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Prolonged Copulation in *Dysdercus cingulatus* (Red Cotton Stainer) as a Cause for Augmented Fecundity

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Abstract: Cotton stainer, *Dysdercus cingulatus* is the common pest of cotton crops. Both the adults and nymphs are known to feed upon the cotton pods. In recent times its pest status has extended to almost all the crops, which illustrates that these insects have increased in number and also have acclimatized to the ever changing environment. This is an Hemipteran insect and it is known that males and females are known to be involved in prolonged copulation. In the present study, it was observed that the male and female adults were in state of extended copulation both in the field and also in the laboratory. This study has shown that the male and the females remain in copulatory mode for 3 days. This may be attributed to a male strategy to limit the female from mating another male and also a mechanism to improve and augment proliferation, and hence this may be a contributing factor causing an upsurge in the population of these insects.

Keywords: *Dysdercus cingulatus*, Prolonged copula, Cotton stainer, Sperm competition, Hemiptera

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Introduction

Dysdercus cingulatus an Hemipteran insect belonging to the family Pyrrhocoridae commonly known as the cotton stainer, is the pest of cotton crops. Recent studies, suggest that it is not just the pest of cotton, but recognized as the pest upon other plants such as okra, papaya, hibiscus etc. (Sahayaraj and Ilyaraja, 2008; Manzoor, and Haseeb, 2015). Both the nymphs and adults feed upon the cotton pods (Ambayeba, 2018). In recent times, the enormous increase in the pest populations is noticed in many regions of the world. This overall increase in their population may be attributed to their highly adaptive

characters to the changing environment and also may be due to high reproductive rate. These insects are gregarious and they are often found in groups. Their success in evolution as the pest may be attributed to their ability to produce more off springs which may be because of the fact that these insects indulge in prolonged copulation. There are instances where prolonged copulation which continues for several days have been reported and studied in Heteropteran insects (Harris and Todd, 1980; McLain, 1980; Carroll and Loye, 1990; Carroll, 1991). Prolonged copulation or extended copulation in insects is known to

result in increased success rate of reproduction. There are instances where prolonged copulation has been reported in certain species of insects where it is known to reduce sperm competition (Thornhill and Alcock, 1983; Simmons, 2000). In addition to this, extended copulation is also known to reduce predation, improve female insect foraging efficiency (Wilcox, 1984), and also female survivorship (Sivinski, 1983; Gwynne, 1989). Therefore, the present study on *Dysdercus cingulatus* is to learn and understand if prolonged copulation occurs both in field and also in laboratory and thereby aid in upsurge in fecundity.

Materials and Methods

Dysdercus cingulatus, cotton stainer bugs were collected from the field in premises of landscape gardens of University College for women, Koti Hyderabad). The insects were carefully collected using an insect net and were transferred to small plastic containers. They were maintained in the laboratory for a period of one week. Observational studies were conducted. Photographs of the adults (Figs. 1, 2) and nymphs (Fig. 3) were taken using Sanyo 14 mega pixel camera.



Fig. 1: Individual Insect (Dorsal view).



Fig. 2: Individual Insect (ventral view)



Fig. 3: Nymphs.

Results and Discussion

In the present study, it was observed, that over a period of 4 days the male and females were found in a constant phase of prolonged copulation. The field observations coincide with that of the laboratory where both sexes of the insects were seen in extended copulation.

The cotton stainer bugs were collected which were found in copious numbers in the field i.e. in the green sprawling landscape garden of campus of University College for Women. These were collected during the months of October and November, 2021. It was observed that more number of *Dysdercus* insects were found more frequently after the rain. Both nymphs and adults were seen in large groups. In the field the observation for a period of 4 days revealed that both the male and female *Dysdercus* were engaged in prolonged copulation (Fig. 4). To study the phenomenon of prolonged copulation, insects were collected and maintained in the laboratory. It was observed that both male and female insects were engaged in prolonged copulation (Fig. 5) for more than 3 days (72 h), suggesting that this might be a potent strategy for effective fecundity. These observations coincides with that of Jorge and Lomônaco (2011) who have studied prolonged periods of copula in *Dysdercus maurus*. The present study revealed that during the copulatory period both male and female were able to walk, feed, and also excrete. All through the experimental period it was observed that male and female were joined on the ventral side (Fig. 6) in a state of lengthy copulation, probably it is a



Fig. 4: Male and Female in field.



Fig.5: Male and Female in Laboratory.



Fig. 6: Male and Female ventral side.

male strategy to avoid sperm competition as suggested by Alcock (1994).

It has been observed that in almost all the seasons, the population of the adults and nymphs of *Dysdercus* were found to be immense, as the females are known to lay approximately 332 to 695 eggs. However, the population of nymphs was found more during the wet seasons of the year, as they are known to prefer damp environment (Fuseini and Kumar, 1975). Harris and Todd (1980) have performed studies on *Nezara viridula* (Linnaeus, 1758) and suggested that there seems to be a direct correlation between the span of mating or extended mating time and egg production by the female. Similarly Gupta *et al.* (2019) suggested that in *Dysdercus koenigii* total

egg production by the female is influenced by prolonged mating. Based upon these studies, and the present observations, it may be concluded that in *Dysdercus cingulatus*, prolonged copulation seems to be a strategy by the male insects to limit sperm competition and also seems to augment fecundity. This strategy probably has helped these insects to reproduce faster and cause an upsurge in their population.

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