

## Response of male bees to different color contrasts of deceptive orchid flowers



Fig. 1. Flower of *Ophrys insectifera* (left) and *Ophrys splendida* (right) pollinated by a wasp (*Argogorytes mystaceus*) and mining bee (*Andrena* sp.). Photographs by Jean Claessens

**Background:** To reproduce successfully, flowering plants evolved a wide array of stimuli to attract pollinators. Flowers with contrasting color patterns stand out among surrounding vegetation and flying insects can detect such flowers more easily<sup>1-3</sup>. *Ophrys* is an example of a plant genus that evolved a very special set of contrasting floral color patterns to attract pollinators (Fig. 1). The flowers mimic color contrasts of female insect pollinators, urging male insects to mate with them<sup>4</sup>.

We previously conducted physical spectral analyses of sepals (green in some species such as *O. insectifera*, pink in others such as *O. splendida*, see Fig. 1) and the brown median petal, commonly referred to as the labellum, that either has a brown rim (such as in *O. insectifera*) or a yellow one (as in *O. splendida*, see Fig. 1). Our results show that floral contrasts significantly increase when a yellow rim along the brown labellum is present. Whether or not increased floral contrasts also result in a stronger visual stimulus for pollinators<sup>5</sup> remains to be investigated.

**Aim:** Our hypothesis is that increased floral contrasts produce a stronger visual stimulus to pollinators and that this results in more floral visits. You will conduct behavioral experiments with bumblebees exposed to different color stimuli in a laboratory setup in Germany to investigate this hypothesis.

**Methodology:** Both naïve and conditioned male bumblebees will be exposed to green or pink stimuli and brown stimuli with or without a yellow rim. Responses will be scored and statistically analyzed using standardized protocols.<sup>6</sup>

**Planning:** writing of a research plan in the Netherlands (3 weeks), behavioral experiments in Würzburg, Germany (minimum of 12 weeks, possibly split up in two parts), data analysis (4 weeks), thesis writing and presentation (5 weeks) in the Netherlands.

**Supervision:** Dr. Casper van der Kooi (GELIFES, Groningen, The Netherlands), Prof. Dr. Johannes Spaethe (Würzburg University, Germany) and Prof. Dr. Barbara Gravendeel (RIBES, Naturalis Biodiversity Center, Leiden, The Netherlands) will meet with the student in weekly digital progress meetings.

*Requirements:* MSc students with a strong interest in plant evolution, excellent statistical skills and previous experience with animal experiments that can work independently are encouraged to apply.

*Contact information:*

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