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Adult *Tropilaelaps clareae* Males Can Feed and Survive for Two Weeks

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Introduction

First adult *T. clareae* males appear on *A. mellifera* brood 15-17 days after bee egg was laid, (Ritter and Schneider-Ritter 1988). Thus , they have to survive in worker brood cells for at least 5 days, and in drone cells 3 days longer. The males emerge from the cells together with the bees and are found on comb surface in ratio 1.0: 1.8, males to females (Woyke 1989). The males mate with the females inside sealed brood cells, as well as outside (Woyke 1994a). Therefore, it is important to know their survival rate outside sealed brood cells.

The females survive without food for 2-3 days only (Woyke 1984, 1985). Therefore, they enter new brood cells within 2-3 days after emerging from the previous one (Woyke 1987). *T. clareae* males do not enter brood cells to be sealed. How long they can survive outside sealed brood cells and on which substrate is not known.

The distal part of the chelicerae of adult male, the movable chela is modified into a long, sinuous spermatodactyl (Delfinado and Baker 1961, Kitprasert 1984). Consequently, it is described (Akratanakul 1987) and accepted (Jedruszuk 1992), that adult *T. clareae* male can not feed.

Therefore it was investigated whether *T. clareae* males can survive for several days without feeding, or whether they can feed.

Material and methods

The investigations were conducted in the Institute of Agricultural Research of the Chinese Academy of Agricultural Sciences in Beijing, China, in July and August 1992. Adult *T. clareae* mites were collected from comb cells with emerging *A. mellifera ligustica* workers, by the method worked out by Woyke (1994b). The mites were sexed upon the shape of the epigynial plate. The male were released individually, either into empty glass test tubes (0.8 x 4 cm), (n=17), or into tubes containing *A. mellifera* pupae with white-pink eyes (n=18). The tubes were sealed with lids made from wax foundation. Two small wholes were made in the lids. The tubes were kept in an incubator at 34°C. About every 4 days, the bee pupae were exchanged for new ones.

Results

Out of 17 *T. clareae* males released into empty test tubes, no one was alive the next day. However, 100% out of 18 males released on *A. mellifera* bee pupae, were alive the second day and 89% after 48 h. Without statistical calculation it is obvious, that during the two first days, considerably more males survived on pupae than in empty test tubes.

The survival range for all males on bee pupae was 2-13 days. The overall mean survival was 6.7 days (n=18, s.e. ± 0.9 days, s.d. ± 3.8 days). Thus *T. clareae* males survived on bee pupae on the avg 6.7 times, and maximally 13 times longer, than in empty tubes.

The daily survival rate presented in fug. 1 shows, that 50% (9) males survived 8 days. They binomial 95 % confidence interval for 9 mites surviving out of 18 is 0.25-0.75. This means, that in a large number of similar experiments, the survival of 4.5 (25%)-13.5 (75%) males (18 x 0.25 = 4.5 to 18 x 0.75 = 13.5) can be expected till the 8^{th} day. The 11^{th} day, still 22% (4) mites were alive. The binomial 95% confidence interval for 4 out of 18 indicates, that 6% (1) –44% (8) males could be expected to survive till the 11^{th} day. Two (11%) males survived till the 13^{th} day. The binomial 95% confidence interval indicates, that in many repetitions survival of 0.2(1%) – 6(33) males can be expected till the 13^{th} day. This suggests that some mites may survive probably for even longer period. No alive male was found the 14^{th} day of observation.

Fig.1 shows, that the survival during successive days had a staircase character. Higher mite mortality occurred after the exchange of bee pupae.

All the above results show, that adult *T. clareae* males can not survive without food, for several days. However, the males are able to survive on bee pupae up to 13 days after emerging from brood cells.

Discussion and conclusion

The 13 days survival of some *T. clareae* males *T. clareae* males after emerging from brood cells indicates, that including the 5 days spend in sealed cells, the males lived 18 days. The binomial confidence interval shows, that increasing, the number of *T. clareae* males released on bee pupae will probably extent the maximal survival period. Some males survived on bee pupae more than 10 times longer, than those in the same

conditions without any food. This proves that adult *T. clareae* males are able to feed and survive on bee pupae.

I do not suggest that adult *T. clareae* males are able to pierce somehow the epidermis of a bee pupa, or to eat with the aid of the spermatodactyls. I suggest that the males feeds on some liquids through the oral opening of their hypognathum. It is not expected that *T. clareae* male would enter a comb cell with larva and survive till the prepupa or pupa stage. However, bee workers open may cells with pupae infested by mites. In these circumstances adult *T. clareae* males could feed and survive for several days after emerging from brood cells. The results indicate, that adult *T. clareae* males are damaging worker bee pupae for 5 and drone pupae for 8 days before emerging from comb cells. The males can survive also for some time after emerging, mating in that time with the females.

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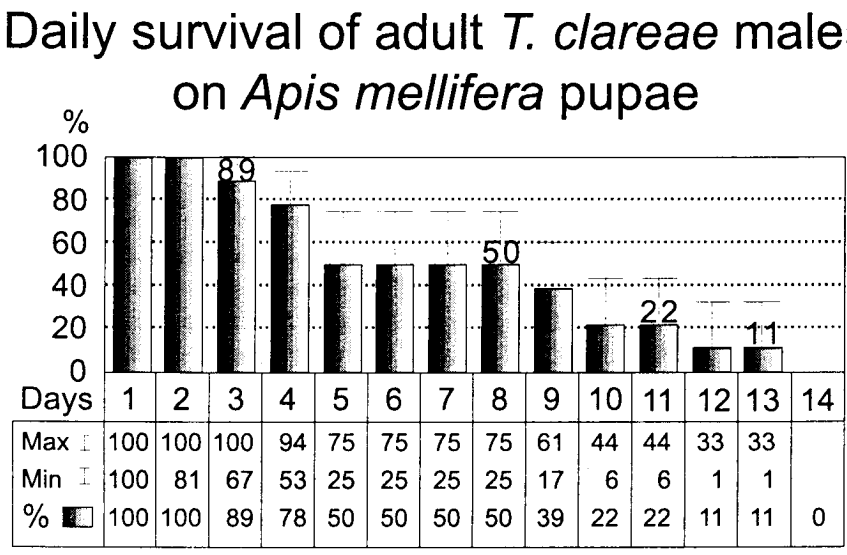
Legend to:

Adult *Tropilaelaps clareae* males can feed and survive for two weeks



Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Max	100	100	100	94	75	75	75	75	61	44	44	33	33	
Min	100	81	67	53	25	25	25	25	17	6	6	1	1	
%	100	100	89	78	50	50	50	50	39	22	22	11	11	0

Fig.1. Daily survival of initial 18 adult *Tropilaelaps clareae* males reared on honeybee pupae. Bars represent percentages of alive males. Error vectors represent the binomial 95% confidence intervals.