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BIOECOLOGY OF REDUVIID *RHYNOCORIS RAPAX*- PREDATOR OF *PODAGRICA DECOLORATA*

Yao N'guessan[1], Tano Dje Kevin Christian[1], Obodji Adagba[2]*, Ossey Christian Landry[3] and Soro Senan[1]

[1]Laboratory for Improvement of Agricultural Production, UFR-Agroforestry, University of Jean Lorougnon Guédé, Daloa, BP 150 Daloa, Côte d'Ivoire
[2]Laboratory of Zoology and Animal Biology, UFR-Biosciences, University of Félix Houphoueët Boigny, Abidjan-Cocody, 22 BP 582 Abidjan 22, Côte d´Ivoire
[3]National Center of Agronomic Research, Research Station of Food Crops, Laboratory of Entomology, 01 BP 633 Bouaké 01, Côte d'Ivoire
*Email: obodji09@gmail.com (corresponding author): ORCID ID 0009-0008-1863-581X

ABSTRACT

Flea beetle *Podagrica decolorata* (Duvivier) is a defoliator of okra. The study of some biological parameters of bedbug, *Rhynocoris rapax* (Stal) was carried out in locality of Man, The study is part of the control of this crop pest. Boxes were used to rear the insects. A thermohygrometer was used to determine the regular temperature and humidity. Larval monitoring revealed five larval stages, with the longest development time of 16.28±2.41 days for stage 5. The highest survival rate was observed for fifth-stage larvae (96.09± 03.14%). Female biological cycle was an mean 82.10± 09.41 days, and male biological cycle was an mean 68.67± 08.44 days. The sex ratio was 0.58. This study revealed positive correlations between humidity and the larval cycle, followed by negative correlations between temperature and the larval cycle.

Key words: *Rhynocoris rapax*, *Podagrica decolorata*, Chrysomelidae, okra, predator, defoliator, Reduviidae, biological parameters, larvae, fertility, egg, sex ratio, temperature, humidity

Okra *Abelmoschus esculentus* (Moench) cultivation is highly valued for its leaves and immature fruits, which are edible in soups and sauces (Khomsug et al., 2010). In Côte d'Ivoire, all peoples cultivate and consume okra (Fondio et al., 2001). However, okra is subject to many pressures that seriously limit its cultivation, most dangerous of which are insects and diseases (Asare-Bediako et al., 2014). One such insect pest is *Podagrica decolorate* (Duvivier), a flea beetle that causes enormous damage (Soro et al., 2016). Defoliation of okra plants by this insect is characterized by holes reducing their photosynthetic leaf surfaces. Given the extent of the damage, several control methods have been proposed, including chemical control. However, the use of insecticides causes enormous problems, such as the elimination of natural enemies and environmental risks. It is necessary to find effective control methods that do not harm human health and the environment. In Côte d'Ivoire, Yao et al. (2020) observed a reduvid bug, *Rhynocoris rapax* (Stal) as a predator of *P. decolorata*. This study evaluates the bioecological parameters of *R. rapax*.

MATERIALS AND METHODS

This study was carried out in the Life and Earth Sciences laboratory of a secondary school in Man and in a semi-controlled environment (25.02± 0.97°C, 74.48± 3.31% RH). 100 and 500 ml culture dishes, petri dishes and a thermohygrometer were used.

Biology of *R. rapax* fed on, *P. decolorata* cultured on okra was studied including the number of eggs laid/female, egg fertility rate, adult lifespan, larval survival rate, sex ratio, duration of larval stages. For pre-copulation, thirty (30) adult pairs of *R. rapax* were isolated. Each pair was immediately placed in a 500 ml plastic dish. All pairs were monitored until the first mating was observed. This experiment was done with 30 females and number of eggs laid/ female was recorded every two days, and the experiment was continued until the female died. For egg fertility rate, the number of eggs hatched was recorded and the mean fertility rate determined. Observations on larval survival, development time and sex ratio were made on the offspring of 30 pairs. Each first-instar larva was isolated in a box containing a diet of four *P. decolorata* adults used to feed these larvae every two days. *P. decolorata* adults were regularly renewed in the box. The rearing box was monitored daily. The dates of successive moults were noted. The mean

duration of passage from one larval stage to the next was determined and expressed in number of days. After the imaginal moult, the insects were grouped by sex and followed through to the adult stage. Adult lifespan was determined from imaginal moult to death. Insect body parts were measured for each sex. The data were analysed using Statistica version 7.1 software. Analysis of variance, Student's t-test and Pearson's correlation test were used. Separation of homogeneous groups was based on Fisher's LSD test (p=0.05).

RESULTS AND DISCUSSION

A female *R. rapax* lays an mean of 44.50± 13.10 eggs/clutch, and mean egg fertility rate was 78.21± 12.63% in semi-natural conditions. The mean incubation period was 8.17± 0.95 days.

The larval stage with the shortest development time was stage 3 at 8.4± 1.57 days and the larval stage with the longest development time was stage 5 at 16.27± 2.41 days. The mean duration of the larval cycle was 56.30± 4.94 days. Larval survival rate increased with the age of the larvae. Thus, the survival rate of first instar larvae was 74.28± 9.02% and that of last instar larvae was 96.08± 3.14% (Table 1). The development duration of stage 5 was longer. These results are in conformity with those of Sahayaraj (2012) and Hema (2017). The gradual increase in larval survival rate is thought to be due to the accumulation of nutrient and energy reserves acquired during the previous stage and the insect's resistance to certain abiotic factors. The present results are in conformity with those of Tano et al (2011), who showed that larval survival in *Pseudotheraptus devastans* (Distant) increases from the first to the last larval instar. According to Panizzi and Parra (1991) and Hema (2017), the high larval survival rate of the fifth instar is due to the energy accumulated in previous instars. At the end of larval development of the offspring of *R. rapax* pairs giving rise to 15.10± 4.01 females and 8.53± 2.75 males, giving a sex ratio of 0.58 in favour of females. These results are similar to those of Srikumar et al. (2014).

Table 1. Mean development time and larval survival rate of *R. rapax*

Larval stages	Mean development time (days)	Larval survival rate (%)
Larval 1	12.1± 1.43b	74.28± 9.02d
Larval 2	10.3± 3.15c	82.74± 6.70c
Larval 3	8.4± 1.57d	88.45± 6.04b
Larval 4	9.23± 2.02d	93.60± 5.78a
Larval 5	16.28± 2.41a	96.08± 3.14a
p	0.001	0.001
F	80.55	56.09

Values followed by the same letter in the same column not significantly different (p=0.05)

Adult longevity, the time between adult emergence and death was 82.10± 9.41 days (female) and 68.67± 8.44 days (male). The mean lifecycle lasted 81.71± 13.95 days. Similar results were obtained earlier *Phonoctonus lutescens* (Guérin)) females have a live longer duration than males. Sahayaraj and Paulraj (2001) also found that *Rhynocoris marginatus* females lived longer and nymphal development took 56.30± 4.94 days. The study revealed a positive and highly significant correlation between the duration of nymphal development and the humidity in the breeding boxes (Fig. 1).

The mean temperature during nymphal development was 26.22± 1.05°C and it was observed that higher the temperature, the development time was short and vice versa. The correlation between nymphal development time and the internal temperature of the rearing boxes was negative and highly significant (Fig. 2).

The negative correlation between the duration of development cycle and temperature could be explained by the fact that high temperatures speed up metabolic activities, while low temperatures slow them down. These results are in line with those of Ouattara (2015) and Hema (2017), who showed that during the winter period, temperatures and humidity levels were relatively lower and could have favored the development of *P. lutescens* and similar to those of Braman et al. (1984) and Whitcomb (1994). The rearing of *R. rapax* has provided important insights into

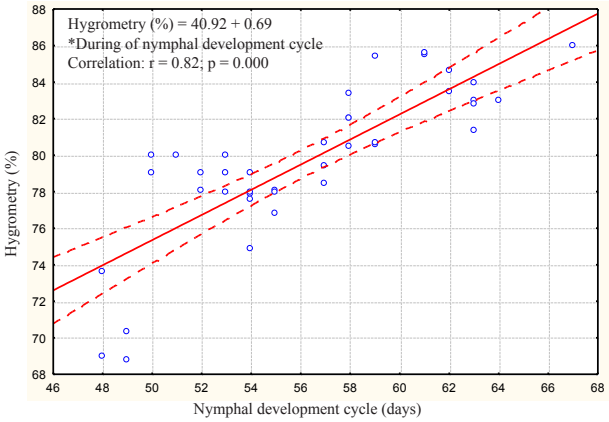

Fig. 1. Correlation humidity vs duration of nymphal development of *R. rapax*

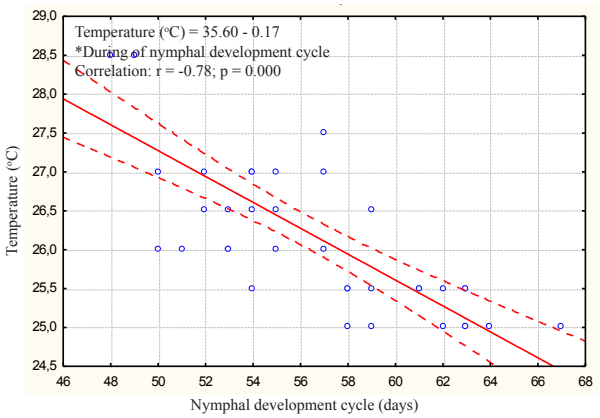

Fig. 2. Correlation- temperature vs nymphal development of *R. rapax*

some of its bioecological parameters. The study of the correlation between has shown that temperature and humidity have an influence on its development cycle. Thus, knowledge of the biology of *R. rapax* would make it possible to develop suitable control methods against for *P. decolorata* populations.

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AUTHOR CONTRIBUTION STATEMENT

The idea of research conducting experiment by Yao N'guessan, and the other authors contributed to the analysis of the results and the writing of the manuscript.

CONFLICT OF INTEREST

No conflict of interest.

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