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ECOLOGY OF THE CITRUS PSYLLA, *TRIOZA ERYTREAE* (HEMIPTERA: TRIOZIDAE). 3. MATING, FERTILITY AND OVIPOSITION*

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ABSTRACT

Key words: citrus psylla, fertility, fecundity, mating behaviour, oviposition, *Trioza erytreae*

Males of the citrus psylla, *Trioza erytreae* (Del Guercio), are the aggressors during mating. From time to time they become restless and wander around on the plants, presumably in search of females. During these periods a male often searches a number of leaves and attemps to mate with any adult psylla, male or female, or with mating pairs which it encounters. He may also try to mate with aphids and can become stuck to the aphid's siphunculi. Copulation lasts on average 5 min 32 s at 21 to 26 °C. It takes 29 s to lay an egg, followed by a delay of 23 s before the next egg is oviposited.

Males become sexually mature on the same day that they become adults, and females on the second and third day after the final moult. A female can mate without leading to fertilization. In most cases the duration of mating does not determine whether a female is fertilized or not. A single successful mating enables a female to lay eggs for 16 ± 1,5 days (S.E.) or to fertilize a mean of 591 ± 60,8 eggs. As females lay from 102 to 2 335 eggs (mean 982), they will have to mate twice on average, but up to four times to be fertilized fully. There are indications that overwintering females will have to mate within about a month previously for the eggs to be fertile. One male has the ability to fertilize one but not more than four females to their full capacity. A 95,9 % hatching was observed in field collected eggs. On citrus, eggs are mostly laid on the tips of shoots, young leaves, stems and thorns. They may also be deposited on citrus flower buds and on lemon fruit.

Uittreksel

EKOLOGIE VAN DIE SITRUSBLADVLOOI, TRIOZA ERYTREAE *(HEMIPTERA: TRIOZIDAE). 3. PARING, VRUGBAARHEID EN EIERLEGGING*

Mannetjies van die sitrusbladvlooi, Trioza erytreae *(Del Guercio), is die aggressors tydens paring. Van tyd tot tyd word hulle rusteloos en dwaal op die plante rond, vermoedelik op soek na wyfies. Gedurende hierdie periodes soek 'n mannetjie dikwels 'n aantal blare deur en probeer om met enige volwasse bladvlooi, mannetjie of wyfie, of met ander parendes wat hy teëkom te paar. Hy mag ook met plantluise probeer paar en kan verstrik raak aan een van die plantluise se siphunculi. Paring duur gemiddeld 5 min 32 s by 21 tot 26 °C. Dit neem 29 s om 'n eier te lê, gevolg deur 'n periode van 23 s voordat die volgende eier gelê word.*

Mannetjies word geslagtelik volwasse op dieselfde dag wat hulle volwasse word en wyfies op die tweede en derde dag na die finale vervelling. 'n Wyfie kan paar sonder om bevrug te word. Die tydsduur van paring bepaal nie in alle gevalle of sy bevrug word nie. 'n Enkele suksesvolle paring stel 'n wyfie in staat om bevrugte eiers vir 16 ± 1,5 dae (S.F.) of om 'n gemiddelde van 591 ± 60,8 eiers te lê. Aangesien wyfies van 102 tot 2 335 (gemiddeld 982) eiers lê, sal sy van twee tot vier keer moet paar om volledig bevrug te word. Daar is aanduidings dat oorwinterende wyfies minder as 'n maand vooraf moet paar om vrugbare eiers te lê. Een mannetjie het die vermoë om een maar nie meer as vier wyfies tot hulle volle kapasitiet te bevrug nie. Van veldversamelde eiers het 95,9 % uitgebroei. Op sitrus word eiers meestal op die punte van takkies, op jong blare, bas en dorings gelê. Hulle mag ook op sitrus blomknoppe en op suurlemoenvrugte gelê word.

INTRODUCTION

More than 90 years ago it was reported that the citrus psylla, *Trioza erytreae* (Del Guercio) feeds on citrus (Lounsbury, 1897). However, it only became of prime importance once this insect was implicated as a vector of the greening disease of citrus in South Africa (McClean & Oberholzer, 1965b).

Trees severely affected by greening are badly stunted and produce poor crops of predominantly greened, worthless fruit (McClean & Oberholzer, 1965a). The importance of greening in South Africa was realized when approximately 100 000 sweet orange trees were rendered commercially unprofitable (Oberholzer *et al.*, 1965).

Despite the importance of the citrus psylla to the citrus industry, information on many aspects of its life history is still unknown. Brief descriptions of its mating behaviour have been published (Van der Merwe, 1923; Catling, 1967, 1973) but the effect of mating on the fertility of eggs has not been investigated. Moran & Blowers (1967) stated that, based on the capacity of the spermatheca of this species, more than one mating appears to be required for the full complement of fertilized eggs to be laid. This aspect and the fertility of this species has not been investigated fully. On the other hand, pre-oviposition and oviposition have been described in detail by Moran & Buchan (1975). However, the time occupied for oviposition has not been studied. Field studies revealed that mating may occur almost at any time of the day and night and that two mating peaks occurred, one just after sunrise and the other before sunset (Van den Berg *et al.*, 1990).

This paper forms part of investigations on the ecology of the citrus psylla. The aim of these studies is to investigate the habits of the psylla to arrive at a feasible control programme for this pest in citrus orchards.

MATERIALS AND METHODS

A field population of the citrus psylla was established at Nelspruit (25° 27′ S and 30° 58′ E), as described in an earlier paper (Van den Berg *et al.*, 1990). This population was maintained on about 300 sweet orange nursery trees and 10 young false horsewood trees. The citrus psylla used in the experiments came from this population or from those collected in an orchard at Burgershall (25° 07′ S and 31° 05′ E).

Experiments in the laboratory were carried out in two types of cages, namely in modified 2 ℓ soft drink bottles (Van den Berg, 1989) and in 40 mℓ pill vials. Both containers are transparent. The bottoms of the pill vials were replaced with organza sleeves and a hole made in each screw top was also covered with

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organza. These cages were moved with the psylla in them from one citrus nursery tree to another. During these experiments the ambient temperatures and relative humidities were recorded hourly or registered on a thermohygrograph.

Mating and oviposition behaviour

The mating and oviposition behaviour of more than 500 adult citrus psylla was studied on citrus nursery trees in the laboratory and where they occurred naturally on false horsewood and citrus trees.

Age of psylla when sexually mature

Five citrus nursery trees, bearing psylla nymphs nearing their final moult, were brought to the laboratory. Soon after the adults emerged and thus prior to mating, the males and females were placed in different 2 ℓ cages on citrus nursery trees. This was repeated for a number of days, each group being held in separate cages. Five one-day-old females were caged in separate 40 mℓ cages. Each cage contained a seven-day-old male. After 8 h the males were removed and the females held in the cages to ascertain whether they could lay fertile eggs. This procedure was repeated for females 2 to 7 days old. Males that were 1 to 7 days old were exposed similarly to females 7 days old.

Effect of mating on vitality of eggs

To obtain unmated psylla the same procedure was followed as described above. When these were 5 days old, five females were placed separately in small glass vials (5 × 50 mm) containing a male of the same age. Constant vigil was kept and the exact time each female mated was recorded. Each female was allowed to mate only once and as soon as this process had ended, each psylla was shifted to a 2 ℓ cage on a citrus seedling. The females were allowed to oviposit on the nursery trees and were transferred daily to other nursery trees until their death. The males were left on their original plants. The eggs laid were counted and the number not hatching was recorded 10 to 12 days later.

The above procedure was repeated for 49 females. Three females that had failed to lay fertile eggs within 10 days were allowed to mate once more with the same males that they had mated with before. Thereafter they were placed on nursery trees as mentioned before. The data from those females that lived more than 25 days were used to determine how long a singly mated female can lay viable eggs.

As a control for the females that failed to lay fertile eggs, eight virgin females were placed individually on nursery trees and were treated likewise.

Effect of winter conditions on the period that a single mating lasts

Twenty-one females, 5 days old, were allowed to mate once and placed individually in the laboratory (± 25 °C day and 18 °C night) on nursery trees for 24 h in order to lay eggs. The latter were counted and their viability checked 10 days later. On the sixth day, the females were placed individually in pill vials on dormant leaves on trees kept at 20 °C day (10 h) and 10 °C night (14 h) to simulate winter conditions. Twenty days later, the females still alive were placed on nursery trees in the laboratory. These were transferred daily to other nursery trees until their death. The eggs that were laid were counted and those that hatched were recorded as mentioned before.

Fecundity

Recently emerged adults were placed in each of 20 2 ℓ cages on nursery trees in the following proportion: Eight 2 ℓ cages contained one male and one female; five contained five males and one female and the rest contained one male and five females. These were kept in a controlled temperature room at 22,3 ± 1,3 °C (range) day—14 h and 17,0 ± 1,5 °C night—10 h with a relative humidity of 51 to 92 %. The cages containing the psylla were shifted daily to other nursery trees. The cages containing one male and female were shifted until the female died, while the other groups were kept until the 19th day. The latter period was chosen as some of the females died a few days thereafter. If adults died before the 19th day, the procedure was repeated with new groups. The eggs laid by each female or group of females per day were counted and the hatching success recorded.

The maximum capacity of increase was calculated as the number of female progeny produced from one female in one year assuming maximum fecundity, no mortality and no verlap of generations (Hodkinson, 1974).

Fertility of field laid eggs

Twenty citrus nursery trees bearing eggs nearing hatching, were taken from the field population on 14 December 1987. These were placed on their sides on a work bench. The egg-bearing leaves were arranged in such a manner that they could be inspected with a stereo-microscope mounted on a movable stand. A total of 468 eggs were inspected individually once a day until all fertile eggs hatched after 3 days.

Oviposition sites on citrus

Oviposition sites were studied in citrus orchards at Nelspruit and Burgershall.

RESULTS

Premating behaviour

Males are the aggressors during mating. From time to time, fully sclerotised males stop feeding, become restless and wander around on the plants, presumably in search of females. Females do not exhibit such restless activities. During daylight, females often feed, mate and oviposit on the same leaf, often spending 2 of more h on such a leaf. During the restless periods, a male often searches a number of leaves and attempts to mate with any adult citrus psylla (male or female) or even with mating pairs which it encounters. If a female is not found, the male takes up a feeding position and will again attempt to mate with other citrus psylla of either sex in the immediate vicinity. Males may also try to mate with aphids that occur on the same shoot. On three separate occasions it was noticed that males in the field population that attempted to mate with an apterous aphid became stuck to one of its siphunculi.

A female may refuse a male by raising her abdomen at an angle of approximately 90° to the surface she clings to. After unsuccessfully trying to reach the female's genitalia, the male seems to lose interest and wanders off. However, a male has also been seen clining to the abdomen of a female that took up a "refusing" position. The female first tried to shake herself free and then jumped away.

Mating activities

The male positions himself parallel with the female with their heads pointing in the same direction. He bend his abdomen towards hers and claps her genitalia with his parameres. Their terminalia then join. Soon after this, one or both may take up feeding positions while remaining coupled. They may also move a small distance while mating. In the field at 21 to 26 °C, mating duration was observed to last from 1 min 3 s to 18 min 38 s [mean 5 min 32 s; ± 34,4 s (S.E.); n = 46] (Fig. 1). Mating is often terminated when the female starts to move away. When their terminalia part, the male often moves off and may continue to search for another female or may again attempt to mate with the same female. Directly after mating with one male, a female may mate again either with another or with the same male. Four successive matings of 210, 443, 350 and 314 s were observed between the same mating pair in less than 45 min. A second male often tries to cuckold a female that is mating. In all instances observed this was without success. A female in a feeding position or ovipositing, may terminate this to mate and directly after mating resume her prior activities.

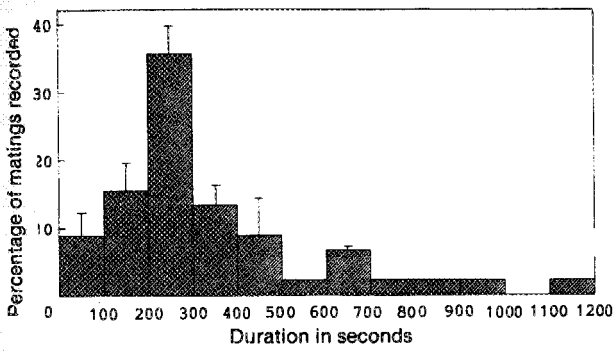

FIG. 1 Duration of citrus psylla mating in the field at 21–26 °C (± S.E.; n = 46)

Age of psylla when sexually mature

The ages at which male and female psylla become sexually mature are summarised in Table 1. Males become sexually mature on the same day that they become adults and females on the second and third day after their final moult (Table 1).

TABLE 1 Age of citrus psylla when sexually mature

Age of females (days)	Age of males (days)	Number of females laying fertile eggs out of 8 females
1	7	2
2	7	4
3	7	8
4	7	8
5	7	8
6	7	8
7	7	7
7	1	7
7	2	8
7	3	8
7	4	7
7	5	8
7	6	8

Oviposition behaviour

Before the female starts to lay eggs, she wanders about on the leaf and frequently pierces the tissue with her valvulae. If the leaf tissue is suitable, she then proceeds to lay an egg. At temperatures between 25,6 and 28,8 °C, this takes an average of 29 ± 1,6 s (S.E.; n = 15). Before laying another egg, she either waits a while, moves a few mm or moves to another part of the leaf and may again "test" the tissue with her valvulae. On average there is a delay of 23 ± 5,7 s (n = 9) before she continues to oviposit. A female usualy lays between five and ten eggs (in succession), then stops to feed, mate or move to another part of the leaf or to another leaf before again resuming oviposition.

Effect of mating on viability of eggs

After their first mating, 39 females laid fertile eggs and 10 laid infertile eggs. Two females which mated for only 31 and 48 s, respectively, produced infertile eggs. With the exception of the latter two, the females that laid infertile eggs, mated on average for 8 min 36 s ± 1 min 57 s (S.E.; n = 8) while those that laid fertile eggs mated for 9 min 29 s ± 0 min 34 s (n = 39). Thus in general, fertilization does not appear to be correlated with duration of mating.

The egg production of mated females that laid fertile eggs, those that laid infertile eggs and of virgin females are given in Table 2. Females that laid fertile eggs produced significantly more than those that mated but laid infertile eggs and also more than the virgin females (Table 2). This indicates that the mated females that laid infertile eggs could somehow determine that they were still not fertilized. Thus the females seem to be stimulated to oviposit by the presence of the spermatheca rather than whether mating took place or not.

TABLE 2 The effects of mating on egg production of *T. erytreae* females

Females that were	n	Average number of eggs laid/female
Mated and laid fertile eggs (A)	8	786,5
Mated and laid infertile eggs (B)	5	139,4
Unmated (C)	8	128,4

T-tests least significant difference (L.S.D.) for variables

Comparing	Lower confidence limit (L.S.D.)
A & B	478,9 [a]
A & C	510,2 [a]
B & C	145,3

[a] Comparisons significant at P = 0,05

Females that had mated once, produced fertile eggs immediately thereafter and during a further 16,0 ± 1,5 days (S.E.; n = 8) they produced 591,0 ± 60,8 fertile eggs (n = 8). Less eggs per day were produced when they started to lay infertile eggs (Fig. 2). This is a further indication that females are stimulated to oviposit by the presence of the spermatheca.

The three females that were infertile after the first mating, and that were re-mated with the same males, produced 76,2 % fertile eggs subsequently. It can therefore be deduced that these adults were all fertile but that all matings do not produce fertile eggs. One of these females lived longer than the others and started to produce infertile eggs 15 days after the second mating.

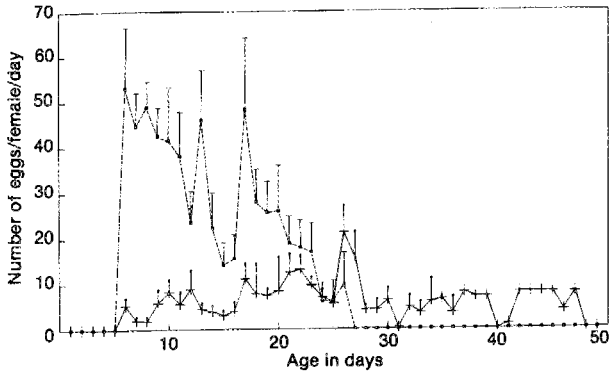

FIG. 2 Average number of fertile and infertile eggs laid by citrus psylla females that mated once (— ⊟ — ⊟ — Fertile eggs, ⊺ S.E. ++ Infertile eggs, ⊺ S.E.)

Effect of winter conditions on the period that a single mating lasts

Of the 21 females, 20 were successfully mated and laid an average of 84,8 eggs during the following 24 h. After being exposed to winter conditions for 20 days, nine of the mentioned 20 females were still alive. Seven of these laid predominantly fertile eggs for the rest of their lives (2–16 days) but two laid only infertile eggs and lived 2 and 8 days. This indicates that the period that a single mating lasts is at least for some females less than 21 days, even during winter conditions.

Fecundity

Females

The average daily numbers of eggs laid by eight females kept in cages with one male each and at fluctuating temperatures of 22,3 ± 1,3 °C (range) day and 17,0 ± 1,5 °C night are provided in Fig. 3. Under these conditions the pre-oviposition period ranged from 2 to 6 days. After this, egg production increased and was above average on the 5th day and started to decline from the 30th day (Fig. 3). The females stopped laying eggs 0,9 ± 0,2 days (S.E.) prior to their deaths.

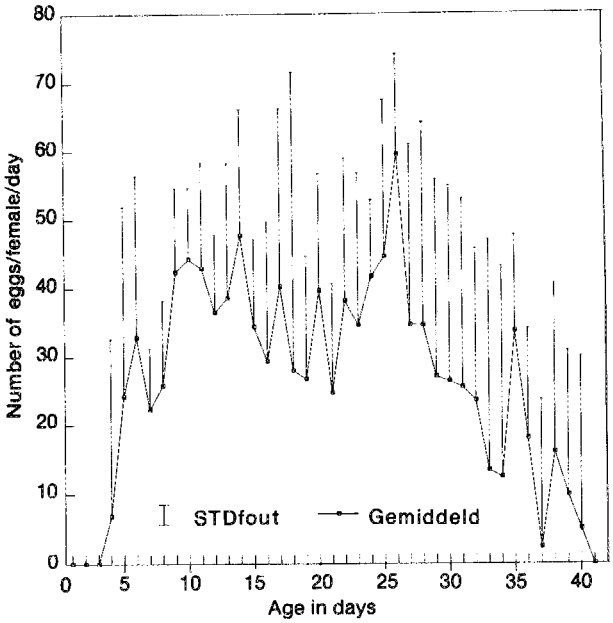

FIG. 3 Average number of eggs laid by eight citrus psylla females per day when each was kept continuously with one male (± S.E.)

The average number of eggs laid per female was 982 (range 102 to 2 335). If the pre- and post-oviposition periods are included, the average number of eggs laid per female was 35 per day. Some of the females laid more than 100 eggs per day, and one kept this up for 3 consecutive days. On the other hand, some females failed to lay eggs on one day and again oviposited the following day. Under these conditions, the females lived up to 41 days.

Effect of males on egg production of females

The average number of eggs laid per female when kept in different ratios with males, are given in Fig. 4. When the ratio of males per female increased the egg production per female reached its optimum earlier (Fig. 4). With the exeption of the 6th day, the average number of eggs laid per day by these females were not significantly different from one

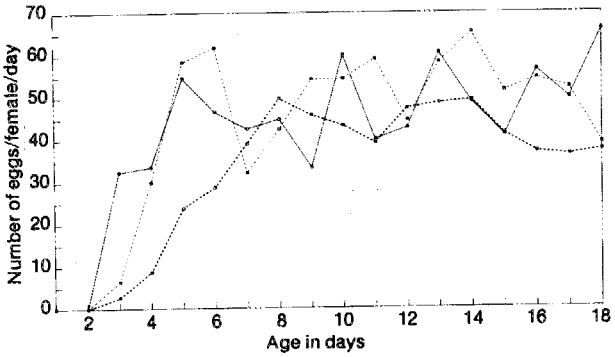

FIG. 4 Average number of eggs laid per female when kept in different ratios with males (· · · · ⊡ · · · · 5 females: 1 male; — — ⊟ — — 1 female:1 male —⊟— 1 female: 5 males)

TABLE 3 Mean number of eggs laid by citrus psylla females per day for the first seven days when with different numbers of males [Standard error (± S.E.) and t-test least significant difference (L.S.D.) values are also given]

Day	5♀♀ + 1♂ mean[a] (± S.E.) (n = 7)	1♀ + 1♂ mean[a] (± S.E.) (n = 8)	1♀ + 5♂♂ mean[a] (± S.E.) (n = 5)	L.S.D. (t-tests)
1	0	0	0	
2	0	0	0	
3	2,7 a (± 2,0)	6,4 a (± 6,4)	32,4 a (± 32,4)	58,9
4	8,7 b (± 5,2)	30,0 b (± 19,9)	33,6 b (± 18,8)	49,5
5	23,8 c (± 8,8)	58,4 c (± 16,0)	54,6 c (± 11,6)	38,5
6	28,8 d (± 6,0)	61,8 e (± 13,0)	46,6 de (± 11,5)	32,6
7	39,0 f (± 8,8)	32,2 f (± 4,8)	42,6 f (± 13,8)	30,3

[a] Means with the same letter are not significantly different at P = 0,05

TABLE 4 Mean number of eggs laid and % of fertile eggs laid by citrus psylla when in different sex ratios

Sex ratios ♀:♂	Mean number of eggs per female[a]	Mean % of fertile eggs[a]
1:5	45,8 a	73,5 c
1:1	41,0 ab	68,3 cd
5:1	36,0 b	64,6 d
LSD (t-tests)	9,2	7,9

[a] Means with the same letter are not significantly different at P = 0,05

another (Table 3). The mean number of eggs laid by females when in different ratios with males are given in Table 4. Significantly more eggs were laid by females in a 1:5 ratio with males than females with a 5:1 ratio but not significantly more than females with a 1:1 ratio with males. A significantly greater percentage of eggs hatched from females in a 1:5 ratio with males than in a 5:1 ratio but not greater than in a 1:1 ratio (Table 4). From the mean number of eggs laid and the percentage of eggs hatched, it can be deduced that a male has the ability to fertilize one but not more than four females to their full capacity.

Fertility of field layed eggs

Of the 468 eggs taken from the field population, 449 eggs hatched, which represented 95,9 %.

Oviposition sites on citrus

Eggs were found on the tips of shoots on the youngest growth. This included young developing auxillary buds, leaves that were still soft to the touch and young stems. They were also laid on tender young thorns and occasionally even on flower buds and on lemon fruit.

Eggs laid on the very young leaves of which the dorsal sides are still against the growth tips, are therefor deposited on the ventral side. Once the leaf has opened completely, eggs are laid mostly along the mid veins of the dorsal side or on the leaf margins.

DISCUSSION

Our observations indicate that males seek out females during their occasional restless periods. This was also reported for *Cacopsylla pyricola* (Förster) (Burts & Fisher, 1967) and for *Cardiaspina densitexta* Taylor (White, 1970). We also found that *T. erytreae* males will frequently attempt to copulate with mating pairs and with other males. The same was found with *Cardiaspina densitexta* (White, 1970) and this corresponds to our findings. However, no reference could be found on Psylloidea attempting to mate with aphids. The mating process which is described for the citrus psylla, is an uncomplicated act with no obvious courtship behaviour. This has also been reported for many other Psylloidea (Cook, 1963; Hodkinson, 1974). However, the male of *Pachypsylla celtidis-gemma* Riley holds the female by placing a prothoracic leg across the female's head (Walton, 1960). A well-defined pre-copulatory behaviour pattern is found in some of the members of this group e.g. in *Cardiaspina densitexta* (White, 1970). In the orchard, the duration of mating lasted an average of 5 min 32 s (range 1 min 3 s to 18 min 38 s) which confirms earlier work done by Catling (1973). He stated that it lasts approximately 4 min. The mating duration of about 2 h, mentioned by Catling (1967), seems to be atypical. The duration of mating of *T. erytreae* agrees largely with that of other Psylloidea species. In most species, copulation lasts no longer than about 30 min (White, 1970; Pande, 1971; Hodkinson, 1974; Taylor, 1985) although it can vary from less than 1 min to 3 or 4 h for *Cacopsylla pyricola* (Burts & Fisher, 1967).

The present observations on the pre-oviposition behaviour of the citrus psylla which indicate that females wander about on the leaf and frequently pierce the leaf surface with her valvulae, confirms the work by Walton (1960) on *P. celtidis-gemma* and also that of Moran & Buchan (1975) on *T. erytreae*. As females prefer soft leaves for oviposition, citrus cultivars with harder leaves or with leaves that harden faster than those of other cultivars, will probably be less suitable for oviposition than others. This may be one reason why certain cultivars and varieties are less atrractive to citrus psylla adults than others as has been reported (Samways & Manicom, 1983; Van den Berg *et al.*, unpublished).

During the present investigations it was found that the duration of mating was not a crucial factor in determining whether a female was fertilized or not. This agrees, with the work of Krysan (1990) who stated that few matings of less than 5 min in *Cacopsylla pyricola* resulted in insemination and that copulations of longer than 5 min were likely to result in females laying fertile eggs.

Our results show that a single mating is sufficient to fertilize 591 ± 61 eggs (S.E.) which are laid within the space of 16,0 ± 1,5 days. this is in agreement with the results of Moran & Blowers (1967) who stated that the limited capacity of the spermatheca of this species appears to make more than one mating a necessity for the full complement of eggs to be laid. Furthermore, it also confirms the results of Catling (1973) that when *T. erytreae* males were removed, females started to lay infertile eggs after 11–16 days. Similar results were obtained with *Cacopsylla pyricola* where it was found that females must mate once every 10 days to produce fertile eggs at full capacity (Burts & Fisher, 1967).

There are indications that it is the presence of spermatheca in the female, rather than mating *per se* that stimulates her to lay eggs.

During the present work it has been found that single mated females laid an average of 787 eggs and unmated females laid 128 eggs. Catling (1973) found 828 and 217 respectively which is comparable to the present findings.

Based on an average egg production of 982 eggs with a maximum of 2 335, an average of two but up to four matings will be required to fertilize a female fully. It has been shown that if females are exposed to winter conditions, a single mating prior to this lasts in about 20 % of the psylla females less than 21 days. If taken into account that females can live up to 82 days in winter (Catling, 1969), it seems possible that a greater percentage of females than mentioned will be infertile by the end of winter, unless they mated during this period. For this reason, many of those that overwinter will have to mate prior to laying fertile eggs on the new flush in spring. It has also been shown that a female needs up to four matings for her full egg capacity. It therefore follows that at low population densities some of the females will probably lay infertile eggs during part of or her entire lifespan. This may therefore be a further advantage in keeping populations at low levels, especially during winter when populations are mostly already relatively low.

The present findings indicate that one male has the ability to fertilize one but not more than four females to full capacity. This agrees largely with the work on *Cacopsylla pyricola* where Burts & Fischer (1967) found that one male can fertilize four but not more than five females to full oviposition. The sterile male technique, if it is to be tried, will stand a smaller change of success than if only one mating was needed to fully fertilize a female.

The present results indicate that the maximum production of eggs takes place from shortly after the pre-oviposition period up to a few days prior to the females death. This agrees with Catling's results

(1973) in that the maximum egg production occurred towards the middle of the adult's lifespan. However, Van der Merwe (1923) found that this occurred at the beginning of the egg laying period.

The fecundity of *T. erytreae* was recorded to be between 102 and 2 335 (mean 982) eggs per female. This is much higher than the results of Van der Merwe (1923) who recorded 197–502 (288) indoors and a mean of 611 outdoors and of Moran & Blowers (1967) who registered 109–560 (327). However, it agrees with the results of Catling (1973) who recorded 31–2 542 (827). If taken into account that *T. erytreae* has eight generations per year and that the sex ratio varies in the field from 60–79 % females (means 69,5 %) (Catling, 1972), the maximum capacity for increase per year was calculated to be $9{,}5 \times 10^{25}$. The capacity increase of seven Psylloidea spp. was from $1{,}5 \times 10$ to $2{,}1 \times 10^{25}$ (Hodkinson, 1974) and for *Diaphorina citri* Kuwayama $4{,}2 \times 10^{25}$ (Hodkinson, 1988). This indicates that *T. erytreae* has a greater capacity to increase than many other Psylloidea. Its capacity is about twice that of *D. citri*.

The 95,9 % hatching of field collected eggs recorded during the present studies is in agreement with observations made by Clarke (1962) and Catling (1973). These authors mentioned that under favourable conditions, more than 95 % of the eggs of *Cardiaspina albitextura* Taylor and the citrus psylla hatched respectively.

T. erytreae oviposit mostly on young foliage which is consistent with this behaviour of other Psylloidea. According to Kozlowski (1971 in Taylor, 1985) it is only in these developing leaves that plant growth hormones and nutrients are sufficiently concentrated that insect and gall growth is possible.

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