





Beeing healthy: how land-use intensification shapes floral resources nutritional quality and diet of pollinator insects

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Abstract:

Pollination is an essential ecosystem service involved in the conservation of biodiversity and reproduction of 80% of wild plants and 75% of agricultural plants. Through the provision of this service, pollinator insects ensure the presence of different plant species and promote greater gene diversity. In the last decades, land-use intensification played a key role in determining the decline of pollinator insects. Nevertheless, many knowledge gaps about this topic persist, specifically about the role of landscape anthropization in shaping pollinator insects' diets.

This study aims to investigate the possible variation of pollinators' diet quality in highly disturbed environments, focusing on its macro and micronutrient composition. For this purpose, we set up two experimental workflows. In the first one, we collected pollen from the curbiculae of *Bombus terrestris* specimens, belonging to 15 commercial colonies placed in 14 sites in the city of Milan characterized by different degrees of impervious cover, for a total of 1562 samples. In the second one, we collected pollen and nectar directly from eight wild plant species (pollen from *P. reptans*, *H. radicata*, *L. corniculatus*, and *M. sylvestris* and nectar from *T. pratense*, *S. pratensis*, and *P. vulgaris*) from 17 sites scattered within the metropolitan area of Milan, following a gradient of growing urbanization, for a total of 60 pollen and 22 nectar samples respectively.

The phytochemical characterization of these floral resources allowed us to perform a qualitative and quantitative comparative analysis of their macro and micronutrient composition by exploiting multiple analytical approaches (i.e.,. colorimetric assays and HPLC-UV-MSⁿ). We observed that the fragmentation of natural landscapes is negatively correlated with the protein and lipid (P:L) ratio of the pollen collected by *B. terrestris* which is a parameter of high concern in the definition of the value of bumblebees nutrition. To go deeper into the field of nutritional ecology at the landscape level, we analyzed the composition of secondary metabolites from pollen samples and the sugar and aminoacids composition of nectar samples collected from the abovementioned wild floral species commonly visited by pollinator insects.

The output of these investigations will provide new insights in the field of nutritional ecology in anthropized environments that could help inform mitigating measures for safeguarding pollinators' health status, e.g. by providing suggestions for planting of species suitable to lower from a nutritional point of view the environmental stressors triggered by urbanization.