

BUMBLE BEES PREFER NECTAR CONTAINING YEASTS

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Photo 1. Flowering plant of the early-blooming, mountain forest understory herb *Helleborus foetidus* (Ranunculaceae). Inflorescences are produced in early winter, each bearing 20–75 flowers that open gradually over the following 1.5–2.5 months. Flowers are hermaphrodite, last for 1–3 weeks, and are pollinated by bumble bees. Photo by Carlos Herrera.



Photo 2. *Helleborus foetidus* flower with the perianth partly removed to show the nectaries, which form a distinct ring between stamens and sepals. Each nectary may accumulate up to 5 mL of sucrose-dominated nectar. Nectar commonly harbors dense populations of specialized nectarivorous yeasts. Photo by Carlos Herrera.

The tripartite system formed by the early-blooming perennial herb *Helleborus foetidus* (Ranunculaceae), the yeasts inhabiting its floral nectar, and the bumble bees that pollinate the plant and disseminate the yeasts, was investigated to test whether nectar-dwelling yeasts can influence pollinator behavior and plant reproductive success. Under both laboratory and field conditions, bumble bees (*Bombus terrestris*) preferred yeast-containing nectar. In addition, experimental yeast inoculation of the nectar of *H. foetidus* flowers in the field was associated with reductions in number of pollen tubes in the style, fruit set, seed set, and mass of individual seeds. This provides direct evidence that nectar yeasts can modify pollinator foraging patterns, pollination success, and the quantity and quality of seeds produced by insect-pollinated plants.

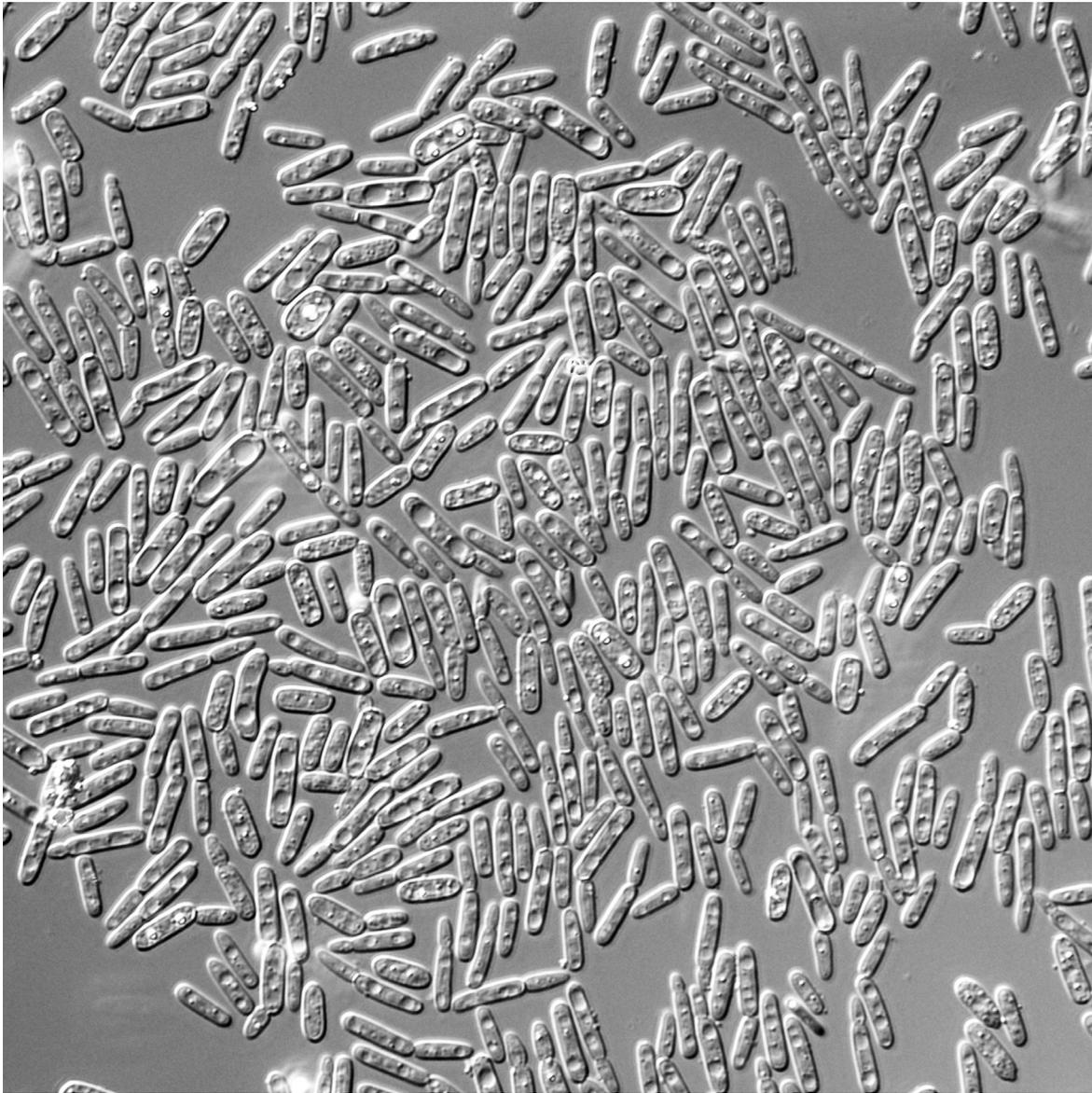


Photo 3. Nomarski interference contrast photomicrograph of living cells of the yeast *Metschnikowia reukaufii* (Metschnikowiaceae, Saccharomycetales) proliferating in nectar of *Helleborus foetidus*. The colonizing inocula of *M. reukaufii* are brought to *H. foetidus* nectaries by foraging bumble bees. Photo by Carlos Herrera.



Photo 4. *Bombus terrestris* queen gathering nectar from a *Helleborus foetidus* flower. Laboratory and field experiments showed that *B. terrestris* preferred yeast-containing over yeast-free nectar. Photo by Mónica Medrano.

These photographs illustrate the article “Yeasts in nectar of an early-blooming herb: sought by bumble bees, detrimental to plant fecundity,” by Carlos M. Herrera, María I. Pozo, and Mónica Medrano, published in *Ecology* 94:273–279, February 2013. doi: <http://dx.doi.org/10.1890/12-0595.1>