Nutritional ecology of bees: balancing bee nutrient demands and nutrient supply with a diversity of pollen sources

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Pollinators such as bees can help themselves to an abundant buffet of nectar and pollen served by trees, shrubs, and other flowering plants. Nectar provides bees the energy required to perform their daily tasks, while pollen is used as one of the food sources for the young, which need it to grow and develop. For a baby bee to grow into a healthy adult, high-quality food is essential. And herein lies the problem.

Pollen is made of various organic substances, namely, sugars, fats, proteins, amino acids and vitamins, all of which are built from elements such as carbon, hydrogen, oxygen, nitrogen, phosphorus, sodium, potassium, zinc, and approximately twenty others. Sugars are solely composed of carbon, hydrogen, and oxygen, and other substances feature atoms of other elements. However, all are needed by bee larvae for their bodies to properly develop. This is where pollen comes in as the source of those substances. However, do all plants produce pollen that is rich in the necessary nutrients? Well, probably not, and that is the crux of the issue.

It is likely that pollen produced by different species of plants provides bees with varying amounts of certain chemical elements in proportions that are often inadequate. We base our study on ecological stoichiometry, a method that treats atoms as the building blocks of all organisms. When an organism grows, it can use only resources found in the environment, but in most cases, there is simultaneously an excess of some elements and a shortage of others. With that in mind, we will compare the atomic structure of bee bodies with the chemical compositions of various types of pollen.

The decrease in plant diversity is commonly thought to be one of the main causes of the dwindling numbers of pollinators worldwide. Currently, governments and the societies are attempting to combat this phenomenon by curbing the use of pesticides and improving the quality of food sources for bees. Knowing which elements are crucial for the diets of bees is a prerequisite to tailor conservation efforts for this group of insects so important for human nutrition and for the functioning of ecosystems. It is estimated that approximately 80% of wild plants and 75% of cultivated plants are directly dependent on pollinators, so without pollinators, those plants would not be able to produce seeds and fruits. The value of the labor performed by bees worldwide is estimated to be 153 million euro per year, which is equal to 9.5% of the value of all agricultural products on earth.

All of this is why we constantly strive to gain a better understanding of the complex relationships between the quality of pollen and the number and diversity of pollinators. We will study the nutritional dietary demands of a dozen or so wild bee species worldwide as well as the supply of nutrients in the pollen offered by different plant species. Implementing our solutions will strengthen the protection of pollinators and consequently secure the future of our food supply. It would be detrimental to ignore the dietary requirements of bees, because failing to understand their biology could go along with dwindling seed and fruit productivity of many plants.

You will find additional information here:

https://appliedecologistsblog.com/2019/05/20/re-defining-bee-friendly-plants/