Impact of elevated temperatures on bumblebee cognition

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Climate change threatens important pollinator groups such as bumblebees and their interaction with plants. However, while some studies highlighted negative effects of elevated temperatures on bee-plant interactions, like phenologies, we still lack knowledge about how they impact their behaviours. One of the most crucial behaviour is foraging: bumblebees have to visit flowers of different plant species that provide nectar and pollen of varying amounts and qualities. They must learn and remember which flowers are the most rewarding, as well as optimise their flight from the colony to the flowers, and among flowers. Yet, it could be a major challenge when they face elevated temperature. Their cognition could be impacted if they are overheating, as well as the efficiency of their flight or their ability to perform a sufficient number of foraging trips to bring back food rewards in the colony. To address this knowledge gap, we aim to understand how ambient temperatures of 32°C compared to 24°C affected the cognition of *Bombus terrestris*. We used two identical set-ups in two climate-controlled rooms and allowed the bumblebees to forage freely on artificial flowers. We measured their associative learning between a reward (i.e. sugar solution), and a colour associated to this reward. We observed that the cognitive abilities were affected. Indeed, bumblebees at 24 ºC learn faster during their first 10 trials than those at 32 ºC. In addition, bumblebees at 32 ºC show lower proportion of correct choices during the initial trials if they experienced 24 ºC in the previous week. By affecting the cognition, elevated temperatures could have negative effects on plant-insect interactions as well as pollination services. It raises concern for species less heat-adapted than *B. terrestris*, e.g., arctic species. Moreover, summer temperatures can be warmer than 32 degrees, during several days in a row. Exploring how bumblebees respond to even higher temperature would thus provide valuable information to understand how they would face projected temperature increase.