Research Article *Journal of Plantation Crops, 2011, 39 (3): 347-350*

Comparison of the developmental and survival rates, adult longevity and fecundity of *Helopeltis antonii* Signoret (Hemiptera: Miridae) on different phenological stages of cashew

K.K. Srikumar* and P.S. Bhat

Directorate of Cashew Research, Puttur, Karnataka, 574202

(Manuscript Received: 08-08-11, Revised: 13-10-11, Accepted: 27-10-11)

Abstract

Among the several species of insect pests recorded on cashew in India, the Tea Mosquito Bug (*Helopeltis antonii* Signoret) is one of the serious pests. Nymphs and adults of *H. antonii* feed on cashew by sucking the sap from flushing shoots, panicles and immature fruits. The present study compared these food sources on the development, survival and oviposition of this species. The nymphal stages developed faster with enhanced survival rate when fed on fruits compared to those fed on flushing shoots or panicles. The whole developmental period of *H.antonii* was found to be 217.96 h on fruits, 225.23 h on panicle and 231.37 h on flushing shoots. The adults survived significantly longer when fed on fruits than fed on flushing shoots and panicles. The mean number of egg laid by *H.antonii* fed on fruits was 101.50 compared to 94.50 on panicles and 88.50 on flushing shoots. Adult TMB fed on fruits continued egg laying till 21st day after emergence while those fed on shoots and panicles laid eggs till 19th and 17th day, respectively.

Keywords: Anacardium occidentale, development, growth, tea mosquito bug

Introduction

Cashew (*Anacardium occidentale* Linn.) a native of Brazil, was introduced in to the West Coast of India by the Portuguese during sixteenth century. The Tea Mosquito Bug, *Helopeltis antonii* Sign. (Hemiptera: Miridae) is one of the serious pests of commercially grown cashews in India. *H.antonii* is the dominant species, the reviews by Devasahayam and Nair (1986), Sundararaju and Bakthavatsalam (1994) and Sundararaju (1996) exemplified the distribution, nature and extent of damage, biology, natural enemies and hosts plants. Both adults and nymphs of the pest suck the sap from tender shoots, panicles and immature fruits (Fig. 1). The typical feeding damage is the formation of a necrotic lesion around the point of entry of the stylets of the mouth parts of the bug. On flushing shoots, feeding occurs on the midribs and petiole on the adaxial surface of the laminae. On the panicles, feeding is usually restricted to the main axis around the nodes and also on the secondary floral branches. Since there are alternative feeding sites, it is assumed that food is not a limiting factor, but the quality of nutrients derived from each part of the plant may differ significantly and affect the population dynamics of the species.

In the present investigation, the influence of flushing shoots, panicles and fruits on the rate of development, survival, adult longevity, and oviposition of *H. antonii* under natural conditions in the field.

Materials and Methods

Laboratory rearing of *H.antonii*

The gravid female collected using long test tubes from cashew plantations at the Directorate of Cashew Research (DCR), Puttur, and Experimental Station Shanthigodu were allowed to lay eggs on potted cashew seedlings in the laboratory. These seedlings with eggs were maintained in the laboratory avoiding direct impact from rainfall. The seedlings were enclosed in perforated tubular transparent polyester film (thickness 175 micro) cage size: 30x7.5 cm. The caging was done from fifth to seventh day after oviposition to prevent nymphal migration. Each seedling was labeled with oviposition

**E-mail:* sreeku08@gmail.com

date and number of eggs deposited on it until hatching. Immediately after hatching, nymphs were transferred to aluminum nymphal rearing cages (Sundararaju and John, 1992). Four glass vials (5 ml capacity) were fixed on a small aluminum stand, which consists of an aluminum plate (size: 15 x 15 x 20 cm and thickness: 18 gauge) and a handle of 15 cm height fixed at the centre with an adhesive. In the rearing cage, provisions were made on two sides with cloth sleeve to felicitate the removal of adults after final moulting. Temperature and relative humidity in the laboratory were monitored throughout the experiment.

Developmental rates of *H.antonii* nymphs

The study was carried out on fresh (3-5 days old) flushing shoots, 5-7 days old developing panicles, and 7 - 14 days old developing fruits. Using camel hair brush, 20 hatched nymphs (0 - 12 h old) were transferred individually onto 20 each of flushing shoots, panicles and fruits (serving as the food sources), each enclosed in nymphal rearing cage. The nymphs were observed at 24 h intervals to determine the moulting status as indicated by the presence of cast skins. The duration of each of the five nymphal instars was recorded along with the rate (duration) of development. The experiment was conducted with three treatments and each insect constituted a replication.

Survival rate of *H.antonii* nymphs on different parts of cashew

The number of 1st instar nymphs that survived to subsequent instars on flushing shoots, panicles and fruits respectively was recorded.

Longevity and oviposition of *H. antonii reared* on different parts of cashew

Male and female TMB emerged in the laboratory from shoots, panicles or fruits were paired in a sleeve cage on flushing shoots in the field within 24 h after moulting into adults, and observed for their longevity and fecundity. In alternate days, the pairs were transferred to new flushing shoots for oviposition. Adult longevity and number of eggs laid were recorded. Monthly rainfall, temperature and relative humidity in the cashew plantation at Puttur were monitored throughout the experiment. The design for each experiment was completely randomized and the means were statistically analyzed using ANOVA.

Results and Discussion

Temperature and relative humidity in the field ranged from 19 to 35 °C and 58 % to 94 %, respectively, and monthly rainfall ranged from 1.79 to 12.9 mm during the same period.

The rates of development of first to fifth instar nymph on the three cashew parts are also presented in Table 1. The nymphal stages developed significantly faster when fed on fruits than on flushing shoots or panicles. The duration from first to second instars on fruits was 32.83 h, whilst that on flushing shoots and panicles was 50 and 48 h, respectively. Similarly, from 5th instars to adulthood, duration of development was 63.82 h on fruits and 76 and 70.2 h on panicles and flushing shoots respectively. The duration from first to second instar was, therefore, 17.17 h longer on the flushing shoot than on the fruit and, still 15.17 h more on the panicle. The next noticeable difference in the developmental rate occurred during the change from 5th instars to adulthood, where it took 6.38 and 12.18 h. more on flushing shoot and panicles respectively, than on the fruit . The whole developmental period of *H.antonii* was found to be 217.96 h on fruits, 225.23 h on panicle and 231.37 h on flushing shoots (Table 1).

The survival rate from first to fifth instar nymph on the three cashew parts is shown in Table 2. The mean percent survival of nymphs showed non significant values. This result indicates flushing shoot, panicle and fruit are good food sources for survival of nymphs (Fig. 1).

There was distinct difference in the longevity of both sexes and also in mean number of eggs laid on fruits than on flushing shoots or panicles (Table 3). In both sexes, those fed on fruits show highly significant

Table 1. Mean development rate of *H.antonii* instar nymphs reared on different parts of cashew

Cashew plant part	Mean development rate (h)					
	1st instar	2nd instar	3rd instar	4th instar	5th instar	Total ± SD
Flushing shoot	50.00	37.13	37.34	36.70	70.20	231.37±11.44 (9.64)
Panicle	48.00	31.33	45.90	24.00	76.00	225.23±14.76 (9.38)
Fruit	32.83	41.67	39.82	39.82	63.82	217.96±10.87(9.08)
CD (*P*=0.05)	0.50	N.S	5.46	4.79	6.57	11.45
CV (%)	1.35	29.54	16.23	17.04	11.09	6.03

N.S=Not significant

Figures in the parentheses indicate the duration in days.

Table 2. Mean percentage survival of *H.antonii* instars nymph reared on different parts of cashew

Cashew plant part	Survival (%)				
	1st instar	2nd instar	3rd instar	4th instar	5th instar
Flushing shoot	94(9.54)	88(9.09)	94(9.54)	94(9.54)	94(9.54)
Panicle	100(10.00)	100(10.00)	94(9.54)	94(9.54)	94(9.54)
Fruit	94(9.54)	100(10.00)	94(9.54)	100(10.00)	100(10.00)
CD (*P*=0.05)	NS	NS	NS	NS	NS

NS= Not significant

Figures in the parentheses indicate the square-root transformed values.

Table 3. Mean longevity and number of viable eggs laid by adults reared on different parts of cashew

	Mean longevity (days) ± SD		
Cashew plant part	Male	Female	Mean number of eggs
Flushing shoot	17.50±0.70	21.50±0.71	88.50±0.79 (9.41)
Panicle	17.50±0.71	21.50±0.71	94.50±0.71 (9.77)
Fruit	23.50±0.70	25.50±0.71	101.50±0.71 (10.11)
CD (*P*=0.05)	2.25	2.25	2.25 (0.27)

Figures in the parentheses indicate the square-root transformed

a b c

Fig. 1. Damaged flushing shoot (a), panicle (b) and shriveled tender fruits(c).

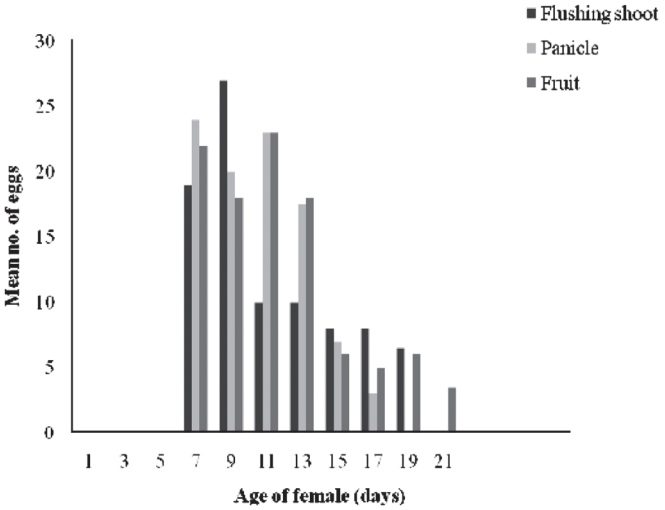

Fig.2. Mean number of eggs laid during the life span of *H.antonii* female emerged from flushing shoot, panicle and fruit

longevity than fed on panicles or flushing shoots even though there was resemblance in the longevity on flushing fruits and panicles. The females generally lived longer than the males on all the cashew plant parts tested. Both females and males lived longest on fruits than on panicles and flushing shoots. The mean numbers of eggs produced by the females of *H.antonii* caged on fruits were significantly greater than for those reared on cashew panicles and flushing shoots.

The mean number of eggs laid during life span of females of *H.antonii* fed on cashew shoots, panicles and fruits are shown in Fig.2. The egg laying started in all the stages (fed on flushing shoots, panicles and fruits) at the 6th and 7th day after the adult emergence. Adult bug fed on fruits continued egg laying till 21st day after emergence while those fed on shoots and panicles laid eggs till19th and 17th day, respectively.

The rate of nymphal development is affected by quality of the food source (Betrem, 1953; Awang *et al.*,1988). In the present investigation, the nymphal stages developed significantly faster when fed on fruits than on flushing shoots or panicles. This finding agrees with most reports on *Helopeltis theobromae* on cocoa, in which the nymphal instars fed on pods experienced faster rates of development than those fed on shoots (Awang *et al.*, 1988) and *Helopeltis schoutedeni* on cashew has shown faster rates of development when fed on fruits compared with feeding on flushing shoots or panicles (Dwomoh *et al*., 2008). The ability of *H. antonii* to develop faster on fruits could probably be due to the quality of food nutrients found in the fruit, which is more juicy and succulent compared to the flushing shoots and panicles.

The mean percent survival rates of nymphs were almost similar on fruits, panicles and flushing shoots. The results suggest that, the flushing shoot and panicle and fruits are good food sources for the survival of nymphs. However, the fruits are very important to adult bugs for optimum survival.

Adult longevity was also reported to vary with the food source (Betrem, 1953). Both females (25.5 days) and males (23.5 days) recorded their longest life span on fruits whilst their shortest life spans were also recorded on flushing shoots. Similarly, Tan (1974) recorded a mean adult longevity of 30 days for *Helopeltis theivora* on cocoa pods in Malaysia. The same species was reported by Awang *et al*. (1988) to have a mean longevity of only six days when raised on cocoa shoots. This may be due

to difference in climatic conditions and quality of the food source as referred by Betrem (1953) and Awang *et al*. (1988). The results clearly show that longevity of *H.antonii* greatly depend on availability of fruits in the field and this may explains the large populations of the pest experienced during the fruiting season of the cashew.

The mean number of egg laid by *H.antonii* fed on fruits was 101.50 compared to 94.50 on panicles and 88.50 on flushing shoots. The results indicate that the fecundity of *H.antonii* was favoured by feeding fruits compared to panicles and flushing shoots. The egg laying was prolonged for the adults fed on fruits than panicles or flushing fruits. This difference observed might, therefore, be attributed to nutritional differences in the plant parts.

Conclusion

The present study has shown that, among the plant parts tested, the fruit was the most preferred choice by *H.antonii* for food and oviposition. The nymphs of *H.antonii* also developed faster when fed on fruits or panicles than on flushing shoots. The adults survived longer and produced greater numbers of eggs when fed on fruits or panicles than on flushing shoots. It was observed that in absence of fruits and panicles the flushing shoots are sustenance for the survival of nymphs.

Acknowledgement

The authors greatly acknowledge the Indian Council of Agricultural Research Network Project on Management of Sucking Pests for providing all financial support to carry out the work. We are also thankful to the Director, Directorate of Cashew Research, Puttur for providing necessary facilities.

References

Awang, A,. Muhamad R. and Chong, K.K. 1988. Comparative merits of cocoa pod and shoot as food sources of the mirid *Helopeltis theobromae* Miller. *Planter* 64: 100-104.

Betrem, J.G. 1953. The control of the mosquito blight on cocoa in Java. pp.593-596. In: *Proceedings of the Eighth International Congress of Entomology*, Stockholm 1948:

Devashayam, S. and Nair, C.P.R.1986. The mosquito bug, *Helopeltis antonii* Sign. On cashew in India. *J. Plannt. Crops* **14**:1-10.

Dwomoh, E.A., Afun, J.V.and Ackonor, J.B.2008.Comparison of the developmental and survival rates, adult longevity and oviposition of *Helopeltis schoutedeni* Reuter (Hemiptera: Miridae) on cashew. *Journal of Cell and Animal Biology* **2**(4):92-95.

Sundararaju, D. 1996. Studies on *Helopeltis* spp. with special reference to *H.antonii* Sign in Tamil Nadu. Ph.D. thesis. Tamil Nadu Agricultiral University, Coimbatore, India.

Sundararaju, D. and Bakthavatsalam, N,N.1994. *Advances in Horticulture* 10:759-785. (Eds). Chadha K.L. and Rethinam P., Malhotra Publishing House, New Delhi.

Sundararaju, D. and John, N. J. 1992. Mass rearing technique for *Helopeltis antonii* Sign. (Heteroptera: Miridae) – An Important pest of cashew. *J.Plantn. Crops* **20**(1):46-53.

Tan, G.S.1974. *Helopeltis theobromae* on cocoa in Malaysia. I. Biology and population fluctuations. *Malaysian Agricultural Res*.**3**:127-147.