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EXPOSURE TO THE RIPE FRUIT OF TROPICAL ALMOND ENHANCES THE MATING SUCCESS OF MALE *BACTROCERA DORSALIS* (DIPTERA: TEPHRITIDAE)

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Males of the Oriental fruit fly, *Bactrocera dorsalis* (Hendel), are strongly attracted to methyl eugenol (Howlett 1915), a phenylpropanoid compound found in over 200 plant species representing 32 families (Tan & Nishida 1996). After ingesting the compound, *B. dorsalis* males sequester break-down products of methyl eugenol in the rectal gland and use these metabolites to synthesize a sex pheromone attractive to females (Nishida et al. 1988). Subsequent studies (Shelly & Dewire 1994; Tan & Nishida 1996) confirmed that males fed methyl eugenol produce a more attractive pheromonal signal and enjoy a higher mating success than control males denied access to the chemical. Importantly, other studies showed that feeding by *B. dorsalis* males on natural sources of methyl eugenol likewise conferred a mating advantage (Nishida et al. 1997—*Fagraea berteroana* A. Gray, pua kenikeni, Loganiaceae; Shelly 2000—*Cassia fistula* L., golden shower tree, Fabaceae; Shelly 2002—*Carica papaya* L., papaya, Caricaceae). The purpose of this study was to determine whether exposure to the fruits and leaves of the methyl eugenol-bearing (Siderhurst & Jang 2006a,b) plant *Terminalia catappa* L. (tropical or Indian almond, Combretaceae) similarly confers a mating advantage to *B. dorsalis* males.

The flies used in this study were from a laboratory colony started with 600-800 adults reared from field-collected guava fruits (*Psidium guajava* L., common guava, Myrtaceae). The colony was housed in a screen cage with superabundant food (a mixture of sugar and yeast hydrolysate, 3:1 w/w) and water; ripe papayas were provided for oviposition. Adults were separated by sex within 24 h of emergence, placed in holding buckets (5 L volume, 100-125 flies per bucket), and provided the sugar-yeast diet and water. The flies were held at 22-26°C and 55-85% RH. Flies used in this study were four generations removed from the wild.

Three separate treatments were conducted in which males exposed to ripe (yellow) fruits, unripe (green) fruits, or leaves, respectively, competed against non-exposed males for females in field-cage trials. Siderhurst and Jang (2006b) reported that methyl eugenol was present at 1.3 µg/mL of pressed juice from ripe fruits and at a trace amount too low for measurement in the leaves. For exposure, we transferred 90-100 mature males (20-25 d old) to a screen cage (30 cm cube) and introduced 10 fruits (~5 cm long) or 2 leaves (~25 cm long, 15 cm wide), all of which were collected from the same tree at the University of Hawaii Agricultural Experiment Station, Waimanalo, within 1 h of use. Exposure commenced between 1000-1030 h and lasted 2 h. At that time, the fruits or leaves (and the paper towel upon which they were placed) were removed, food and water were introduced, and the males were left in the cage until testing 2 d later.

Trials were conducted in nylon-screen field-cages (2.5 m height, 3 m diameter) at the USDA-ARS laboratory, Honolulu. Each field-cage contained 2 artificial trees (2 m tall) used to eliminate potentially confounding effects of plant chemistry on fly behavior. Within a given field-cage, we introduced 75 exposed males, 75 non-exposed males, and 75 females (all flies were 22-28 d when tested). Non-exposed males were marked one day before testing by chilling them in a refrigerator and then applying enamel paint to the thorax. Males recovered quickly from handling, and no adverse effects were apparent. Flies were released into the field-cages 3-4 h before dusk (the period of sexual activity), and mating pairs were collected over a 90-min period starting 60 min before sunset. For each treatment, we conducted 2 trials per day over 4 d for a total of 8 replicates. The numbers of matings achieved by exposed and non-exposed males were compared by a *t*-test as parametric assumptions were met for all 3 treatments.

Males exposed to ripe fruit obtained significantly more matings than non-exposed males, while males exposed to unripe fruits or leaves did not display significantly higher mating success than non-exposed males (Fig. 1). On average, males exposed to ripe fruits obtained 68% of the total matings per replicate, whereas males exposed to unripe fruits or leaves obtained only slightly more than 50% of the total matings (56% and 53%, respectively).

The present study identifies the fourth methyl eugenol-bearing plant species that enhances the mating success of *B. dorsalis* males. Other studies on *B. dorsalis* (Tan et al. 2006) or closely related species in the *dorsalis* complex (Tan et al. 2002; Nishida et al. 2004) showed sequestration of pheromone precursors following feeding on methyl eugenol-containing orchids (genus *Bulbophyllum*, Orchidaceae), but follow-up mating tests were not conducted. While these results suggest that methyl eugenol-bearing plants uniformly (i.e., independently of taxonomic affiliation) boost the mating ability of *B. dorsalis* males, evaluating the validity of this generalization requires additional data. Further studies on *B. dorsalis* will also

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Fig. 1. Number of matings obtained by *Bactrocera dorsalis* males exposed to ripe fruits, unripe fruits, or leaves of the tropical almond *Terminalia catappa* or not exposed to any part of this plant. Bar height represents the average number of matings per replicate; error bar represents ± 1 SE. Eight replicates were performed for all 3 treatments. Results of *t*-test comparing exposed and non-exposed males are presented, where *** represents $P < 0.001$ and NS represents $P > 0.05$.

sharpen comparisons with other methyl eugenol-responding *Bactrocera* species, in which the influence of methyl eugenol on male mating success is apparently less pronounced (e.g., *B. cacuminata* (Hering), Raghu & Clarke 2003).

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SUMMARY

Mating trials conducted in field tents showed that males of *B. dorsalis* exposed to ripe fruits of the tree *T. catappa* obtained significantly more matings than non-exposed males. Exposure to unripe fruits or leaves did not similarly enhance male mating success.

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