

87721
P. D.
24.3.83.

CR/PS/100/154

2023/2024
CR
100/154

INVESTIGATION OF THE BIOLOGY AND LIFE HISTORY OF
TETRASTICHUS HAGENOWII (RATZ.), THE EGG PARASITE OF
THE AMERICAN COCKROACH PERIPLANETA AMERICANA (L.)

by

Priyadarshani Gamalath



Thesis submitted for the Degree of Master of Science of the
Faculty of Science, University of Sri Jayewardenepura,, Nugegoda,
Sri Lanka

87721

August, 1980

18778

ABSTRACT

- 1) The biology and life cycle of the egg parasite Tetrastichus hagenowii (Ratz.) (Hymenoptera : Eulophidae) was studied in order to find out whether it is suitable for use in the control of the cockroach Periplaneta americana. Although a few scientists in various parts of the world had worked on this parasite they had not given sufficient information about its biology and other features like searching behaviour and the pattern of population fluctuation. In any case, even those parts of its biology that had been studied by these authors had not been studied under Sri Lankan conditions. I have, therefore, attempted to rectify this lack of knowledge about the parasite and in my study the following salient features of its biology, behaviour and ecology have been worked out.

- 2) T. hagenowii oviposits inside the eggs of P. americana that are within the oothecae. The parasite eggs are elongate and oval and measure 0.32 mm in length and 0.04 mm in breadth. The newly hatched larva is 0.48 mm in length and is broadest at the middle. The mature larva is 2.7 mm in length and 0.75 mm in breadth. The width of head capsule is 0.11 mm on the average. When measurements of length and width of the head capsule of larvae were analysed according to Dyar's Law it was seen that T. hagenowii has four distinct larval instars. Pupae are off-white in colour. Mature pupae are

2.4 mm in length and 1.8 mm in breadth. Red eyes, mouth appendages, rudiments of legs and the wing buds are visible at this stage.

- 3) Adult T. hagenowii are black in colour. The female parasite is 2.0 mm in length and the male is 1.44 mm in length. Eyes are reddish brown in colour. Both male and female parasites are weak fliers. The size of the male and female parasites vary considerably depending on the number of parasites in a brood. This relationship is more pronounced in the case of the females than in the case of the males.
- 4) From a single parasitized ootheca 5 to 195 parasites emerged, the average being 64. The maximum number of offspring produced by a single oviposition is 54. Therefore, it becomes clear that in a large number of broods at least two females had oviposited. From each ootheca, therefore, a mixed brood actually emerges. This would be important from an evolutionary point of view as this would allow a mixture of gene pools, for on emergence it is most likely that males and females of the same brood would mate.
- 5) In the total population of T. hagenowii counted by me (17,085) the average sex ratio was found to be 1 male : 2 females. On three occasions unisex broods (1 all male and 2 all female) were observed. In just a few broods (offspring from one cockroach ootheca) there were more males than females. In general, therefore, at least twice as many females as males were obtained from each parasitized ootheca.

C O N T E N T S

	Page
ACKNOWLEDGEMENTS	i - iii
ABSTRACT	iv - ix
CHAPTER 1 - INTRODUCTION	
1.1 General	1 - 10
1.2 The review of literature on <u>T.hagenowii</u> (Ratz.)	10 - 15
CHAPTER 2 - MATERIALS AND METHODS	
2.1 Rearing techniques of the cockroach	16 - 20
2.2 Rearing techniques of the parasite	21 - 24
2.3 Apparatus used for the study of searching behaviour of the parasite	24 - 25
2.4 Rooms used for searching behaviour	25
2.5 Field stations	26 - 28
CHAPTER 3 - OBSERVATIONS AND RESULTS	
3.1 The breeding of the parasite	29 - 47
3.2 Development of the parasite inside the ootheca	47 - 80
3.3 Searching behaviour of the parasite	81 - 115
3.4 Studies on parasitization of cockroach oothecae in the laboratory	115 - 132
3.5 Field work	133 - 160
CHAPTER 4 - DISCUSSION	161 - 180
REFERENCES	181 - 184