Sterile medfly males of the *tsl*Vienna 8 genetic sexing strain improved mating performance with ginger root oil

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Abstract

A key point of the Sterile Insect Technique (SIT) applied to the medfly, *Ceratitis capitata*, is that the sterile males produced in the laboratory should have at least a minimal sexual compatibility with wild females. Among several genetic sexing *tsl* (Temperature Sensitive Lethal) strains of *C. capitata* mass-reared around the world, the Biofábrica Moscamed Brasil has chosen the most recent mass produced tsl strain, Vienna 8 (V8), which has been evaluated in the San Francisco River Valley, Brazil, since April, 2005. This study has been carried out at Embrapa Semi-Árido, Petrolina-PE, as an attempt to improve sterile males performance by exposure them to ginger root oil prior release. The tests were accomplished in field cages, with different treatments for V8 males, sterile or fertile, exposed to the aroma of ginger root oil (GRO) or not, versus wild males and females. The competitiveness was evaluated by RSI (Relative Sterility Index) and Fried´s competitiveness values (C)were calculated for each field cage. The percentage of females mated was statistically higher to sterile males exposed to GRO than to non exposed. Time in copula was significantly higher for wild flies than for Laboratory flies, except for the case of fertile V8 males exposed to GRO x wild females. The RSI and C values were significantly higher for V8 males (irradiated and fertile) treated with GRO than for V8 males not treated.

Introduction

Over generations of rearing in the laboratory, it is known that sterile males of the medfly become less competitive. Therefore, recent research efforts have focused on finding simple but effective means to improve the quality of fruit fly adults destined for field release in SIT programs worldwide. One encouraging effort has been the development of aromatherapy with ginger root oil (GRO) as a strong booster of sterile male mating performance (Shelly and McInnis 2001; McInnis et al. 2002; Shelly et al. 2005).

Objective

The objective of this work was to evaluate the GRO aromatherapy on mating compatibility and competitiveness of sterile medfly males, *tsl*, Vienna 8, with wild females of *Ceratitis capitata* from San Francisco River Valley, Brazil.

Materials and Methods

Place: Embrapa Semi-Árido, Petrolina-PE, Brazil.
Period: from April/2005 to July/2006.
Field cages: 3 x 2 x 2 covered with a fine screen cloth with 2 potted plants of *Ficus benjamina*.
Insects: Virgin wild flies, from several many host fruits, were between 10-19 days old when tested and virgin laboratory flies (Vienna 8 strain) were 5-9 days old.
Irradiation: Pupae (24 h) received 95Gy of gamma radiation from Co^{60} source.
Marking one of males: On the day prior to a test, either lab or wild male flies were marked with a spot of white paint on the thorax.
Exposed to GRO: 50 males of the V-8 strain were exposed to 40 l of the aromatic oil on filter paper for 5 hours in a well ventilated, isolated room.
Experiment: At 8 A.M., 50 wild and 50 V-8 males were released onto the foliage near the bottom of the cage. After ca. 10 min 50 wild females were released. Nont -flyers or dead flies were replaced. Mating pairs were collected in glass vials. The starting and stopping time of each pair was recorded. The mated flies were taken to the laboratory and placed inside small cages for oviposition using grapes as the host fruit. Eggs were dissected from the grapes and seeded on moist filter paper in a Petri dish for 3 days prior to being scored for larval eclosion.
Data and statistics: It was evaluated the RSI (Relative Sterility Index), time in copula, and Fried's male competitiveness value (C).

$$C=(W/S) \times [(Hw\ \ Hc)/(Hc\ \ Hs)]$$

W= number of wild males released in the test enclosure, **S=** number of sterile males released in the test enclosure, **Hw=** % of egg hatch from wild females following mating with wild males exclusively, **Hc=** % of egg hatch from wild females in the test enclosure, **Hs=**% of egg hatch from wild females following mating with sterile males

Results

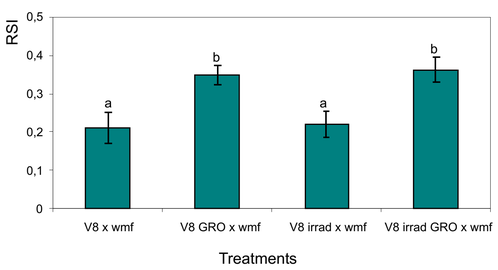

Figure 1. Relative sterility index (RSI) among V-8 males, fertile or irradiated, and treated or not treated with GRO, in mating competition with wild males for wild females. Bars with same letter do not differ significantly from each other (Tukey's test, p = 0.05).

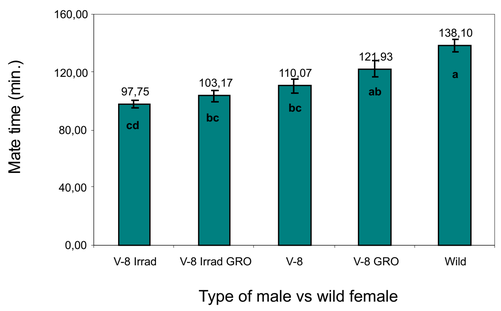

Figure 2. Mate time between wild females and five male types: irradiated V-8 strain, irradiated V-8 strain exposed to GRO, non irradiated V-8 strain, non irradiated V-8 strain exposed to GRO, and wild males. Bars with same letter do not differ significantly from each other (Tukey's test, p= 0.05).

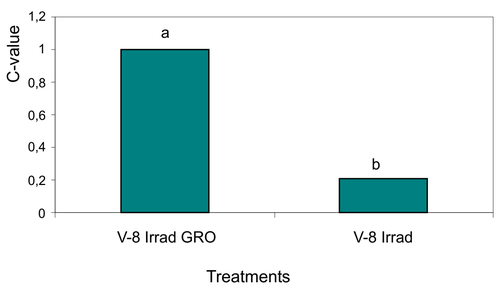

Figure 3. Competitiveness Fried test, C-value, between V-8 irradiated males exposed and unexposed to GRO in mating competition with wild males for wild females. Bars with different letters are significantly different from each other (Tukey's test, p= 0.05).

Conclusions

There is sexual compatibility between sterile, mass-produced Vienna 8- tsl males and wild females of *Ceratitis capitata* present in San Francisco River Valley, Brazil.
A dose of 95Gy applied to pupae, 24 h before emergence, does not affect the sexual performance of Vienna 8- tsl males of *C. capitata*.
Ginger root oil aromatherapy improves the mating competitiveness of Vienna 8- tsl sterile males of *C. capitata.*

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Support: BNB, FINEP, IAEA