

STUDIES ON THE BIOLOGY OF THRIPS (*STENCHAETOTHRIPS BIFORMIS*) OF MEGHALAYA¹Dr. S. Choudhury and ²Dr. M. Kharbangar¹Assistant Professor, Department of Zoology, Entomology Lab. North Eastern Hill University, Shillong- 793022, India.²Research Scholar, Department of Zoology, Entomology Lab. North Eastern Hill University, Shillong- 793022, India.***Corresponding Author: Dr. S. Choudhury**

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ABSTRACT

Study on biology of *Stenchaetothrips biformis* (Bagnall) on rice *Oryza sativa* (Linn.) showed that the thrips laid singly minute, kidney shape and translucent white in colour egg inside the leaf tissues with its pointed ovipositor. The average incubation period varied from 2.92 ± 0.18 days. The Larvae passed through two instars. The average first larval period varied from 3.38 ± 0.19 days and second larval period varied from 1.5 ± 0 days while both pre-pupal and pupal period were 1.38 ± 0.19 days, respectively. The average pre oviposition, oviposition and post-oviposition period were 2.63 ± 0.19 , 3.29 ± 0.14 and 3.63 ± 0.49 days, respectively. The average fecundity of female was 22.25 ± 0.7 eggs during entire life span. The average longevity of adult was 21.79 ± 0.58 days. Total life cycle lasted for 25.75 to 36.17 days with an average of 30.96 ± 0.61 days.

KEYWORDS: *Stenchaetothrips biformis* (Bagnall); *Oryza sativa* (Linn); Biology (Egg, Larvae, Pre-pupa, Pupa and Adult).

INTRODUCTION

Thrips (Thysanoptera) are closely related to other insects in hemipteroid assemblage, such as book lice (Psocoptera), lice (Phthiraptera), true bugs (Hemiptera), whiteflies and aphids (Sternorrhyncha), cicadas and treehoppers (Auchenorrhyncha). Although, insects in hemipteroid assemblage develop hemimetabolously, they are exopterygotes that most closely relate to endopterygotes which develop holometabolously.^[1] Thrips, though do not have complete metamorphosis, they do have two or three quiescent and non-feeding stages depending on suborder classification.^[2] Females of most thrips species in the suborder Terebrantia oviposit within the leaf tissue of host plants. Incubation and developmental periods vary with species and environmental conditions.^[3, 4, 5, 6] Eggs hatch after 2-26 days.^[7, 8, 9, 10, 11, 12, 13, 3, 14, 4, 5, 6] Following eclosion, two plant feeding larval stages occur. Larval development periods range from 2-13 days.^[7, 8, 9, 10, 11, 12, 13, 3, 14, 4, 15, 6] These two larval stages are followed by a mobile, but non-feeding pre-pupal stage. Thrips adults emerge after 1-10 days.^[7, 8, 9, 10, 11, 12, 13, 3, 14, 4, 15, 5, 6] Most species of thrips overwinter as adults.^[4, 16, 17, 15, 18, 19]

The life stages exhibited by *Stenchaetothrips biformis* are typical of the Terebrantian Thysanoptera. There are four immature stages before adulthood, two of which are active and two of which are inactive. The two active immature stages are termed larva 1 and larva 2 and the inactive stages, pre-pupa and pupa.^[20] The two active

larval stages ingest all the food required by the thrips for development to the adult stage. Reproduction in *S.biformis* is predominantly parthenogenetic especially in the warmer environment where males are rarely seen at all.^[21] Some males are seen in field populations but they are rare and the sex ratios of most populations appear to be heavily balanced in favour of females. Female's ovipositors are sharp and saw-like and are used to cut into the surface of the leaf; eggs are then laid inside the leaf surface with only a small area projecting above it. This provides the egg with a high level of protection from both predators and desiccation and makes *S.biformis* eggs very difficult to locate.

MATERIAL AND METHODS

Experimental sites: The study specimen were from Mawlai site in Meghalaya "Fig. 1." under laboratory condition at an average temperature of 16 - 26°C and relative humidity 40-60%, following the protocol of H. M. Rohini and K. Ekanayake, 1984^[22] and H. R. Pourian *et al.*, 2009^[23], in the Department of Zoology Entomology Laboratory, North Eastern Hill University, Shillong.



Fig. 1. Mawlai study site in Meghalaya

Laboratory culture of host: The three days paddy leaves from nurseries are planted in flower vase and covered with a muslin cloth to prevent the outward movement of thrips. These plants are then used as food and rearing material for the further study of biology “Fig. 2”.



Fig. 2.: Mawlai study site in Meghalaya

Laboratory culture of *S.biformis*

In order to develop the initial culture of thrips, *S.biformis* adults were collected with the help of camel brush from rice fields at Mawlai site. Both adult's males and females (most of the thrips were females due to thelotokous parthenogenesis) were collected individually with the help of camel brush and released into the flower vase containing fresh paddy leaves. Two females and one males thrips collected from each sites were then released into glass beaker (150 × 18 mm) in 6 replicates containing fresh paddy leaves for oviposition the beaker was covered with a fine muslin cloth and wet cotton to maintain humidity “Fig. 3.”. As soon as the larvae emerged from the leaves, they are reared individually in separate glass beaker (150 × 18 mm) covered with a fine muslin cloth and wet cotton to maintain humidity on paddy leaves up to adult stage. The adults were used for further investigations.



Fig. 3.: Laboratory culture of *S.biformis*

Incubation period of *S.biformis* is considered as a period between day of egg lying and day of egg hatching. The colour of eggs was typically observed after hatching. With a view to determine the number and duration of different larval instars, the newly hatched larva of *S.biformis* was kept individually and fed with paddy leaves. The total larval period was calculated. The pupa, when formed collected and kept individually into glass beaker (150 × 18 mm) for emergence of adults. Observations on pre-pupal and pupal periods were recorded. Adults emerged from pupa were observed for their colour, shape and size by examining under microscope with the help of ocular and stage micrometer. In order to determine the pre-oviposition period, the newly emerged adults of *S.biformis* are kept separately in glass beaker (150 × 18 mm). Fresh paddy leaves are provided as food. The period between the emergence of adult female and commencement of egg laying recorded as the pre-oviposition period. Period between commencement the egg laying and ceasing of the egg laying by individual female recorded as oviposition period and period between ceasing of egg laying to death of female was considered as post-oviposition period. The total number of eggs laid during the life span of the adult female considered as its fecundity. Longevity of adult was calculated separately from the date of emergence to death of adults. Total life cycle considered as the period between the dates of egg laying to the death of adults.

RESULT AND DISCUSSION

Eggs

Studies on site of oviposition showed that the female thrusts eggs singly and scatteredly in the upper epidermal tissue inside the leaf with its pointed ovipositor. The eggs studied could be seen as minute translucent swellings when viewed in transmitted light and whitish in colour. Almost similar observations were also reported by Rohini and Ekanayake 1984.^[22] Since the eggs embedded in leaf tissues, the incubation period was derived based on number of larvae which emerged out from the eggs. The incubation period of thrips from Mawlai site varied from 2.58 to 3.25 days with an average of 2.92 ± 0.18 days “Table 1”. The incubation period reported to be 4 to 4.5 days on cotton^[24], 4.52 days on garlic^[25] and 4.97 days on onion.^[26] Thus, this period depends on the host on which the pest reared.

Larvae

An investigation was carried out to study the number of larval instars, instar duration and entire larval period of this pest. Newly hatched larvae reared individually up to pupation in separate glass beakers containing paddy leaves. The larvae moulted once and passed through two larval instars. The first instar larva was small. It was completely transparent but becomes pale yellow in colour with the ingestion of food, head bears a short pair of seven segmented antennae, body is covered with long bristles and there were no wing buds. The first instar larval period varies from 3 to 3.75 days with an average of 3.38 ± 0.19 days "Table 1". The second instar larva resembled with the first instar in general appearance except body size and colour. The body colour of the second instar larvae was white to light yellow. The abdomen divided into 8 distinct segments and a large segment, which was conical in shape. There were 3 pairs of leg. The second instar larval period varies from 1 to 2 days with an average of 1.5 ± 0 days "Table 1".

Pupa

Pupation normally takes place inside the rolled leaves under laboratory condition in the rearing glass beakers. It is also observed that before pupation, the second instar larva become sluggish and entered into pre-pupal stage, which was pale yellow in colour, eyes are red, small wing buds are also visible at this stage and the antennae are freely directed forward, all other character are essentially larval in nature. Larvae of thrips remain as pre-pupae for about 1 to 1.75 days with an average of 1.38 ± 0.19 days "Table 1". The pupa, when completely formed the antennae folded back over the head and wing pads were well developed. Both the stages have showed slight movement, when they were disturbed. The colour of pupa was pale yellow, antennae are slightly longer than those of pre-pupa and are deflected over the prothorax, wings buds are longer than pre-pupa, eyes are red and genitalia are visible in the abdominal region of the pupa. Pupal period of thrips varies from 1 to 1.75 days with an average of 1.38 ± 0.19 days "Table 1". These findings are similar to the results of Changela, 1993 on garlic and Fekrat *et al.*, 2009, on onion.^[25, 26]

Adult

It is observed that the adult thrips immediately after the emergence from the pupa, climbed up on the wall of glass rearing beaker. The colour observed to be dark brown with a pair of seven segmented antennae, eyes are dark brown and there are three ocelli between eyes arranged in a triangle on the dorsal side of the head, the characteristic long mouth cone is directed ventrally towards the prothorax and the tip of the cone is black and the fore wings and hind wings were fringed and pale in colour. The adult period of thrips varies from 17.17 to 23.67 days with an average of 20.42 ± 0.39 days "Table 1".

The pre-oviposition period of thrips was around 2 to 3.25 days with an average of 2.63 ± 0.19 days. The egg laying (oviposition) of thrips continued for 2.83 to 3.75 days with an average of 3.29 ± 0.14 days. Post oviposition period of thrips from varies from 2.5 to 4.75 days with an average of 3.63 ± 0.49 days. The number of eggs laid by female during its entire life span of thrips ranged from 21.17 to 23.33 with an average of 22.25 ± 0.7 . Developmental period or longevity of this pest varies from 18.17 to 25.42 days with an average of 21.79 ± 0.58 days and entire life span of female varies from 25.75 to 36.17 days with an average of 30.96 ± 0.61 days "Table 1". Under laboratory conditions, adult lifespan is relatively long compared with immature development time. For example, at 28°C, median egg to adult development time is 12 d, whereas median longevity for females is 26 days^[27], with some females living up to 5 weeks.^[28, 29, 30, 27] The relevance of these data to actual longevity in the field is unclear, but overlapping, continuous generations are likely to occur in the field. Although determining longevity in the field is problematic with such small vagile insects, mark-recapture studies indicate that adults can survive for over 5 days following release in pepper and tomato plantings. Results obtained through the present investigation are near to the results of Rohini and Ekanayake, 1984.

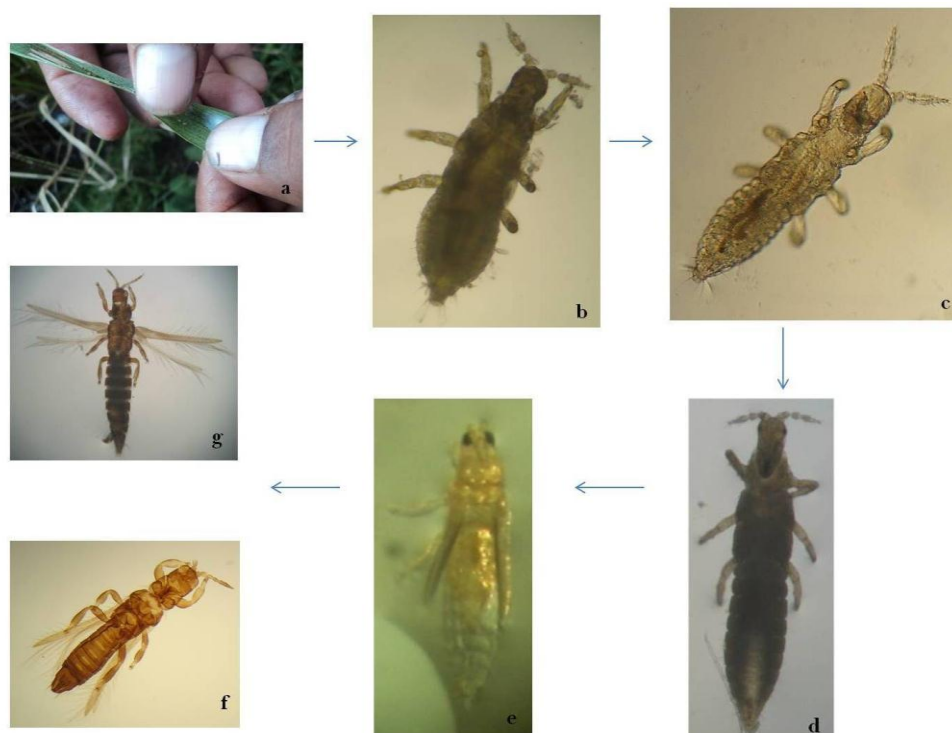


Fig. 4.: Life cycle stages of *S. biformis*; a) Egg stage; b) Ist instar larva; c) IInd instar larva; d) Pre-pupa; e) Pupa; f) Adult male; g) Adult female

Table 1.: Duration of various life stages of *S. biformis* from Mawlai site

Sl.No.	Stage	Duration (Days)		
		Min	Max	Mean \pm SD
1	Egg	2.58	3.25	2.92 \pm 0.18
2	Ist instar larva	3	3.75	3.38 \pm 0.19
3	IInd instar larva	1	2	1.5 \pm 0
4	Pre-pupal	1	1.75	1.38 \pm 0.19
5	Pupal	1	1.75	1.38 \pm 0.19
6	Adult	17.17	23.67	20.42 \pm 0.39
7	Pre-oviposition	2	3.25	2.63 \pm 0.19
8	Oviposition	2.83	3.75	3.29 \pm 0.14
9	Post-oviposition	2.5	4.75	3.63 \pm 0.49
10	Longevity	18.17	25.42	21.79 \pm 0.58
11	Total life period	25.75	36.17	30.96 \pm 0.61
		No. of eggs		
		Min	Max	Mean \pm SD
12	Fecundity	21.17	23.33	22.25 \pm 0.70

*Mean data of six replicates

CONCLUSION

The requirement of knowing the biology of these minute insects in rice plants will be a boon to agriculturist in the state of Meghalaya as fewer reports have been put into account regarding their existence. The knowledge on their feeding habits and types of damaged they can cause will provide a significant influence on the economic production.

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