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PP-282 [Beekeeping Technology and Quality]

Melissopalynological properties of Ivy (*Hedera helix* L.) honey

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Introduction

Common ivy (*Hedera helix* L.) is a widely distributed evergreen climber in Croatia, thriving in both sunlit and shaded habitats. It's yellow-green, nectar-rich flowers are highly attractive to honey bees (Fig. 1), making it an important late-season pollen and nectar source. Melissopalynological analysis, based on the identification and quantification of pollen grains, is essential for determining the botanical origin and authenticity of honey, as well as for identifying secondary nectar sources contributing to it's composition. Recent studies have indicated the presence of rare or underexplored unifloral honeys in Croatia, underscoring the need for further investigation. This study therefore focuses on the melissopalynological properties of ivy honey to support it's recognition and classification.

Fig. 1. *H. helix* flowers during flowering time in September

Materials and methods

Twenty ivy honey samples (n=19) were collected directly from beekeepers across Croatia during the autumn of 2023 (Fig. 2a). Samples were stored in glass jars under cool and dark conditions, and all analyses were conducted within three months.

Melissopalynological analysis (Fig. 2c) followed the method of Von der Ohe et al. (2004). Pollen grains were identified and quantified using a Carl Zeiss Axio light microscope (400×–1000×), referencing a curated internal pollen collection and relevant literature. Pollen morphology was evaluated based on shape, color, size, exine structure, and germination pores (Fig. 2b).

Figure 2.a) *H. helix* honey samples; 2.b) Morphology of some pollen types in ivy honey samples; 2.c) Melissopalynological analysis

Results

Melissopalynological analysis confirmed the dominance of *H. helix* pollen (>45%) in all examined samples, with a pollen spectrum reflecting plant species flowering during the summer and early autumn period (Fig. 3). The percentage of *H. helix* pollen varied between 51% and 96%, depending on geographical location, climatic conditions, and foraging behavior of honey bees. The accompanying pollen group included asparagus (Asparagus spp.) pollen (24%) and alder buckthorn (*Frangula alnus*) pollen (20%). In half of the samples, pollen from the secondary pollen group was identified, with the most prevalent originating from the Asteraceae family, followed by Apiaceae, Rosaceae, Rhamnaceae and Poaceae. Additionally, pollen from asparagus (Asparagus spp.), sweet chestnut (*Castanea sativa*), buckthorn (Rhamnus spp.), linden (Tillia sp.) as well as clover (Trifolium sp.), was also identified. In the rare pollen group, were presented: Poaceae, Lamiaceae, *Helianthus annuus*, Fabaceae, Ericaceae, Boraginaceae, Brassicaceae and *Amorpha fructicosa*.

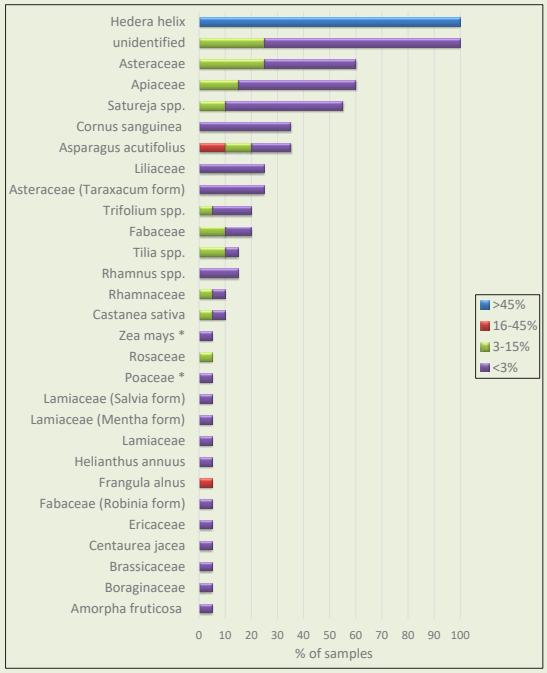

Figure 3. Results of melissopalynological analysis of ivy honey (n=19)

Conclusions

The study on ivy honey revealed uniflorality (>45% of ivy pollen) between 51% and 96%, along with pollen from other plant families. The variability in pollen composition suggests that ivy honey can incorporate nectar from a wide range of late flowering plants, depending on local vegetation. A well-defined pollen spectrum is crucial for honey authentication in terms of uniflorality confirmation, quality control, and the assessment of potential bioactive compounds derived from different botanical sources.

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Ivy honey (Hedera helix L.) is classified as a late season unifloral honey, characterized by a distinctive pollen spectrum that reflects the floral composition available to foraging pollinators during autumn. Melissopalynological analysis is crucial for verifying the botanical origin and authenticity of honey, as well as identifying secondary nectar sources that contribute to its composition. Therefore, this study aimed to investigate the melissopalynological properties of ivy honey. The study was conducted on 19 ivy honey samples collected directly from the beekeepers in Croatia during 2023. Samples were analyzed by qualitative melissopalynological analysis according to the method of Von der Ohe et al. (2004). Melissopalynological analysis confirmed the dominance of H. helix pollen (>45%) in all examined samples, with a pollen spectrum reflecting plant species flowering during the summer and early autumn period. The percentage of H. helix pollen varied between 51% and 98%, depending on geographical location, climatic conditions, and foraging behavior of honey bees. In addition to H. helix pollen, ivy honey contained pollen from other plant sources flowering during the same period, classified as accompanying (15-45%), secondary (3-15%), and rare (<3%) based on their relative abundance. The accompanying pollen group included asparagus (Asparagus spp.) pollen (23%) and alder buckthorn (Frangula alnus) pollen (21%). In half of the samples, pollen from the secondary pollen group was identified, with the most prevalent originating from the Asteraceae family, followed by Apiaceae, Fabaceae, Lamiaceae, Poaceae, Brassicaceae and Boraginaceae. Additionally, pollen from dogwood (Cornus sanguinea), asparagus (Asparagus spp.), sweet chestnut (Castanea sativa), and buckthorn (Rhamnus spp.), as well as sunflower (Helianthus annuus), was also identified. In the rare pollen group, alder buckthorn (F. alnus) was present at 2%, while pollen from false indigo (Amorpha fruticosa) and brown knapweed (Centaurea jacea) was found at 1% each. The variability in pollen composition suggests that ivy honey can incorporate nectar from a wide range of late flowering plants, depending on local vegetation. A well-defined pollen spectrum is crucial for honey authentication in terms of uniflorality confirmation, quality control, and the assessment of potential bioactive compounds derived from different botanical sources.