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## The impacts of floral fragrances and ant contamination on pollinator behavioral responses

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World economy, including agriculture and food production, is heavily dependant on animal pollination. For this reason, it is important to understand factors that mediate plant-pollinator interactions. We investigated behavioral responses of the bumblebee *Bombus kirbyellus*, an important pollinator in alpine ecosystems, to floral scent compounds found in the alpine wildflower *Polemonium viscosum*. We also examined how contamination by the nectar-thieving ant, *Formica neorufibarbus gelida*, impacts bumblebee preferences among these floral scents. We conducted field "interviews" of queen *B. kirbyellus* foragers, providing a choice between cut inflorescences of *P. viscosum* spiked with sucrose or sucrose + 2-phenol ethanol (2-PE), a common floral scent component of *P. viscosum* and many other plant species. We also documented insect visitors to naturally occurring *P. viscosum* inflorescences spiked with sucrose solutions with or without 2-PE. To understand whether nectar thieves affect cues mediating pollinator foraging, we measured queen *B. kirbyellus* consumption rates of sucrose and sucrose + 2-PE solutions with or without ant contamination. Additionally, we tested the impact of 2-PE on ants by sealing them in Petri dishes containing filter paper doused with sucrose or varying strengths of 2-PE. Bumblebees preferred plain sucrose solutions over sucrose + 2-PE, showing increased consumption and visitation rates on the former. However, ant contamination had no effect on consumption or visitation. No variation in natural insect visitation was observed among spiked *P. viscosum* inflorescences. Interestingly, high concentrations of 2-PE resulted in significantly increased ant mortality rates compared to sucrose or lower 2-PE concentrations. While floral scents have generally been considered as attractants to animal pollinators or seed dispersers, our results show that under some circumstances floral scent compounds may function as deterrents. Future investigation of additional scent compounds and natural variance of 2-PE concentration could clarify the roles of floral fragrances in plant animal interactions.