7,0\%$ dans l'insectarium, les femelles pondent en moyenne 1,8 œufs par jour. La durée du développement est la suivante : œuf : $1,8 \pm 0,5$ jours ; larve : $1,5 \pm 0,7$ jours ; protonympe : $2,3 \pm 0,4$ jours ; deutonympe : $3,5 \pm 0,5$ jours. La sex ratio est de 5 femelles pour un mâle. L'accouplement n'a pas été observé. Seuls les protonymphes, les deutonymphes et les adultes ont été observés en train de manger sur la peau de l'hôte, mais les piqûres n'ont pas été vues. On peut supposer qu'ils se nourrissent en grattant la peau. Plus de 200 Acariens, sans compter les centaines d'œufs, ont été trouvés sur un seul hôte sous le pronotum et sur la face dorsale de l'abdomen sous les ailes. Dans le cas d'une infestation modérée aucune mortalité significative n'a été mise en évidence chez les hôtes.

ACKNOWLEDGEMENT

I wish to express my thanks to Dr. O. S. BINDRA, Professor and Head, Department of Entomology, Punjab Agricultural University, Ludhiana (Punjab) for providing facilities to carry out the present work and to Dr. A. S. SIDHU, Senior Entomologist (Research) of the above department for going through the manuscript.

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