THE DEVELOPMENTAL PERIOD OF TWO SPECIES OF *ANOPHELES* MOSQUITOES (DIPTERA: *CULICIDAE*) FROM THREE VILLAGES AROUND WAD MEDANI TWON

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ABSTRACT

This work aimed at studying the developmental periods of the different stages of the vector under laboratory conditions. The study was conducted in three villages around Wad Medani, namely Kereba, Barakat and Hantoub. The research was targeting three species of the vector in all three villages viz. *Anopheles arabiensis* and *A. pharoensis.* The tests were conducted in 2001.

The oviposition period was longer in *A. arabiensis* and *A. pharoensis* (3.0 and 3.2 days, respectively). The oviposition rates were 214.6 and 239.6 eggs/female/day, respectively. Consequently the mean fecundity was higher for those two vector species (762.0 and 760.3 eggs/female).

Under laboratory conditions the developmental period of the eggs, larvae, pupae, adult stages and total life cycle for the two species, ranged 2.0-2.5, 5.5 – 6.0, 2.0 – 2.3, 15.5 – 19.5 and 25.0 – 30.0 days, respectively.

الخلاصة : فترة التطور لنوعين من بعوض الأنوفلس في مدينة ود مدني

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هدف هذا البحث إلى دراسة فترات التطور والخصوبة أي عدد البيض الذي تضعه إناث الأنواع المختبرة تحت الظروف المعملية. وقد أجريت الدراسة في ثلاث قرى حول مدينة ودمدني وهى قرية الكريبة، قرية بركات وقرية حنتوب وذلك خلال الفترة من يوليو – ديسمبر من عام 2001م.

تم إجراء البحث علي نوعين من البعوض في المناطق الثلاث وهى:- *A. pharoensis* و *A. Arabiensis*

فترة وضع البيض كانت أعلى (3 و 3.2 يومياً) في النوعين *A. Arabiensis* و*A. pharoensis* على التوالي، كما أن معدل وضع البيض أيضاً كان عالياً (214.56 و 239.55 بيضة لكل أنثى في اليوم) في نفس النوعين على التوالي وكنتيجة لذلك كان متوسط الخصوبة عالياً (672.0 670.3 بيضة لكل أنثى للنوعين على التوالي).

أظهرت نتائج الدراسة المعملية لتطور النوعين أن متوسطات فترة طور البيض، اليرقة، العذراء، الطور الكامل وإجمالي دورة الحياة كان مداها 2.0 – 2.5، 5.5-6.0 ، 2.0-2.3، 15.5-25.0، 19.5-30.0 يوماً على التوالي.

INTRODUCTION

Mosquitoes are important vectors of several tropical diseases, and about 100 species act as vectors of human diseases (Burgess and Coman, 1993). Examples of such diseases are malaria, filariasis, Japanese encephalitis and yellow fever (Muirhear, 1951) and some species may transmit a few arboviruses. Few *Anopheles* species, beside transmitting malaria, they also transmit filariasis (Lacey and Oidacre, 1983).
The most important man-biting mosquitoes belong to the genera *Anopheles*, *Culex, Aedes, Mansonia*, *Haemagogus* and *Sabethes* (Hawking, 1973). The genus *Aedes* includes important vectors of yellow fever, dengue fever and encephalitis, viruses, while the genus *Mansonia* transmits *Brugia malyi* (Buttiker, 1979). However, several other genera are vectors of various arboviruses in central and south America (White, 1989). Other biting species of *Anopheles* mosquito are nuisance to man (Clements, 1992).
Malaria is a wide spread disease and about 200 million persons in different parts of the World are affected and as a result high mortalities occur (BNHP, 1989). In the Sudan, malaria is recorded in several areas especially the southern and central States (Haridi, 1994). In the Gezira, malaria spreads all the year round and increases during autumn and winter because of the increase of the vector population (White, 1989).
This work aimed at studying the developmental periods of the different stages of the vector under laboratory conditions. The study was conducted in three villages around Wad Medani, namely Kereba, Barakat and Hantoub. The research was targeting two species in all three villages viz. *Anopheles arabiensis* and *A. pharoensis* during autumn months of the year 2001.

MATERIALS AND METHODS

1- The study area:
Three locations were selected for conducting this study, viz. kereba and Barakat, and Hantoub villages. Sampling of larvae and adult mosquitoes was carried out in these three locations at 14 days interval during July – December, 2001.

2- Sampling of the larvae:
Sampling of the larvae was carried out at all three locations every 14 days, during July – December, 2001. In each location, the mosquito larvae were collected from 4 ponds by means of small metal dishes (20 cm diam.). The larvae collected from each location were counted, transferred separately to glass jars (20 x 20 x 20 cm) supplied with dry yeast as food and were reared on the same water from which they were collected until the adults emerged. Several *Anopheles* larvae were transferred to glass tubs (10 x 10 x 10 cm) containing 70% ethanol alcohol and were kept for identification by using the key for identification of common anophelines in Sudan described by Medical Entomology Section (1960). The number of larvae collected during July – December in 2001 was recorded in all sites.

3- Meteorological data:
The meteorological data was obtained from the meteorological station, Agricultural Research Corporation (ARC) at Wad Medani and also from the Gezira State Vaccination Administration.

4- Statistical analysis:
Analysis for descriptive statistics and data presentation were run by using Microsoft Excel program.

5- Development periods of the different stages of the three species:

5.1- Incubation period of the eggs:
Newly deposited eggs of the three species were transferred separately to the cages and kept until the eggs hatched and the incubation period was recorded for the three species.

5.2- The larval period:
The larvae that were sampled were used in these tests. The larvae were transferred to Petri-dishes and provided with food. Rearing was continued until pupation when the larval period was recorded.

5.3- The pupal period:
The pupae formed were kept until the adults emerged then the pupal period was recorded.

5.4- The adult period:
The adult life span was obtained from the fecundity experiment.

5.5- The total life cycle:

The total life cycle was determined for all species.

6- Reproductive periods and fecundity:

Each pair of the adult males and females of the two species was transferred separately to the cages described by Stewart (1974). A trough containing water was provided as an oviposition site, a pigeon and sugar solution were provided as source of food for females and males, respectively.

When the female oviposited, the preoviposition period was recorded. The daily number of eggs deposited and the oviposition period was also recorded. When the female ceased to oviposit and died, the past oviposition period and adult longevity were recorded.

The total number of eggs per female was recorded for all species.

RESULTS AND DISCUSSION

1. The development period under laboratory conditions (28°C and 75% RH):

1.2. The incubation period:

The incubation period of the eggs, was significantly higher in *A. pharoensis* (2.5 days) than in *A. arabiensis* as was shown in Table (1). These results agree with the finding of Tesfa Yohama (1982), who reported that the incubation period of *A. pharoensis* eggs under laboratory conditions of 30°C and 100% R.H was 2.7 days. Van Pletezen and Vander Linde (1981) recorded an incubation period of 2-3 days in *A. arabiensis*.

1.3. The immature period:

This period was greatly similar in *A. pharoensis* and *A. arabiensis* (6 and 5.8 days, respectively).

The period of pupae was 2.0 days in *A. arabiensis* and *A. pharoensis* i.e. no significant differences were recorded between the means.

1.4. The adult longevity:

Adult *A. pharoensis* lived significantly longer (19.5 days) than those of *A. arabiensis* (17.8 days). Van Pletezen and Van der Linde (1981) recorded a longer period for *A. arabiensis* (20 days) under laboratory conditions of 30°C and 80% R.H, as was shown in Table (1).

The total life cycle period took significantly longer (30 days) in *A. pharoensis* than in *A. arabiensis* (27.9 days). Steffan and Evenhuis (1981) reported that the total life cycle of *A. gambie* and *A. arabiensis* ranged between 21 – 30 days, in the tropics.

Table (1): Developmental Period (Days) of Different Stages of Two *Anopheles* Species Reared Under Mean Laboratory Conditions of (28 ^{0}C) and RH of (75%) During July – December 2001.

Species	Mean (days)				
	Eggs	Larvae	Pupae	Adults	Total Life Cycle
A. arabiensis	2.3	5.8	2.0	17.8	27.9
A. pharoensis	2.5	6.0	2.0	19.5	30.0

2. Reproductive period, oviposition rate and fecundity:

2.1. The reproductive periods

2.1.1. The pre oviposition period:

As was shown in Table (2), females of all species oviposited after one day from their emergence from the pupae. This agrees with findings of Steffan (1974) and Christopher (1911) who recorded the same period for *Anopheles* mosquito. The oviposition period took about 3.2 days in *A. pharoensis* and about 3 days in *A. arabiensis*. The oviposition period recorded for same species of *Anopheles* was 2 days (Hawking, 1973), 4 days (Christopher, 1911) and much longer i.e. 6 days (Schaefer *et al*., 1971).

2.1.2 The oviposition period:

In all observations this period took only one day as was shown in Table (2).

2.2. The oviposition rate:

The oviposition rate was significantly higher in *A. pharoensis* (239.5 eggs/female/day) than in *A. arabiensis* (214.5 eggs/female/day). Service (1977) reported that the oviposition rate of *A. arabiensis*

ranged 50 – 200 eggs/female/days. Belkin (1962) and Hawking (1973) reported a wider range i.e. 30 – 300 eggs/female/day for most species of *Anopheles* as was shown in Table (2) and Figure (1).

2.3. Fecundity:

Table (2) and Figure (1) showed that, the fecundity of *A. arabiensis* was 762 (eggs /female) and that of *A. pharoensis* was 760.3 (eggs /female). Belkin (1962) reported that the fecundity of *A.gambie* (A and B) ranged between (600-800 eggs/female).

Table (2) Reproductive Period (Days), Oviposition Rate and Fecundity of Two *Anopheles* species Collected During September – December 2001.

Species	Mean (days)				
	Pre-ovip.	oviposition	Pupae	Post-ovip.	Fecundity
A. arabiensis	1.0	3.0	1.0	214.56	762.0
A. pharoensis	1.0	3.2	1.0	239.55	760.3

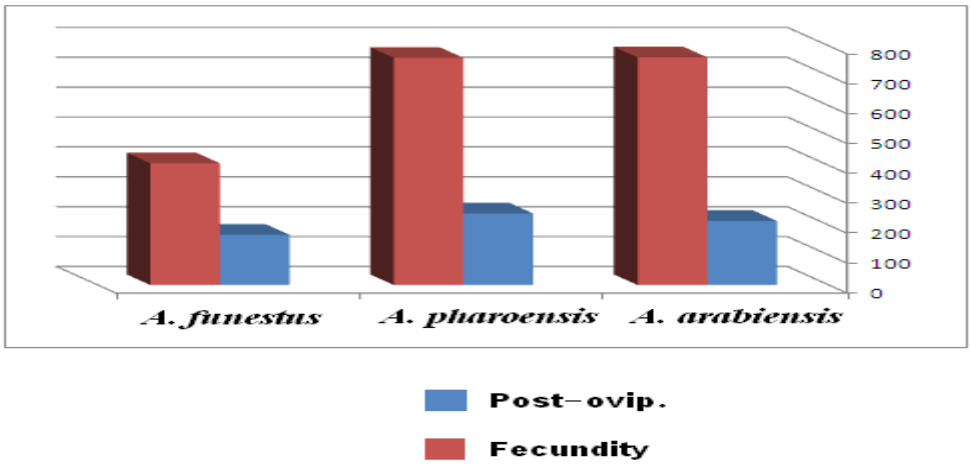

Figure (1): Post Oviposition and Fecundity Rate of Two Species of *Anopheles* Mosquito During September-October, 2001.

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