

Mate location and sexual maturity of adult male mealybugs: narrow window of opportunity in a short lifetime

E.B. Silva¹, J. Mouco¹, R. Antunes¹, Z. Mendel² and J.C. Franco¹

¹*Departamento de Protecção de Plantas e de Fitoecologia, Instituto Superior de*

Agronomia, Universidade Técnica de Lisboa, 1349-017 Lisboa, Portugal; ²*Department of*

Entomology, Volcani Center, ARO, Bet Dagan 50250, Israel

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Abstract

The identification of sex pheromones of several mealybug species has facilitated the development of monitoring techniques and management tactics based on these compounds. However, experience shows that the efficiency of tactics such as mass trapping, mating disruption, and lure and kill may be constrained by a lack of knowledge of basic aspects of the life history and mating behaviour of male insects and the mechanisms involved in their interactions with pheromone sources. Unlike neotenic and apterous adult females, male mealybugs fly, but do not feed and live only a few days. In order to estimate how much time a male mealybug is able to dedicate to mate location and mating, we performed a Petri dish bioassay in which we tested the amount of time needed for a male of the citrus mealybug, *Planococcus citri* (Risso) to reach sexual maturation. We did this by testing the abilities of males of different ages to respond to a synthetic pheromone and virgin females. Males from three different age classes (I- up to 10 hours after eclosion; II - 10-29 hours after eclosion; III- 29 or more hours after eclosion) were exposed to 100 ng of pheromone or a virgin female and the occurrence of a clear response, with copulation behaviour within 30 minutes of exposure, was noted. The insects' survival rate, in terms of time, was also determined. In a parallel study, we also examined daily flight activity rhythms based on the number of male mealybugs captured each hour in pheromone traps in a citrus orchard. In our Petri dish bioassay, no Class I males and less than 20% of class II males responded to the pheromone or virgin females. On the other hand, most of class III males presented a clear response. Data suggest that, after eclosion, most *P. citri* males need to complete a period of sexual maturation of at least 30 hours before they can respond to the sex pheromone and mate. Without mating, the maximal lifespan of males was approximately five days and 50% of males lived only up to 4.4 days. Therefore, we estimate that most *P. citri* males have less than three days to find a receptive female and mate with her. However, since *P. citri* males only fly within a period of approximately four hours after sunrise, the total effective time available for mate location by flight is actually only less than 12 hours.