Nectar microbe mixtures differ from single species in volatile emission and pollinator acceptance

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Use of volatile cues to locate and assess the quality of food is ubiquitous in nature. In many cases, microbes that colonize a food source alter its nutritional value and contribute to its volatile profile. For pollinators, colonization of nectar by microbes can contribute to floral scent and influence foraging behavior. Nectar microbe metabolism and subsequent impacts on pollinator acceptance have been evaluated in single species cultures, but the effects of microbial consortia on these endpoints are not known. Though the anthosphere is notably species-poor relative to microbial communities isolated from other plant organs, visited floral nectar typically hosts several thriving species, making an improved understanding of pollinator response to microbial mixtures essential.

Two nectar microbes, the yeast *Metschnikowia reukaufii* and the bacteria *Asaia astilbes* were inoculated individually and together at equal cell densities. We assessed growth and volatile production of the inoculated nectars over 48 h. To reflect the variability of carbohydrate content in natural floral nectar and because nectar sugar levels differentially affect microbial growth, two synthetic nectars with a 10-fold difference in sugar content were adopted. To evaluate pollinator response, the inoculated nectars were deployed in a honey bee feeder assay.

In all cases, introduced species survived and microbe solutions could be distinguished based on volatile emission alone. Unique chemicals that could not be attributed to emission in single strain solutions were not detected in co-inoculations. Honey bees exhibited preferences among microbial solutions, consuming more of *Asaia* compared to *M. reukaufii* or the mixture, suggesting that the paradigm that nectar yeast are generally more acceptable to pollinators than bacteria may be overly simplistic.