Understanding the dietary needs of the red mason bee

Zuzanna M. Filipiak
Michał Filipiak

Video Abstract

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Abstract

Plant diversity is quickly dwindling across the world. That's put our planet's pollinators in danger. Pollen contains a variety of nutritional elements that are key to life itself. Not only are global changes affecting pollen amounts, they're also affecting pollen varieties. This means that many pollinators, including bees, aren't eating the best-balanced diet they need to survive. Understanding how the elemental ingredients in pollen affect different traits in bees, such as their survival, body mass, and ability to protect themselves, could help scientists determine whether and how the scarcity of specific nutrients affects them. And it could lead to new ways of conserving pollinators and the critical roles they play in many ecosystems.

For their part, researchers from Jagiellonian University in Poland examined the effects of an inadequate supply of potassium, sodium, and zinc in pollen on _Osmia bicornis_, the red mason bee. Unlike its highly social cousins, bumble- and honeybees, the red mason bee leads a solitary lifestyle. These bees don't live in colonies or make honey, they don't serve a queen, and they don't raise their young communally. Females lay each of their eggs on a ball of pollen and nectar and seal it up, one after the other. The eggs hatch into larvae, which eat the pollen and hibernate for nearly a year before emerging as adult bees. The team from Poland fed red mason bee larvae an array of pollen diets either lacking or balanced in terms of the availability of sodium, potassium and zinc and noted their effects on traits related to bee fitness. These diets had varying influences on bee mortality, the ability to protect their bodies during the ten months spent inside cocoons, reflected as cocoon development, and adult size, reflected as body mass. Potassium deficiency had similar effects on bees of both sexes: reducing survivability and body mass and causing the underdevelopment of cocoons. When supplemental potassium was added to attain the concentration observed in larval food under natural conditions, however, survivability and cocoon formation were improved, while body mass was unaffected. A scarcity of sodium strongly reduced survivability in both sexes, while its supplementation had a slightly positive effect on female fitness, causing an increase in adult body mass. Regarding zinc, pollen supplemented with the mineral had the strongest effect on males, leading to lower mortality rates and higher body masses than zinc-deficient pollen. Understanding these relationships is important because it paints for researchers a picture of optimal bee nutrition and tells them whether bees are getting what they need out of the food available to them. Looking at bee health holistically in this manner could reveal important interactions between pollinators and other parts of the food web. And it could provide insight into how to protect pollinators and the vital functions they serve in the environment.