

## LABORATORY STUDIES ON THE EGYPTIAN PRAYING MANTIS *Miomantis paykullii* STAL, (MANTODEA: MANTIDAE)

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### ABSTRACT

Certain biological aspects of the Egyptian praying mantis *Miomantis paykullii* (Stal, 1871) were studied in the laboratory. Results indicated that ootheca contained an average of 52.4 nymphs, with a mean length of 15.0 mm. The total duration period of nymphal stage required  $64.1 \pm 10.54$  and  $54.8 \pm 6.54$  days for female and male respectively. The generation period was 99 days at daily mean of temperature  $25.9^{\circ}\text{C}$  and relative humidity percentage 45.0%. Six nymphal instars were recorded for male whereas, seven instars were found for female. The fecundity of *M. paykullii* through the oviposition period was  $336.2 \pm 56.78$  nymph per female.

### INTRODUCTION

*Miomantis paykullii* (Stal, 1871). is a species of praying mantis belonging to genus *Miomantis*, family *Mantidae*, order *Mantodea*. Genus *Miomantis* has two synonym *Calidomantis* (Rehn 1901) and *Oreomantis* (Uvarov 1935), while species *paykullii* has four synonym *savignyi* (Saussure 1872), *pharaonica* (Saussure 1898), *senegalensis* (Schulthess-Rechberg 1899) and *pharaonis* (Kirby 1904). This species was found in different African countries, including Egypt, Ivory Coast, Ghana, Uganda, Senegal and Togo. *Mantodea* is a small insect order in number of species, it represented by 2452 species in 446 genera and 14 families distributed all over the world (Otte & Spearman, 2005). Mantids of Egypt form one of unique and sophisticated mantis fauna on the planet, with 59 species in 21 genera and four families (Sawaby Rabab *et al.* 2010). All mantids are predators feeding mainly on other insects and arthropods (Preston, 1990; Ehrman, 1992). Mantids are diurnal insects live mainly on tropical and sub-tropical regions with only few species occur on cold area (Ehrman, 2001). In Egypt nymphs of *M. paykullii* appear during the early spring season and prefer green grasses and small plants (Sawaby Rabab *et al.* 2010)

These studies were initiated to fill in obvious gaps in the reproductive and developmental biology of this insect, as previous workers had published few data on the immature stages, number of nymphs per female, nymphal instars, immature mortality, generation period, life cycle and adult longevity.

### MATERIALS AND METHODS

#### Sources of insect:

Adults (females and males) of the Egyptian praying mantis *Miomantis paykullii* (Stal, 1871) (*Mantodea: Mantidae*) were collected from the Horticulture Department farm, Faculty of Agriculture, Al-Azhar University at Nassr-City Cairo in March 2012. They were kept in glass cages (70cm x

40cm x 40cm). Circle doors were cut into one glass side of each cage and covered with gauze to introduce prey into the cages. Adults of mantis were maintained in these cages, held at 23.9°C and 41.8 % R.H. They were fed on moths of cotton leafworm (*spodoptera littoralis*) daily during eggs laying period.

**Insect rearing:**

To rear the various stages of *M. paykullii* and to carry out further biological studies, under laboratory conditions, Plastic jars 17 cm in length and 8 cm in diameter were used. Oothecae laid in the laboratory were measured with calipers accurate to 0.05 mm (Suckling, 1984). The number of newly hatched nymphs per each ootheca were counted then transferred to a rearing jar individually. Nymphs were fed daily with a mixture of different collected insects; aphids, jassids, cotton leafworm larvae, and moths while, adults were fed on cotton leaf worm moths. The biological data of different stages or instars of the insect were observed and recorded. Newly hatched nymphs of *M. paykullii* were replicated and daily observed. The moulting, the immature stages duration, adult stage, the pre-oviposition, oviposition, post-oviposition periods and generation periods were recorded under the laboratory conditions. Captive mantids need additional water. Gently place a small wet sponge inside the container three times per week. The mantids will gather the water off the sponge.

## **RESULTS AND DISCUSSION**

The obtained results presented in Table (1) showed that male and female of the Egyptian praying mantis *M. paykullii* are not equal in numbers of moulting and nymphal duration. The insect has six nymphal instars for male and seven for female, the last acdysis is followed by the adult stage.

**Incubation period and duration of nymphal instars:**

Incubation period of eggs laid by *M. paykullii* females previously fed on live insects and incubated at 23.9C°±3.7C° and R.H. 41.8%±12.1% required 20.1±1.98 days in average . Egg-laying starts in February and continues while the females survive, which may be until April – May. The juveniles will spend five to six months in the egg case until hatching in spring-summer. (Ramsay, 1990).

From the obtained data presented in Table (1), the 1<sup>st</sup> nymphal instar lasted 10.0±2.62 and 9.8±2.17 days for female and male respectively at 24.1C°±2.4C° and R.H. 41.4%±12.0%. The same observation was observed in the 2<sup>nd</sup> instar; female required a longer time as 11.0±3.92 days while male needs only 9.5±1.52 days to complete the mentioned instar at 25.9C°±2.2C° and R.H. 42.7%±10.1%. The short time was recorded in the 3<sup>rd</sup> nymphal instar, as 6.7±1.86 and 7.0±1.58 days for female and male respectively at 26.2C°±2.2C° and R.H. 42.0%±10.0%. Also each of the 4<sup>th</sup> and 5<sup>th</sup> instars required the same periods as 7.0±1.26 and 7.5±0.89 days for female and male respectively at 26.8C°±2.1C° and R.H. 44.7%±9.5%, during the 4<sup>th</sup> instar, also 6.2±0.45 and 7.5±1.64 days for female and male at 27.5C°±1.4C° and R.H. 46.0%±9.0%, during the 5<sup>th</sup> instar.

However, the 6<sup>th</sup> instar as a penultimate nymphal instar for female but it was the last instar for male; it required 9.2±3.96 days for female at 27.8C°±1.3C° and R.H. 46.6%±7.4%. The longest instar was recorded in the last nymphal instar for both female (7<sup>th</sup> instar) and male (6<sup>th</sup> instar). The last nymphal instar for female was 14.0±6.56 days at 29.2C°±1.3C° and R.H. 50.7%±5.4%, while it was 13.5±2.07 days in the last nymphal instar of male (6<sup>th</sup> instar) at 27.8C°±1.3C° and R.H. 46.6%±7.4%.

**Table (1): Certain biological aspects of immature stages of the Egyptian praying mantis *Miomantis paykullii* under laboratory conditions.**

Stages	Duration (in days)		Mortality (%)	Temp °C	R.H.%
	Female	Male			
Incubation period	20.1±1.98		—	23.9±3.7	41.8±12.1
1 <sup>st</sup> . nymphal Ins.	10.0±2.62	9.8±2.17	9.8	24.1±2.4	41.4±12.0
2 <sup>nd</sup> . nymphal Ins.	11.0±3.92	9.5±1.52	10.4	25.9±2.2	42.7±10.1
3 <sup>rd</sup> . nymphal Ins.	6.7±1.86	7.0±1.58	0	26.2±2.2	42.0±10.0
4 <sup>th</sup> . nymphal Ins.	7.0±1.26	7.5±0.89	0	26.8±2.1	44.7±9.5
5 <sup>th</sup> . nymphal Ins.	6.2±0.45	7.5±1.64	0	27.5±1.4	46.0±9.0
6 <sup>th</sup> . nymphal Ins.	9.2±3.96	13.5±2.07	0	27.8±1.3	46.6±7.4
7 <sup>th</sup> . nymphal Ins.	14.0±6.56	—	0	29.2±1.3	50.7±5.4
Nymphal stage	64.1±10.54	54.8±6.54	20.2	26.6±2.9	44.8±10.2

The total duration of nymphal stage of *M. paykullii* required 64.1±10.54 and 54.8±6.54 days for female and male respectively to complete their development at 26.6±2.9C° and R.H. 44.8%±10.2%. There are usually 6-8 moults during the immature stages of *Miomantis savignyi* and it may pass the winter months in any stage, young, adult, or oothecae; the postembryonic stage varies from 2 to 8 months, and the adults vary to the same extent Adair (1924). Nymphs of *Orthodera novaezealandiae* go through six instars, taking three to six months until becoming adults (Walsby, 1996). Six nymphal instars occurred on *Orthodera ministralis*, (Suckling 1984). Although this may be variable depending on the availability of food to the developing nymphs, as in *Paratenodera augustipennis* (Matsura, et al. 1975).

**Nymphal mortality:**

During the development of nymphal stage it may suffer mortality which differs among instars. As shown in Table (1) both 1<sup>st</sup> and 2<sup>nd</sup> instars suffered the highest rates of mortality. The mortality percentage was 9.8% for 1<sup>st</sup> nymphal instar at 24.1 C° ±2.4 C° and R.H. 41.4%±12.0%. While it was 10.4% for 2<sup>nd</sup> nymphal instar at 25.9C°±2.2C° and R.H. 42.7%±10.1%. Obviously no mortality were recorded or completely absent among nymphs during the other following instars of this insect. The total of nymphal mortality averaged 20.2% at 26.6C° ±2.9 C° and R.H. 44.8%±10.2%. Mortality occurred among individuals of the various nymphal instars may be due to failure in acdysis, natural mortality. A large number of young failed the first moult, and nymphs lost about 50% of the young at each moult of *Miomantis savignyi* (Adair, 1924).

**Sexual reproductive periods and egg laying:**

From the data presented in Table (2) the total life cycle of *M. paykullii* lasted  $84.2 \pm 11.0$  days at  $25.6\text{C}^\circ \pm 3.8\text{C}^\circ$  and R.H.  $44.1\% \pm 11.1\%$ . The pre-oviposition period extended to  $14.8 \pm 6.18$  days at  $28.7\text{C}^\circ \pm 1.4\text{C}^\circ$  and R.H.  $49.5\% \pm 7.7\%$ . Adair (1924) recorded that the paired females of *Miomantis savigny* laid oothecae 8-11 days after the last moult while unmated females laid 14-28 days after the last moult. Suckling, (1984) observed that the oviposition of *Orthodera ministralis*, began immediately in some females, and in a few cases continued to do so until late June, far later than normal for Palmerston North (April-May).

**Table (2): Certain biological aspects of the Egyptian praying mantis *Miomantis paykullii* adult under laboratory conditions.**

Biol. aspects	Duration (in days)	Temp °C	R.H.%
Total life cycle (days)	84.2±11.0	25.6±3.8	44.1±11.1
Pre-oviposition period	14.8±6.18	28.7±1.4	49.5±7.7
Oviposition. Period	36.2±4.71	29.1±1.3	51.1±6.5
Post-oviposition period	10.0±4.20	30.1±1.1	53.7±7.2
Adult longevity	61.0±10.20	29.5±1.14	52.0±7.5
Generation period	99.0±5.69	25.9±3.8	45.0±11.1
Lifespan	145.2±21.2	27.4±3.7	48.1±10.7
Fecundity	336.2±56.78	————	————

Oviposition period lasted  $36.2 \pm 4.71$  days at  $29.1\text{C}^\circ \pm 1.3\text{C}^\circ$  and R.H.  $51.1\% \pm 6.5\%$ , (Table 2). Through this period female deposited  $6.42 \pm 1.1$  ootheca/female in average. About  $52.4 \pm 9.08$  nymphs were emerged from ootheca, with mean length of 15.0 mm, considerably smaller than reported by Adair (1924) in Egypt, the size of oothecae laid by unfertilised females of *M. savigny* may be longer than 25mm in 6% of cases, oothecae from paired females never exceed 25mm. Also it is considerably smaller than reported for other mantis species; *Orthodera ministralis* it was 11.3 mm, (Suckling, 1984) while Sharell (1971) stated that it was 20 mm.

The fecundity of *M. paykullii* through the oviposition period was  $336.2 \pm 56.78$  nymphs/female. Number of eggs in each ootheca is very variable, *Orthodera ministralis* (*Fabricius*). being as high as 70 and as low as 5, with 20-40 most common 34 average (Suckling, 1984). Oothecae in other mantids contain 10-400 eggs (Key 1970).

Post-oviposition period lasted  $10.0 \pm 4.20$  day at  $30.1\text{C}^\circ \pm 1.1\text{C}^\circ$  and R.H.  $53.7\% \pm 7.2\%$ . Adults of the *M. paykullii* survived about two months at  $29.5\text{C}^\circ \pm 1.14\text{C}^\circ$  and R.H.  $52.0\% \pm 7.5\%$ .

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**دراسات معملية على فرس النبى المصرى *Miomantis paykullii* STAL, (Mantodea: Mantidae)**

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تم دراسة بعض الخصائص البيولوجية لحشرة فرس النبى المصرى كأحد المفترسات الهامة والتي تنتشر فى كثير من دول العالم بما فيها قارة افريقيا، واثبتت النتائج ان عدد اعمار الحوريات وكذلك مدة كل عمر وبالتالي الفترة اللازمة لتطور الحشرة ووصولها الى الطور البالغ تختلف من الذكر الى الانثى، حيث كان عدد اعمار الحورية 6 اعمار فى حالة الذكر بينما كانت 7 اعمار للانثى وكانت الفترة اللازمة لتطور الحوريات ووصولها الى الطور البالغ هي 54,8 يوما للذكر بينما كانت 64,1 يوما للانثى، وكانت القدرة التكاثرية لهذا المفترس 336,2 حورية للانثى الواحدة وكانت المدة اللازمة لاكمال جيل واحد من اجيال الحشرة هي 99 يوما.

قام بتحكيم البحث

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