

The flowers of Heterostemma ficoides (Apocynaceae, Asclepiadoideae) fool fig-pollinating wasps with their olfactory resemblance to figs

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The flowers of *Heterostemma ficoides* (Apocynaceae, Asclepiadoideae) fool fig-pollinating wasps with their olfactory resemblance to figs

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INTRODUCTION

Fig-fig wasp interactions are highly specialized mutualisms. The specificity of pollinator attraction is mediated by Volatile Organic Compounds (VOCs) emitted by receptive figs. Pollinator access to the egg-laying site inside the figs depends on passage through the fig's sole entrance (ostiole)¹. Fig wasps should avoid non-host figs and even more non-*Ficus* flowers. *Heterostemma*, a genus of 30–40 liana species, includes a bizarre Thai endemic species, *Heterostemma ficoides*² bearing globose closed flowers that anyone can mistake for figs (syconia) of *Ficus* spp. **Could this 'anyone' include a fig wasp?**



FLOWER VISITORS OF *H. FICOIDES* AND CREEPY-CRAWLIES INSIDE FLOWERS

Methods:

• At 2 sites: Tak (in 2018) and Chiang Mai (in 2019, 2021, 2022), the numbers of insects and larvae in the blooming flowers were counted.

• The larvae were reared for identification to species.

• At 2 sites: Chiang Mai and Bangkok (plants grown in a private garden), insect visiting activities were monitored by recording with cameras.

Average number (± SE); % flowers with fig wasps Year inside Fig wasps Ν 2018 10 0.2 ± 0.1; 20% 0.03 ± 0.02; 1.9% 2019 204 2021 298 0.04 ± 0.01; 3.7% 2022 0.02 ± 0.01; 1.5% 273



• Adult insects obtained from rearing are flies from 4 families: Phoridae, Loncheidae, Cecidomyiidae and Chloropidae.

Results:

• 58.8% of the flowers studied were infested by insect larvae (2 ± 0.2 per flower).

• Female fig wasps were found inside flowers in all sites and years. They belong to a single species of *Kradibia*, a specific pollinator of *Ficus heterophylla* throughout Thailand. Some individuals carried a pollinarium on their legs. Video recordings showed that they regularly visited flowers of *H. ficoides* in all sites. They usually entered flowers by pushing themselves through the fissures between corolla lobes.

PHYSICAL RESEMBLANCE

Methods: Morphology and ultrastructure of flowers of *H. ficoides* and those of figs of *F. heterophylla* were examined using light microscopy and SEM.

Results: Flowers/figs of the two species are similar in general appearance, i.e. a (semi)globose closed form with minute pore, but there is no apparent similarity in

OLFACTORY RESEMBLANCE

Methods: VOCs of receptive figs of *F. heterophylla* and those of blooming flowers of *H. ficoides* and a congener, *H. siamicum*, were analyzed using gas-chromatography coupled with mass spectrometry.

Results:

• In the 3 species, a total of 57 VOCs (most of which are

other details (size, color, outer/inner surfaces)



Ficus heterophylla

ATTRACTION BY VOCS OF H. FICOIDES

Methods: Attraction of *Kradibia* wasps to the VOCs emitted by flowers of *H. ficoides* was investigated using Y-tube olfactometer tests at 2 sites.

Results:



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mono- and sesquiterpenes) were identified.

• H. ficoides shares more VOCs with F. heterophylla (36



CONCLUSION AND PERSPECTIVES

• *H. ficoides* deceives *Kradibia* females by producing odors similar to those of the wasp's host plant, *F. heterophylla*. The wasps are stimulated by the sutures at the flower mouth to force their passage into the flower as if they were passing through the ostiole of the fig.

• Flies of different families also visited and laid eggs inside the flowers of *H. ficoides*. Are some of them specialists of *F. heterophylla* figs lured by *H. ficoides* odors?

• The fig-like flower of *H. ficoides* could be pollinated by deceit by insects developing in *F. heterophylla* figs, in a new case of pollination by mimicry.

REFERENCES

¹ Hossaert-McKey, M, Proffit, M, et al.(2016) How to be a dioecious fig: chemical mimicry between sexes matters only when both sexes flower synchronously. Sci Rep 6, 21236.

² Kidyoo A. (2019) *Heterostemma ficoides* (Apocynaceae: Asclepiadoideae), a new species with fig-like flowers from Northern Thailand. Kew Bull 74,2.