

Bumblebee Foraging Pheromones

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Bumblebees use flower scent to guide their nest-mates to good food sources and use pheromones to encourage their nest-mates to go foraging

FOR ANY animal, finding food on its own can be time-consuming and inefficient; social animals such as bees reduce these problems by informing their peers of plentiful sites and ‘recruiting’ them to the search.

BUMBLEBEE PHEROMONE

Honey bees use their waggle dance to tell nest-mates the distance and direction of a food source but bumblebees can’t communicate geographical information in this way. Instead, they release a recruitment pheromone in the nest to encourage their colleagues to venture out in search of food. But where should they look?

Work has been done to discover if this recruitment pheromone helped bees to learn which specific flowers were most rewarding at that time. Bumblebee colonies were exposed to an anise scent mixed with recruitment pheromone and their foraging patterns monitored.

Bees learned that anise-scented flowers were the most rewarding. They learned this best when the flower smell was brought back to the nest by another ‘demonstrator’ bee, but they could also learn it when the anise odour entered the nest as either scented nectar or simply scent in the air.

SEARCHING FOR THE SAME SMELL

Dr Raine explains: ‘Successful bees motivate their sisters to find food by running excitedly around the nest, buzzing and releasing pheromone. They bring home the scent of the flowers they visited which fills the air and flavours the honey. The other bees leave the nest and search for nectar-rich flowers with the same smell’.

The presence of recruitment pheromone did not affect how well bees learned a new flower scent but it did increase foraging activity.

FORAGING DEPENDS ON FOOD STORES

Bumblebees returning to the nest from a successful foraging mission produce a pheromone which encourages their nest mates to go out and find food. It was originally thought that these pheromones elicited a standard response from all bees, but new research has shown that bees’ response to the pheromone changes according to their situation.



Mathieu Molet and Nigel Raine have shown that worker bees are much more likely to respond to the pheromone and leave the nest in search of food if the colony has little or no food reserves left.

Flying around all day to find nectar and pollen from flowers is hard work so it makes sense that bees are more likely to respond to the pheromone when honey reserves are low.

ELECTRONIC TAGGING

Writing in the journal *Behavioral Ecology and Sociobiology*, the team explain how they used radio-frequency identification (RFID) technology (the same electronic tagging system used in a London Underground oyster card) to record automatically the activity of bees in the laboratory.

Different colonies of bumblebees (*Bombus terrestris*) were stocked with different levels of food reserves (honeypots). Artificial foraging pheromones were applied to the bees and they were monitored over 16,000 ‘foraging bouts’. The response to the pheromones was stronger in colonies with less food – with more worker bees becoming active and more foraging bouts being performed.

EFFECTIVE FORAGING

The team’s findings suggest that the pheromone can modulate a bumblebee’s foraging activity, preventing needless energy expenditure and exposure to risk when food stores are already high. In future, such artificial pheromones could also be used to increase the effectiveness of bumblebee colonies pollinating commercial crops such as tomatoes. ✨

‘How floral odours are learned inside the bumblebee (*Bombus terrestris*) nest’. *Naturwissenschaften*, 23 October 2008: DOI:10.1007/s00114-008-0465-x.

‘Colony nutritional status modulates worker responses to foraging recruitment pheromone in the bumblebee *Bombus terrestris*’, M Molet, L Chittka, RJ Stelzer, S Streit and NE Raine. *Behavioral Ecology and Sociobiology*: DOI:10.1007/s00265-008-0623-3.



Marking a bumblebee

Tagged bumblebees share food
(Photos: Nigel Raine)