



CAN BEES MEET THEIR NUTRITIONAL NEEDS IN THE CURRENT UK LANDSCAPE?

Who's involved?

Dr Geraldine Wright of Newcastle University is the lead investigator. The collaborators include Prof Sue Nicolson and Dr Christian Pirk (University of Pretoria); Prof. Sharoni Shafir (the Hebrew University, Rehovot, Israel); Prof. Steve Simpson and Prof David Raubenheimer (University of Sydney); Dr Annie Borland (Newcastle University), and Dr. Phil Stevenson (Royal Botanic Gardens, Kew).

What did you set out to do?

Our aims were: 1) to identify the nutritional optima of workers and larvae using the Geometric Framework for nutrition developed by Prof Steve Simpson and Prof David Raubenheimer; 2) examine how temperature, toxins, and diseases affected the nutritional optima of bees; 3) examine how nutrition influenced the foraging behaviour and learning and memory of foraging workers; 4) measure the nutritional quality of pollen and nectar from as many plant species as possible in the UK.

What have you found out so far?

We have identified that nurse honey bees have a greater requirement for proteins and amino acids than foraging workers; nurses require ~5x more dietary essential amino acids than foragers. Additionally, we have shown that when foragers are fed diets high in protein or dietary amino acids, they die more rapidly. We found that nurse honey bees reared on diets high in protein were more able to survive low temperature challenges and diets that contained the toxin, nicotine. We have identified that bees balance their diet when they are deficient in specific essential amino acids or fatty acids, and that amino acids affect a forager's learning and memory when they are present in food. We also identified that the nutritional optimum of the forager bumblebee is skewed more towards protein than that of the worker honey bee.

How will this help pollinators?

Our data will facilitate the development of optimal dietary supplements for honey bees and bumblebees. Our database will provide information for beekeepers, land managers, and the general public about which combination of plant species are most likely to help bees survive. We believe that our work will lead on to more detailed studies of the way that nutrition interacts with other stressors for bees, including pesticides and pathogens.

What's the one thing you'd like to tell beekeepers?

The upshot of our study for beekeepers is that they can improve colony welfare if they provide supplements that satisfy the needs of nurses and foragers. For example, a pollen supplement with digestible protein, essential fatty acids and sugars for nurses, and sugar syrup for foragers. We have not found evidence that supports the notion that it is better to provide inverted sugar to bees (e.g. a combination of fructose and glucose) instead of sucrose. If it is cheaper to use store-bought sucrose to make syrup or candy, then use it as fuel for the foragers instead of paying a lot extra for products that claim to be better for bees because they are inverted sugars.

To find out more:

Contact: Dr Jeri Wright, Newcastle University Tel: 0191 222 6667 Email: jeri.wright@ncl.ac.uk
Website: http://www.ncl.ac.uk/biology/staff/profile/jeri.wright#tab_research