Using Pavlovian Conditioning to Promote Attraction of Apis mellifera to the Endangered Orchid Prosthechea cochleata, Year 2

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Apis mellifera (honeybees) are efficient pollinators, but often overlook native plant species such as the endangered orchid Prosthechea cochleata. Previous research established honeybees could be conditioned with each of the primary floral volatiles of the orchid and allowed development of the synthetic scent of Prosthechea cochleata. The impact of Pavlovian conditioning of honeybees using this synthetic scent on attraction to the scent was be observed through exhibition of the proboscis extension response (PER). PER exhibition was first observed in bees conditioned with the synthetic scent (experimental) and hexane (control) in response to the synthetic scent. Logistic analysis found higher PER in bees conditioned with the synthetic scent than controls when exposed to the synthetic scent ($p<0.05$). Success of conditioning with synthetic scent in optimizing PER exhibition was recorded when repeated a various number of times and when fed with different concentrations of scent in a sucrose solution. Five rounds of conditioning and feeding with a concentration of 0.06g/10mL was found to be ideal by a series of logistic regressions ($p<0.05$). 0.06g/10mL was confirmed as the optimized concentration even after repeated unrewarding experiences with the synthetic scent, showing the greatest degree of PER persistence of all tested concentrations. Two hives were fed with sucrose water alone or 0.06g of synthetic scent per 10 mL of sucrose solution and PER observation and persistence of bees sampled from these hives were observed over several days of continuous whole-hived conditioning to determine success of larger-scale implementation.

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