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LIFE CYCLE AND INFLUENCE OF AGE AND FEEDING ON THE FIRST MATING OF *TRIATOMA MAZOOTTII* (HEMIPTERA: REDUVIIDAE)

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A cohort of 100 eggs of Triatoma mazzottii *Usinger was studied to obtain information on its life cycle. Egg incubation took 24 days; mean duration of 1st, 2nd, 3rd, 4th, and 5th instar nymphs was 27, 36, 39, 46, and 64 days respectively; mean time from egg to adult was 236 days. The total duration of the nymphal stages was 212 days. The total nymph mortality in cohort was 16.3%, and the embryonic egg mortality was 14.0%. The greater mortality occurred in the 2nd instar. The average number of eggs/female/week was 9.8 during 15 weeks of observation. Of the total eggs laid (2,514), only 58.7% hatched. The total of insects that achieved the adult stage (72), 38 were females (52.8%), and 34 were males (47.2%). The influence of age and feeding on the first mating of* T. mazzottii *were also studied. It was found that the first mating depended on the male's age and it was on the average 30 days after the last imaginal molt. The female could be mating since 2nd days after the imaginal life. The nutritional status did not play an important role in the capacity of the insect for the first mating.*

Key words: Hemiptera – *Triatoma mazzottii* – biology – mating

Triatoma mazzottii Usinger is a species native to the Mexican Republic, and it has been found infected with *Trypanosoma cruzi* in domiciliated, peridomiciliated and wild environments (Tay & de Biagi, 1964; Carcavallo & Martinez, 1985; Rojas et al., 1989). For this species some aspects of the biology and the behavior as: feeding, defecation, life cycle, dispersion, and mobility are unknown, although the mating behavior is known in part (Rojas et al., 1990).

The purpose of this investigation was to study the life cycle as well as the influence of age and feeding on the first mating of *T. mazzottii* under laboratory conditions.

MATERIALS AND METHODS

Life cycle – A sample of 100 eggs of the F^2 of *T. mazzottii* collected from the community "La Humedad", municipality of Santiago Jamiltepec, Oaxaca, Mexico (Rojas et al., 1989) was used. The colony was started with recently laid eggs (0-24 hr old) by 10 females, they were kept in 0,320 l acrylic containers until all viable eggs hatched. After hatching, the nymphs were transferred to 1,980 l acrylic containers. These containers were covered with nylon mesh and provided with vertically placed strips of paper. The strips served as resting places and enabled the bugs to climb to the top of the container at feeding time (Feliciangeli & Rabinovich, 1985).

The insects were fed with rabbit (Rojas et al., 1990) for 30 min each week and maintained in complete darkness for 12 hr at 27 ± 2 °C and about 70% R.H. The observations were made every day to determine the mortality and the number of nymphs molting. Of the insects that reached the adult stage (F^3), 17 females and 17 males were separated to study mating and oviposition behavior within a period of 15 weeks.

Influence of age and feeding on the first mating – Insects of the F^3 of *T. mazzottii* collected in the area described above were used and were fed with rabbit during 30 min and were maintained at same conditions reported

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above. After imaginal ecdysis, the adults were placed in 0,320 l acrylic containers in pairs. The study was carried out in five groups of *T. mazzottii* couples in which age and the number of meals were varied. Confirmation of mating was obtained by the presence of a spermatophore released by the female in the cage the day after copulation. Mating was studied in a sample of 93 couples of *T. mazzottii.*

RESULTS AND DISCUSSION

Life cycle – Table I shows the characteristics of the life cycle of *T. mazzottii.* Of the five nymphal stages, the 1st showed the most uniform pattern of molting (SD = 6.5, Table I), and the most variability was observed with the 5th stage (SD = 13.7). The total duration of the nymphal stages of *T. mazzottii* was 212 days. This value was longer than 150 days of the nymphal stage duration for *Triatoma infestans* obtained by Rabinovich (1972) and the 160 days of *Triatoma maculata* by Feliciangeli & Rabinovich (1985). However, most of the species requires 150-365 days (Carcavallo & Martinez, 1972; Zarate, 1983). Although there are triatomines that require up two years such as: *Panstrongylus megistus, Paratriatoma hirsuta, Triatoma recurva, Triatoma arthurneivai* (Lent & Wygodzinsky, 1979).

TABLE I

Statistical summary of life cycle characteristics of *Triatoma mazzottii* under laboratory conditions

Days	Mean	SD	n
Of egg incubation	24.0	0	86
As nymph			
1st instar	26.54	6.49	82
2nd instar	36.01	8.53	75
3rd instar	39.01	8.06	73
4th instar	46.06	11.63	73
5th instar	63.63	13.69	72
From egg to adult	235.77		

Table II shows the relative and absolute mortality for each nymphal stage. Total nymphal mortality in the cohort was 16.3%, and the embryonic egg mortality was 14.0%. The highest mortality was in the 2nd nymphal stage. Similar results were found in *T. maculata,* where it was 28.4% (Feliciangeli & Rabinovich, 1985). Zarate (1983) reported that *Triatoma barberi* had a mortality of 14.0%. In *T. infestans* was reported 54.6% of mortality (Rabinovich, 1972). Also it was observed that the mortality decreased with the nymphal development stage, with the exception of the 5th nymphal stage. The total mortality reported in Triatominae reared in laboratory conditions was variable (Nyirady, 1973; Carcavallo et al., 1975; Tonn et al., 1976) and this may be due to different conditions of temperature, relative humidity, and periods of feeding in different studies.

TABLE II

Percent mortality of *Triatoma mazzottii* by development stage under laboratory conditions

Instars	Relative mortality[a]	Absolute mortality[b]
1st	28.57	4.65
2nd	50.00	8.53
3rd	14.28	2.66
4th	0.0	0.0
5th	7.14	1.36
Total nymph mortality in cohort		16.27[c]
Embryonic egg mortality		14.0

a: relative mortality = no. dead nymphs in a given stage/ no dead nymphs of all instars x 100.
b: absolute mortality = no. dead nymphs in a given stage/ no. nymphs that entered that stage x 100.
c: not including eggs., e.g., with respect to thestarting no. of 1st instar nymphs.

Of the total number eggs of *T. mazzottii* that reached the adult stage (72), 38 were females (52.8%), and 34 were males (47.2%). Male: female ratio was 1.1:1. These results agree with that reported in *T. infestans* (Rabinovich, 1972; Perlowagora-Szumlewicz, 1976), *T. arthurneivai* (Juarez, 1970), *Triatoma pseudomaculata* (Heitzmann & Fontanelle, 1972), *Rhodnius prolixus* (Garcia et al., 1975), and *Rhodnius robustus* (Jurberg et al., 1970). While the occurrence of more males than females has been reported in *T. barberi* (Zarate, 1983), *T. maculata* (Feliciangeli & Rabinovich, 1985), *Triatoma protracta* (Ryckman, 1962), *Triatoma dimidiata* (Zeledon et al., 1970), *P. megistus* and *Rhodnius neglectus* (Perlowagora-Szumlewicz, 1976).

The first spermatophore was collected at the begining of the seventh week of observation (43 days after the emergence of the 1st female and 40 days after the emergence of the 1st male) A total of 48 spermatophores were

TABLE III

Number of blood-meals and age of *Triatoma mazzottii* to carried out the first mating

Group	Number of coupies	Interval of feeding (days)	Number of meals		Age at which couples were placed together (days)		Age at which the copulation ocurred (days) (X ± SD)	Percentage of copulation
			male	female	male	female		
I	18	1	2-5	5-11	1	1	31.7 ± 7.2	50
II	20	5	2-6	3-7	1	1	30.4 ± 5.2	45
III	20	10	0-3	1-3	1	1	41.0 ± 3.9	80
IV	20	5	1-2	0	60-70	1	2-3	95
V	15	5	2-8	1-7	1	60-70	47.1 ± 6.7	73

collected, with a mean of 2.82 spermatophores per male. This suggests that one male could mated approximately three times. Multiple matings has been observed in the colonies of *T. mazzottii;* these results are similar to that reported in *P. megistus* (Lima et al., 1987).

In relation to the number of eggs/female/week, an increase in function with time was observed although there appeared to be decrease in the weeks 10 and 13. The total number eggs laid/females was 2,514, with a mean of 148 eggs/female. The average number of eggs/female/week was 9.85 during 15 weeks of observation. Similar results were found with *T. maculata* (Feliciangeli & Rabinovich, 1985), whereas that in *T. infestans* was reported 5.4 eggs/female/week (Rabinovich, 1972). The 1st egg fertilized occurred 53 days after the emergence of the 1st female. Of the 2514 eggs a 58.7% hatched. In general it is known that the meal in one or successive feeding drastically affects the viability of eggs and the process of molting (Perlowagora-Szumlewicz, 1969). The females of Triatominae begin to oviposite about 10 days after insemination (Perlowagora-Szumlewicz, 1976), but in some species such as *T. mazzottii* could laid infertile eggs without mating. On the other hand it was observed that after mating, *T. mazzottii* increased egg production. The stimulant action of mating on oviposition has been reported in *R. prolixus* (Davey, 1967), *T. protracta* (Mundall, 1978), *Triatoma brasiliensis* Neiva (Brasileiro, 1984), and *P. megistus* (Cunha & Brasileiro, 1988).

Influence of age and feeding on the first mating – Male did not copulate until 30th day after the imaginal moult (groups I and II). In the insects of the group III the first mating ocurred on the 41th day. Group III was different to groups I, II, because the interval between meals was 10 days. The group IV realized the first mating to 2-3 days, and in the group V the fist mating occurred to the 47th day (Table III). Whereas that *T. mazzottii* females could copulate in the 2nd day after the imaginal moult, independently to the nutritional status and that the time necessary to carry out the first mating depended on the male's age. Females of *P. megistus* and others species of triatomines present similar behavior (Cunha & Brasileiro, 1988; Perlowagora-Szumlewicz, 1976). On the other hand, Regis et al. (1985) found that *T. infestans* males realized the first mating on the 17th day after the imaginal molt, and *P. megistus* males on the 8th day.

The nutritional status of the males seems not to play an important role in the male ability of *T. mazzottii* to mate, due to the fact that males did not feed were observed mating (unpublished data). These results are agree with that reported in males of *R. prolixus* (Galliard, 1936), *P. megistus* (Regis et al., 1985), and *Panstrongylus geniculatus* (Hase, 1932). On the other hand, Zarate (1983) reported that *T. barberi* required blood meals to carried out the first mating. Males of *T. infestans* presented similar behavior (Regis et al., 1985). The period variation between males to realized the first mating, may be due to the physiological condition of the insects, althought other factors could be involved. The role of the accessory glands, as well as the *corpora allata* in the capacity of the males to carry out the first mating should be studied in the future. These organs have been suggested as responsible of the differences in the time necessary to acquire the capacity for the first mating of *P. megistus* and *T. infestans* (Regis et al., 1985).

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