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COLOUR AND ORIGIN OF POLLEN PELLETS FROM TWO FRESH BEE POLLEN SAMPLES – A PRELIMINARY ANALYSIS

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Abstract

Food supplements are marketed in large numbers in Romania at present, they are the products of a dynamic and profitable industry. Bee pollen is a food supplement with variable composition and properties, reflecting the floral biodiversity used as a source. This product is collected for human use and at the same time it is indispensable for the survival of bee colonies. In the present work fresh bee pollen samples were obtained from two commercial sources in Bucharest (CS1 and CS2) and pellets were sorted by colour and analysed microscopically on unacetolised fresh mounts, one pellet at a time using an optical microscope (magnification 400×; 1000×). The colour of pollen pellets was variable, in the first sample (CS1) there were for example: white (Pinaceae – Pinus sp.), light yellow (Rosaceae – Malus sp.), lemon (Brassicaceae – Brassica sp.), orange (Asteraceae – Taraxacum officinale), firebrick (Geraniaceae – Geranium sp.) and black (Fabaceae – Trifolium pratense) pellets compared to the second sample (CS2) which contained only yellow and orange shades, for example: lemon (Brassicaceae – Brassica sp.), pale yellow (Cucurbitaceae – Cucumis sativus), orange (Asteraceae – Taraxacum officinale).

Key words*: bee pollen, pellet colour, pollen source.*

INTRODUCTION

Palynological studies of bee pollen are used to determine the botanical origin of the pollen which is important in assessing the nutritional quality of this product and at the same time indicate the foraging selectivity of the bees in a geographical area with a high floral diversity.

For example, for the Transilvania region (Romania) the analysis of 35 bee pollen samples showed the predominant plant sources and their influence on the polyphenol and carotenoid content of bee pollen (Stanciu et al., 2016).

Similarly, the botanical origins of selected honeys from Romania were determined by analysing the frequencies of the pollen grains found in their composition (Dobre et al., 2013).

Theoretically color identification of corbicular pollen could be a very useful tool for macroscopic pollen identification if combined with collection time and floral composition of an area but in practice it is not possible to sort pellet samples into plant species based on color alone since pellets from different melliferous species can have the same colour, mostly shades of yellow (Mărghitaş, 2002; Newstrom-Lloyd et al., 2009; Spulber et al., 2017).

MATERIALS AND METHODS

The analysis of the bee pollen samples was carried out at the Laboratory of Biology of the Faculty of Biotechnologies, University of Agronomic Sciences and Veterinary Medicine of Bucharest. Pellet external colour was estimated by color-matching using a standard colour chart (Reiter, 1947), then the microscopic analysis of the pollen was carried out for each pellet separately without acetolysis, on wet mounts (sometimes toluidine blue (TB) was added for better contrast) using a Micros Austria optical microscope with ocular micrometer (calibration ratio was 1 μm for objective 100×, 2.5 μm for objective 40×, 10 μm for objective 10×). Microscopic images of monofloral pellets have been photograped with a Sony Cyber-shot® digital camera (Carl Zeiss Vario-Tessar 5× zoom lens) and were later used to describe the grains. Several morphological characteristics were studied such as the shape, the size, the apertures and the surface patterns. Classification of pollen according to size was based on values from Popescu & Meica (1997). For the present study, the pollen descriptions were compared to those

found in the literature, for example Tarnavschi et al. (1981; 1987; 1990), Şerbănescu-Jitariu et al. (1994), the Pollen-Wiki site (Pollen-Wiki - Der digitale Pollenatlas, Stebler Th., https://pollen.tstebler.ch/MediaWiki/index.php), the PalDat - Palynological Database (www.paldat.org) or the Pollen Atlas of the Medical Faculty of Wiena (www.pollenwarndienst.at).

RESULTS AND DISCUSSIONS

White pollen pellets

White pellets were present in one of the two samples (CS1) of bee pollen that were analysed and they were composed of large size (~ 70 μm) bisaccate pollen, found in members of the family *Pinaceae*, possible *Pinus* (Figure 1).

Figure 1. Large size bisaccate pollen found in white pollen pellets in the present study, granular cytoplasm can be seen

Light yellow pollen pellets

Medium size 3-colporate striate pollen grains (~ 36 μm), oblate in equatorial view, with large elliptic pores (~ 23 μm height, ~ 13 μm width) and thick exine (~ 1 μm) were seen in light yellow pollen pellets found in CS1. This pollen is similar to pollen found in Family *Rosaceae* (Figure 2).

Pale yellow pollen pellets

Pale yellow pollen pellets were seen in CS2. The microscopical images showed medium size 3-porate, spheroidal pollen grains (polar axis ~ 40 μm, equatorial axis ~ 40 μm), elliptical pores and psilate, thick exine (~ 1 μm). Some pollenkitt was present (Figure 3). This pollen could be *Cucumis sativus* (cucumber), Family *Cucurbitaceae*.

Figure 2. Medium size 3-colporate pollen seen in light yellow pollen pellets (TB)

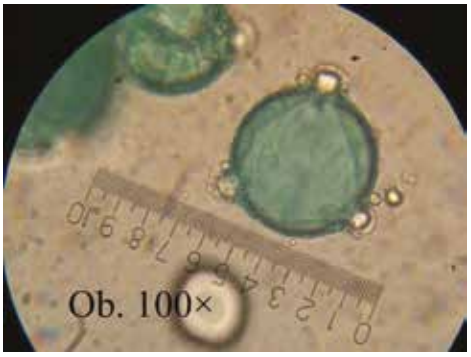

Figure 3. Medium size 3-porate spheroidal pollen grain seen in pale yellow pollen pellets (TB)

Lemon pollen pellets

Lemon coloured pellets were found in both CS1 and CS2 pollen and showed the same medium size 3-colpate, reticulate pollen grain (~ 35 μm) that is similar to that of Family *Brassicaceae* (*Brassica* sp.). Figure 4 shows a triangular (convex) shape in polar view, with 3 angular colpi and a thick exine (~ 2-3 μm). The granules have pollenkitt.

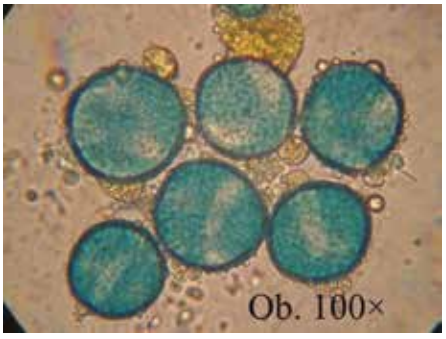

Figure 4. 3-Colpate reticulate medium size pollen grains found in lemon coloured pollen pellets (TB)

Orange pollen pellets

Orange pellets were also present in CS1 and CS2 bee pollen samples. Microscopic images showed medium sized (~ 30 μm) 3-aperturate (porate) spheroidal grains, fenestrate, echinate and surrounded by a lot of pollenkitt (Figure 5). This pollen is *Taraxacum*-type pollen found in the *Asteraceae* Family, most likely it is dandelion pollen (*Taraxacum officinale*).

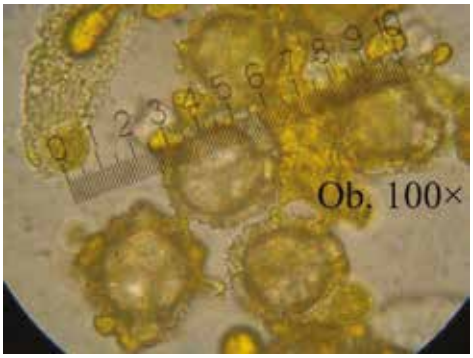

Figure 5. Fenestrate pollen grains with large drops of pollenkitt (*Taraxacum officinale*)

Firebrick pollen pellets

Large size 3-porate pollen grains (~ 70-80 μm) were seen in firebrick coloured pollen pellets that were found in CS1 pollen. The shape of this pollen in polar view is triangular convex, with pores on the corner of the grain. Equatorial view shows elliptic (tall) pores, the size of the polar axis is ~ 50 μm, the size of the equatorial axis is ~75-90 μm (Figure 6). There is a baculate surface pattern (Figure 7). This pollen could be *Geranium* sp., Family *Geraniaceae.*

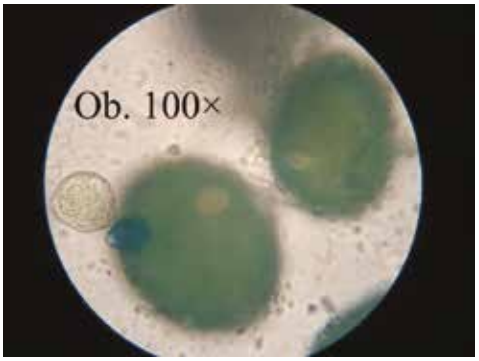

Figure 6. Large size 3-porate pollen grains from firebrick pollen pellets (side view) (TB)

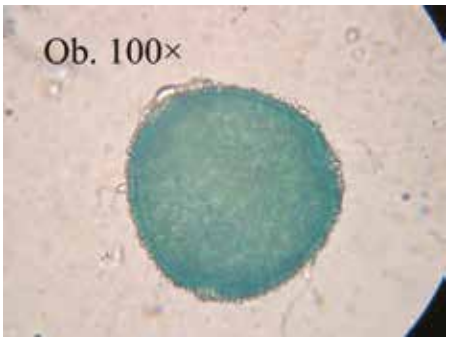

Figure 7. Polar view of 3-porate pollen grain from firebrick pollen pellets, the image shows the surface pattern (TB)

Black pollen pellets

Large size (~ 50 μm) 3-colporate, reticulate, prolate pollen grains were found in CS1 pollen. The apical view shows the angular position of the apertures and a triangular (convex) contour, lateral view shows long colpi that intersect oval pores that have annullum (Figures 8, 9). The pollen could be from Family *Fabaceae*, for example *Trifolium pratense* (red clover).

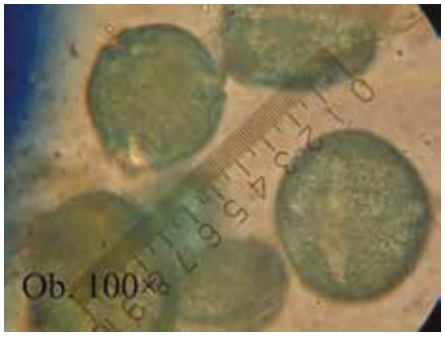

Figure 8. Large 3-colporate pollen grains seen in black pollen pellets, the image shows grains in polar and equatorial view (TB)

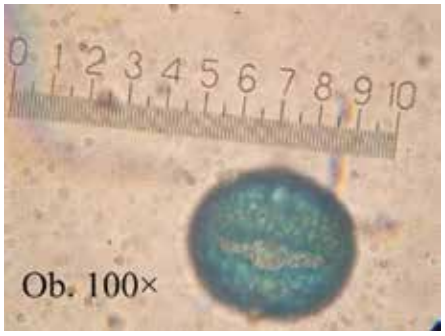

Figure 9. Reticulate 3-colporate, prolate pollen grains, side view (TB)

CONCLUSIONS

The current work provided some information on the pollen composition of the bee pollen samples that were analysed. Several plant families were suggested: *Asteraceae, Brassicaceae, Cucurbitaceae*, for CS2, and *Asteraceae, Brassicaceae, Fabaceae, Geraniaceae, Rosaceae, for CS1,* as well as the anemophilus Family *Pinaceae*.

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