

UNIVERSITI TEKNOLOGI MARA

SPECIFICITY AND SEX
PREFERENCE BETWEEN
Blastophaga spp. FIG WASPS AND
DIFFERENT *Ficus deltoidea* FIG
TREES THROUGH VOLATILE
ORGANIC COMPOUNDS
IDENTIFICATION AND
BEHAVIOURAL RESPONSES

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ABSTRACT

The host specificity in the pollination of fig (*Ficus*) and its fig wasp pollinator (Agaonidae) is maintained by the olfactory signal in combination with morphological co-adaptations. *Ficus deltoidea* complex is a dioecious fig tree that is regularly pollinated by the fig wasp *Blastophaga* spp. There are 13 varieties described under this complex, seven of which are native to Peninsular Malaysia. The classification of this complex is solely based on leaf characterisation with no consideration given to gene flow between sympatric different taxa. Whether the floral scents emitted by receptive-phase figs of the varieties are distinct, the extent to which different varieties support different fig wasp pollinators, and whether the fig wasp is able to discriminate the sex of the figs have never been studied. This study aims to identify the volatile organic compounds emitted by receptive figs from five different varieties of *F. deltoidea*, to determine the pollinator specificity of *F. deltoidea* var. *trengganuensis* (*Blastophaga* sp.) towards seven native varieties of the species, and to determine the preferences of the female fig wasps towards the male and female receptive figs of var. *angustifolia* and var. *deltoidea*. Headspace solid-phase microextraction and gas chromatography-mass spectrometry analysis were conducted to identify the volatile organic compounds. An experiment was conducted to see the host specificity of *Blastophaga* sp. from var. *trengganuensis* in the germplasm of UniSZA by placing a donor male tree from var. *trengganuensis* surrounded by other varieties. The sex preference of the female fig wasps was studied through a dual-choice experiment using the Y-tube olfactometer conducted for the fig wasps from var. *angustifolia* and var. *deltoidea* to make a choice between male and female figs. Monoterpenes, sesquiterpenes, and aliphatic compounds were among the compounds found in the odour of five sympatric fig varieties of *F. deltoidea* with different compositions, where different varieties shared at least two compounds. The greatest number of shared compounds was between var. *kunstleri* and var. *trengganuensis*, in which 14 similar compounds were found. The breakdown of one-to-one specificity in fig and fig wasp mutualism is found when *Blastophaga* sp. from var. *trengganuensis* enters another variety (var. *kunstleri*) apart from its own variety. A chi-square test showed the entry rate of pollinators into the male (donor only) and female figs of var. *trengganuensis* was not significantly different, $\chi^2(1, N = 627) = 0.53, p > 0.05$. Spearman's correlation showed a weak, non-significant, negative correlation between crop size and the percentage of entered figs, $r(3) = -0.30, p > 0.05$. The binomial test showed the choices made by the pollinators from varieties *angustifolia* ($p > 0.05$) and *deltoidea* ($p > 0.05$) were not significantly different when given a fair trial between the male and female receptive figs. A Mann-Whitney *U*-test showed that the time taken by the fig wasps of var. *deltoidea* to make a choice was significantly shorter compared to var. *angustifolia*, $U = 1700.50, z = 2.17, p = 0.03, r = 0.19$. As a conclusion, all five different varieties of *F. deltoidea* produced a unique blend of VOCs, and the VOCs found in this study can act as an important reference for future studies. Pollinator sharing that happened in the two varieties of *F. deltoidea* (var. *trengganuensis* and var. *kunstleri*) showed they indeed belong to the same species. A non-significant difference in the preference towards the sex of figs by *Blastophaga* spp. from varieties *angustifolia* and *deltoidea* showed intersexual mimicry of the fig odour does exist. The morphological and molecular studies on the fig wasps of different varieties can further support this finding.

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