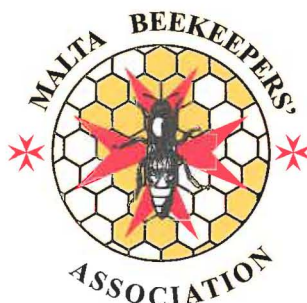


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Quality Evaluation of Honeybee Food Supplements Marketed in Portugal and its Impact in Honeybee's Longevity

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The honeybees, *Apis mellifera*, collect a set of substances from nature to ensure their survival, namely the nectar that is the main source of carbohydrates used for energy production and pollen from where they take proteins, minerals, vitamins and lipids. The consumption of carbohydrates occurs at all stages of bee development, but in adulthood the diet is almost exclusively based on these substances. Artificial carbohydrate supplementation is usually accomplished by feeding bees with honey pastes and syrups, sucrose, inverted sugars, high fructose corn syrups (HFCS) and other fruit syrups, whereas protein diets may be based on soy flour, albumin, brewer's yeast rice flour, maize flour, among others. The objective of the present study was to evaluate six commercial food supplements. First, their nutritional potential was accessed based on moisture, ash, carbohydrates, proteins and fat content. Additionally, the sugar and minerals profiles was determined together with the proline content. And finally, the impact of these supplements on the longevity of the bees under *in vitro* conditions was estimated. The results obtained from the nutritional analyzes underwent a multivariate analysis, where it was clear the proximity of the energetic samples based on the carbohydrate content, while the protein samples were close by the content in ash and proteins. Quantification of minerals has shown that protein supplements are richer in micronutrients and the most common elements were sodium, potassium and calcium, and to a lesser extent magnesium. The amount of proline found in the protein samples was very high, even when compared to the amounts of this amino acid detected in bee pollen. From the results obtained in the *in vitro* tests it was possible to verify a good acceptance of all foods by the bees, however, there was only one energetic supplement capable of increasing the longevity of the bees under *ad libitum* conditions. All the other energetic supplements caused diarrheas and increase the mortality rate of the bees from the 10th day of life, so these products should be provided in a shorter interval of time. Among the protein supplements, two revealed a good performance, while the other showed high toxicity when supplied continuously, producing a health risks for bees. The results show a clear need for regulation of artificial bee feeding products due to the existing gaps in available information on composition, mode of

application and efficacy of the products, but also because clear differences were identified between the composition analysis and the product specifications.

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Preservation Techniques and Their Impact on Bee Pollen Chemical and Microbiological Composition

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In Portugal, beekeeping is closely related to the agriculture sector, often acting as a complement to the exploration income. The pollen is one of the hive products and it has been receiving a lot of attention from researchers. Honeybees produce bee pollen through the agglutination of flower nectar with salivary substances, together with little amounts of nectar or honey. Bees collect pollen based on the hive food necessities and store it separately from honey.

Although bee pollen has been used as a food supplement for many years, due to its antioxidant, antibacterial, and antifungal properties, it continues being undervalued. As a result, there is a relatively small range of bee pollen products in the Portuguese market, in comparison with the considerably larger number of honey products, for example. This can be partially explained by the lack of information that beekeepers have regarding aspects such as the beneficial effects of bee pollen and about the influence of preservation techniques in the chemical composition and quality of bee pollen. Therefore, this work pretends to contribute to a better understanding of the possible impact of various preservation techniques on the bee pollen chemical composition and microbiological quality and safety parameters.

The bee pollen was collected using pollen traps and subsequently submitted to distinct preservation techniques, such as oven drying at 35°C, 40°C, and 45°C, freezing, and freeze-drying. The effect of these preservation techniques on the bee pollen chemical composition was evaluated through the determination of the moisture, ash, protein, and crude fat contents. The effect on the microbiological parameters included the analysis of: total viable counts (aerobic mesophiles), lactic acid bacteria, yeasts, and moulds.

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