

COMPARATIVE STUDIES ON THE RED COTTON BUG,
Dysdercus cingulatus Fabr. AND ITS PREDATOR *Antilochus cocquebertii*
Fabr. (Heteroptera : Pyrrhocoridae).

Ahmad Ali BALOCH*

ABSTRACT

Feeding behaviour and biology of the red cotton bug, *Dysdercus cingulatus* Fab. and its predator, *Antilochus cocquebertii* Fabr. was studied under laboratory conditions at a temperature 30°C and 70% relative humidity. This is the first time that *A. cocquebertii* has been reared under laboratory conditions. The nymphs and adults of *A. cocquebertii* feed on the eggs, nymphs and adults of *D. cingulatus*. A number of other insect species offered as food were not accepted even by starved predators. *A. cocquebertii* therefore, was found a specific predator of *D. cingulatus*.

The nymphal duration and adult longevity was found to be longer in *A. cocquebertii* than its prey *D. cingulatus*. The number of egg batches produced by a single female of *A. cocquebertii* were much more than that laid by *D. cingulatus*. Both the predator and its prey could tolerate low temperature (16°C). A table showing comparative study on the developmental stages of the two species is given.

INTRODUCTION

Cotton is an important cash crop for Pakistan. A total of 2,270,000 ha were under cultivation in 1984, of which 1,620,000 ha in the Punjab Province and 650,000 ha in Sind. But the mean yields is below world average, which was 493 kg lint/ha in 1984. In the Punjab and Sind, yield was 372 kg and 438 kg/ha respectively, during that year, giving an average yield of 405 kg for Pakistan. This unsatisfactory state of affairs is being attributed to several limiting factors, such as poor quality of seed, salinity low plant population, and damage by insect pests and diseases.

C.Ü. ZIRAAT FAKÜLTESİ DERG. CİLT : 6 SAYI : 1 1990

* Cotton Research Institute, Sakrand District Nawabshah Pakistan :

It is estimated that insect pest alone cause a yearly yield loss of 30% - 40% (Anonymus 1983). Much attention is at presently given to plant protection, resulting in a rapid increase in the use of insecticides, especially in the Punjab. In this province 242,000 ha were treated in 1982; which area had increased to 843,000 ha (52% of total cotton hectareage) in 1984. Relevant figures for the province of Sindh are from 129,000 ha to 168,000 ha (25% of total cotton hectareage) over the same 2 years period.

Import restrictions on pesticides were lifted in 1983 so as to encourage private industry to assist in promoting the use of insecticides. Due to this action the prices of pesticides jumped up about 100 to 200% which is a challenge to the entomologists to find out the effective and cheap way of controlling the pests of economic importance.

Dysdercus cingulatus is a pest of cotton and some times causes a noticeable damage to the crop. It also feed on many Malvaceae plants such as silk cotton, *Bombax eschla*; Lady's finger, *Abmoschus esculentus* etc.

Anillochus cocquebertii Fabr. are bright scarlet red bugs with the forewings red and having black apexes (Lefroy, 1909). These bugs are common in fields of Malvaceae plants where *D. cingulatus* are available to them as food. The predatory nature of *A. cocquebertii* was first reported by Pradhan and Memon (1942) from Delhi and Karnal in Rayona State but no detailed studies neither in India nor in Pakistan have so far been made to study the behavioural ecology of *A. cocquebertii* which is to be a specific predator of red cotton bug.

Keeping these lacking points in view some preliminary studies on red cotton bug, *Dysdercus cingulatus* and its predator *Anillochus cocquebertii* were carried out in the laboratory.

MATERIAL AND METHODS

The adults of *Dysdercus cingulatus* is about 1/2" long; red, with eyes, antennae, scutellum, and a spot on each forewing and the membrane of each forewing black; a series of white transverse bands along the posterior margin of each thoracic and abdominal sterna; anterior collar of abdomen also white. The nymphs are red with a central row of black spots bordered on each side by a row of white spots on the abdomen.

Since last two years *D. cingulatus* adults and nymphs are reared in the laboratory on the seeds of *Tilia* sp. at 30°C and 70% Relative humidity in separate plastic jars of 6" diameter having a thin layer of a lightly moist builders sand.

In the present study newly laid eggs from F3 generation were taken and the biological studies were carried out on the hatchlings emerged from these eggs. Half grinded seeds of *Tilia* sp. were used as food throughout the studies and was changed after every week.

As the food habits of *A. cocquebertii* are concerned, several species of insects, other than *D. cingulatus* were tested as food. The tested insects belonged to various orders and families such as heteropterous and homopterous bugs, lepidopterous, coleopterous, orthopterous and hipterous larvae.

A comparative study of the lifecycles of the predator and its prey was made by keeping freshly laid eggs of the two species in separate jars, observations were made on incubation period, number and duration of nymphal instars and duration of their life. On hatching the first instar nymphs of both species were kept singly, each being provided with 20 cc space for better growth.

RESULTS

Food habits of *A. cocquebertii*

Food habits of any organism play a vital role for its survival, distribution effectiveness and social importance towards a grower community. Keeping this aspect in view several insect species such as Aphids, Membracids, Heteropterous bugs, Spodoptera, Red flour beetle, and House fly larvae, and newly emerged and laid nymphs and eggs of grasshopper were tried as food for *A. cocquebertii*. But none was accepted even by starved predators, very little acceptance of red flour beetle larvae was observed in some of starved predators, but all of them could not survive and died of starvation.

The nymphs and adults of *A. cocquebertii* feed on all developmental stages of *D. cingulatus* including the eggs. Early nymphal instars of *A. cocquebertii* attack large late nymphal instars as well as the adults of *D. cingulatus*. In such cases, one or more nymphs of *A. cocquebertii* got attached to the body of the large prey. Usually they are found on the dorsal side of the thorax between wings and do not leave the prey despite to all its efforts to shake them off. In this way, the large prey is

shared by more than one predator. For catching the prey, the predator first moves slowly towards the prey and then jumps over it and immediately inserts its rostrum between head and thorax of the prey. Alternatively, the predator rests quite motionless at some place and then suddenly jumps over the passing prey. In some instances, *A. cocquebertii* actually runs after the prey or catch it. When *D. cingulatus* is released in a jar of *A. cocquebertii* it shows no fear at first and moves towards the predator as though attracted either by some scent or by coloration. But once it comes at touching distance, it turns and runs away from the predator for safety. The predator grabs the prey with its stout legs, pins it down with the rostrum and starts feeding either on the same spot or after carrying it to a safer place. The feedings is continued after killing and the dead prey is not left until it is completely sucked up. the eggs of the prey are praked up one by one bath by nymphal and adult predators. They feed on eggs by inserting rostrum, sucked and the empty case sare discarded. Early instars are equally successful in feeding on the late instars and daults of *D. cingulatus*. Cannibalism was not observed in starved *A. cocquebertii*.

It was observed that the predator *A. cocquebertii* was more active when small twigs of the malvaceve plant were placed in the jars. Probably this provided a suitable hidnig place during its search of the prey.

As for *D. cingulatus*, they are phytophagous, sap sucking bugs and feed on the leaves, green stems, flowers, fruits and seeds of various malvaceous plant. Both the nymphs and the adults feed by inserting the rostrum inside these parts.

Sudies on the life history of *A. cocqpebertii* and *D. cingulatus* were made during the monts of June to November at 30°C and 70% relative humidity. the two species were however able to tolerate as low a temperature as 16°C. They however remanied inactive sluggish and their colour darkened. Feeding was literally stopped and no mating, egg-laying, or hatching of the eggs could be observed at this temperature.

LIFE HISTORY

Eggs of *D. cingulatus* are round, cremy white, some times white yellow about 1.2 mm in length; eleptical in shape; laid in batches. A single female lays 2-3 batches during its life span; and a batch may contain 20 to -20 eggs. Eggs are laid on the surface of the soil or among food seeds. Incubation period is 3-6 days (Fig. 1) at 30°C.

Freshly laid eggs of *A. cocquebertii* are shiny orange yellow in colour; elliptical in shape; 1.4 mm in length; laid in batches on the surface of the and or sometimes in the remains of the dead preys. A single female lays about 15-20 batches during its life span; and a batch may contain 30-120 eggs. Incubation period is 4-6 days (Fig. 2). A comparative study on the developmental stages of both the species under laboratory conditions is given in the Table-1.

DISCUSSION

The present observations suggest that *A. cocquebertii* is an excellent insect for a variety of experiments. It is a specific predator of *D. cingulatus* as it feeds on the nymphs of all instars, adults and eggs. It was also ascertained that the adults of *A. cocquebertii* can tolerate freezing temperature (below 0°C) when frozen for more than three hours for conducting physiological experiments (unpublished) and when brought to room temperature they became active within 20-30 minutes. This low temperature tolerance was not so pronounced in the case of *D. cingulatus*. Low temperature tolerance may be useful for the survival of the predator.

The duration of nymphal instars especially of the last instar and adult *A. cocquebertii* is much more than that of prey. Longevity of the adult *A. cocquebertii* is more than three times than that of *D. cingulatus* and during this period a single female can produce more than 16 batches of eggs as compared to the female of *D. cingulatus* which produces only two to three batches. The prolonged adult life and higher rate of oviposition should be helpful for the survival as well as for the propagation of the predator.

The present observations on the life history and feeding behaviour of *A. cocquebertii* indicate that it is an ideal insect predator and can easily be bred in the laboratory. It is, therefore, suggested to use it successfully for suppressing field population of *D. cingulatus* which causes a considerable loss to cotton, which is a cash crop in Pakistan and also to vegetables like *Abelmoschus* ssp.

ACKNOWLEDGEMENT

The author is highly thankful to Alexander Von Humboldt Foundation of West Germany for providing the financial support to the author. Sincere thanks are also due to Professor Dr. G.H. Schmidt of Hannover University of West Germany for providing laboratory facilities.

Table-1 Comparative study on the developmental stages of *Dysdercus cingulatus* Fab. and *Anticarsus cocquebertii* (Fab.) at 30°C and 70% R.H. based on mean for 50 specimen for each instar. Where *D. cingulatus* was fed on *Tilia* sp. and *A. cocquebertii* fed on *D. cingulatus*.

Insect	Stage	Fig.	Duration (days)	Head	Rostrum	Wing pads	Tarsi length (mm)	Body length (mm)
1. <i>D. cingulatus</i>	1st instar	3	2-3	Prognathus	Long, reaching mid of venture.	absent	2-segged	1.7-2.0
	<i>A. cocquebertii</i> -do-	4	3-4	-do-	Short never reaching mid coxae.	-do-	-do-	1.9-2.1
2. <i>D. cingulatus</i>	2nd ins.	5	3-4	-do-	Long, reaching mid of abdominal venture.	-do-	-do-	2.2-2.9
	<i>A. cocquebertii</i> -do-	6	3-5	-do-	Short, never reaching mid coxae	-do-	-do-	3.0-3.5
3. <i>D. cingulatus</i>	3rd ins.	7	4-5	Hypognathus	Long, reaching mid of abdominal venture.	Rudimentary	-do-	4.7-5.6
	<i>A. cocquebertii</i> -do-	8	4-5	-do-	Short, never reaching beyond mid coxae.	-do-	-do-	4.8-5.9
4. <i>D. cingulatus</i>	4th ins.	9	4-5	-do-	Long, reaching mid of abdominal venture.	-do-	-do-	6.7-7.6
	<i>A. cocquebertii</i> -do-	10	5-6	-do-	Short, never reaching beyond mid coxae.	-do-	-do-	8.0-8.7
5. <i>D. cingulatus</i>	5th ins.	11	5-7	-do-	Long, reaching mid of abdominal ven.	well developed	-do-	10.6-11.7
	<i>A. cocquebertii</i> -do-	12	8-10	-do-	Short, never reaching mid coxae	-do-	-do-	12.5-13.2

Table-2 Continued

Insect	Stage	Fig.	Duration (Days)	Head	Rostrum	Wing pads	Tarsi	Body length (mm)
6. <i>D. cingulatus</i>	To. ny. hal duration		18-24					
<i>A. cocquebertii</i>	-do-		23-30					
7. <i>D. cingulatus</i>	Adult male	13	12-26	Hypogn.	Long, reac. mid ab. nal. venture. reaching apex of abdomen.		dep. 3 seg.	12.4-13.2
<i>A. cocquebertii</i>	-do-	14	80-100	-do-	Short. never reaching beyond mid coxae.	-do-	-do-	14.5-15.1
8. <i>D. cingulatus</i>	Adult fema.	15	24-36	-do-	Long, reaching mid of abdominal venture.	-do-	-do-	14.9-15.1
<i>A. cocquebertii</i>	-do-	16	80-112	-do-	Short, never reaching beyond mid coxae.	-do-	-do-	16.1-16.6
9. <i>D. cingulatus</i>	To. life	Male=	30-50; Fe.le=					42-60
<i>A. cocquebertii</i>	-do-	-do-	103-130; do-					103-142

REFERENCES

- Anonymous, 1983. Annual Progress Report of Entomology Section, C.R.I. Sakrand; 20 pp.
- Lefroy, H.M. 1909. Indian Insect Life : A manual of the insect of the plains. W. Thacker & Co. 2; Creed Lane, London.
- Pradhan, S. and Memon, R. 1942. *Antilochus cocqueberte* (Fabr.) a predator of *Dysdercus cingulatus*. Indian J. Ent. 4 (1) : 191.

Figures 1 - 16

Dysdercus cingulatus;

1, Eggs; 3, First instar nymph; 5, Second instar nymphs;
7, Third instar nymph; 9, Fourth instar nymph; 11, Fifth instar nymph; 13, Adult male; 15, Adult female.

Antilochus cocquebertii;

2, Eggs; 4, First instar nymph; 6, Second instar nymph;
8, Third instar nymph; 10, Fourth instar nymph; 12, Fifth instar nymph; 14, Adult male; 16 Adult female.

NB. Scale between two figures is equal to 1 cm.