

## Proposals for desiccated bee pollen production and labeling.

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### Abstract

**Bee pollen should be with the product-specific quality traits, natural and without contaminations. Available requirements for commercially and organically produced bee pollen lack some specific details related to the processing, storage and sales of the desiccated bee pollen, allowed for human consumption. Based on our surveys and available literature data the more specific requirements to the processing, storage and labeling of this unique food product are proposed with regard to food safety and preservation of its natural physical, chemical and organoleptique characteristics.**

**Keywords:** Desiccated bee pollen, Processing, Storage, Preservation, Organoleptique.

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### Introduction

People obtain the pollen under the form of pellets before its storage in cells. When bees pass through the openings of pollen traps on the entrance of hives, the flower pollen stuck to their bodies falls on the ground, and after purification, sieving, drying and packaging, it is allowed for human consumption [1].

During the last years, consumers turned their attention to bee pollen as natural product. Organically or commercially produced bee pollen should be of high quality with respect to physico-chemical and biological parameters, free of contaminants and to possess traits, both type-specific and close to natural quality indices [2].

The requirements to organically produced bee products [3-8], do not contain any specific norms related to the processing, storage and expiry terms of bee pollen for preserving its unique traits.

### Literature Review

The European legislation [3], specifies only partially some requirements in Art. 7: Husbandry Management Practices and Identification (par. 5). According to this document, particular care shall be taken to ensure adequate extraction, processing and storage of beekeeping products, record-keeping of all measures taken to comply with these requirements. The provisions of Canada [6] and New Zealand [7] legislations are also incomplete with regard to the elucidation of issues.

USA certification documents [8], provide more details especially about the management of the apiary. The plan includes a description of practices and procedures to be performed and maintained, including the frequency with which they will be performed; a list of each substance to be used as a production or handling input, indicating its composition, source, location(s) etc.

Bulgarian requirements for organic production of animal foodstuffs [9], are neither specific about the processing, storage and determination of the "best before..." shelf life of bee pollen.

The aim of the present work is on the basis of our surveys and available literature data to sum up the factors influencing the physico-chemical composition, food safety, and to suggest some definite requirements to processing, labeling and storage of this unique foodstuff, produced or not produced with requirements for organic production.

### Discussion

Available data for remoteness of apiaries from bee pollinators [2], should be analyzed especially in apiaries with production of desiccated bee pollen. For example, the siting of the apiaries shall be such that, within a radius of 3 km from the apiary site no intensive vegetation and industrial enterprises with high environmental impact should be existed [5].

The flight range of bees may exceed the distance of 3 km in the case of attractive forage sources and the pesticides may be transferred through the air in shorter or longer distances to contaminate bee plants and bee products. Pesticides can produce four types of effects on honey-bees: lethal effects and sublethal effects from acute or chronic exposures. For example, neonicotinoids are highly toxic [10] and neurotoxic [11] for bees. The flight range of bees may exceed the distance of 3 km in the case of attractive forage sources and the pesticides could be transferred through the air in shorter or longer distances to contaminate flowering plants, bees and bee pollen. Thus, in the future should be prohibited collection and production of desiccated bee pollen for human consumption in all areas with permission and usefulness of pesticides.

To prevent additional contamination and bacterial replication, pollen collection from pollen traps and immediate processing are advised [12]. Because of found opportunistic bacteria from the family *Enterobacteriaceae* in bee pollen and the possible skin infections occurring from the collection of fresh bee pollen from pollen traps there is therefore a need for observation of a higher level of precautions not only during processing, but also using disposable gloves when working with pollen traps and during the primary processing of the product [13].

Afterwards the pollen should be placed for 2 days in a freezer to destroy all possible harmful insects [14], and prevented additional pollution.

Studies from 2011 have established that bioactive components of pollen were preserved the best after freezing and frying [15]. With respect to a more precise technological processing a sieving and blowing with electric fans and initial drying followed by laboratory analysis of water content of dried pollen were recommended [16].

According to the proposed international standard for bee pollen, the maximum drying temperature is 42°C, and water content–6% [17]. As per current Bulgarian norms, the fresh pollen, collected from apiaries, should be dried at temperatures up to 45°C and should have residual water content not higher than 12% [1]. According our studies, we could propose water content not higher than 12% that could be more suitable for human consumption of the product [13,16].

Desiccated bee pollen should be preferably stored vacuum packed to preserve its antioxidant activity and prevent moisture accumulation and additional contamination [12]. Our surveys in dried bee pollen after one-year vacuum-packed cold storage at 0°C to 4°C [13,16,18] did not establish lowering of the mean quality and safety parameters of the product.

### Proposals for desiccated bee pollen labeling

**Product name:** Desiccated flower bee pollen.

**List of ingredients:** As per art. 19, 1(ii) of EU Regulation 1169 [19], the indication of the amount of product ingredients is not necessary as the product name identifies clearly the nature of ingredients.

Labelling of product ingredients, which might cause allergic reaction–proposition: The product is not recommended for people suffering from allergies or asthma [12], and for children under 1 year of age. This proposition for additional text is motivated by the fact that although allergies arising from pollen consumption are rare and with a prevalence similar to that of other food allergies [20], there are scientific reports for life-threatening anaphylactic reaction following bee pollen consumption [21-23]. As bee product with potential risk for consumers, the restriction for children under the age of 1 is recommended for bee pollen similarly to honey [2].

**Nominal (net) quantity:** An example: Net weight: 100 g e (example).

**Country of origin:** The indication of the country of origin is mandatory.

**Batch number:** The indication of batch number is mandatory.

**Producer:** The registration number of apiary and that product it is produced with requirements for organic production (if any), should be indicated.

**Storage terms and conditions (shelf-life “Best before”):** The shelf life is indicated as for instance. Best before: 29.10.2018 (example). It should conform to the requirement of vacuum packed product storage for 2 years at a cool, dry and dark place at 0°C to 10°C [12] or 1 year at 0°C to 4°C when stored in hermetically sealed packages for food [1,13,16].

**Physical, chemical parameters and contaminants for bee pollen:** These are presented in other studies [16-18].

**Microbiological analyses of the bee pollen:** For microbiological analysis, 25 g of bee pollen was diluted with 225 ml of buffered peptone water (Merck, Darmstadt, Germany), then homogenized for 10 min at 200 rpm in a Stomacher, and left for 30 min at room temperature. From this dilution, serial dilutions were made to 10<sup>-4</sup> in sterile physiological saline. Isolation and identification of the isolates to the species level were proposed in the study from 2016 [13]. The low total counts of microorganisms from the *Enterobacteriaceae* family (7.5 × 10<sup>2</sup> CFU/g to 8.5×10<sup>3</sup> CFU/g) were determined in dried bee pollen after one-year vacuum-packed cold storage at 0°C to 4°C [13]. From these data could be proposed ab to 10<sup>3</sup> CFU/g microorganisms from the *Enterobacteriaceae* family in desiccated bee pollen intended for human consumption.

**Conditions of use:** Recommended use: 2 teaspoonfuls (about 10 g) for adults, 1 teaspoonful (about 5 g) for children [12]. Nutrition guidelines and daily reference intake (adults). They are calculated according Annex XIII and XIV from Regulation 1169, (Tables 1 and 2) [19,24].

### Conclusion

In the study were done recommendations for the desiccated pollen collection, processing, storage and labeling. With a view to preservation of highest natural organoleptic and physical quality traits of the bee pollen packages should not be transparent to control light-induced oxidation of fats in the product [24]. Shelf life (best before...) should be 2 years at a cool, dry and dark place at 0°C to 10°C [12] or 1-year cold storage at 0°C to 4°C when stored in hermetically sealed packages for food [1,13,16], for bee pollen dried only at temperatures up to 45°C and with a residual water content not higher than 12% [1].

Parameters	Nutrient information for 100 g product [17]	Daily reference intake % *	Daily reference intake % for 1 portion (10 g) [12]
Energy	≥ 990.5 kJ/ 233.5 kcal	≥ 11.7%	≥ 1.17%
Fat	≥ 1.5 g	≥ 2.1%	≥ 0.21%
Carbohydrate	≥ 40 g	≥ 15.4%	≥ 1.54%
Protein	≥ 15 g	≥ 30%	≥ 3%

\*Daily reference intake %: Referent quantity for daily reference intake for adults consumed 2000 kcal (8400 kJ) [19].

Table 1. Nutrient information of bee pollen (adults).

Vitamins (in 100 g) [17]	Nutrient reference values [19]	% Nutrient reference values from 10 g bee pollen	Micro- and macroelements (in 100 g) [17]	Nutrient reference values [19]	% Nutrient reference values from 10 g bee pollen [12]
1000 to 20000 µg Vitamin A (µg)	800	12.5 to 250	400 to 2000 mg Potassium (mg)	2 000	2.0 to 10.0
4 to 32 mg Vitamin E (mg)	12	3.3 to 26.6	20 to 300 mg Calcium (mg)	800	0.25 to 3.75
7000 to 56 000 µg Vitamin C (µg)	80	875 to 7000	80 to 600 mg Phosphorus (mg)	700	1.14 to 8.57
0.6 to 1.3 mg Thiamin (mg)	1,1	5.45 to 11.82	20 to 300 mg Magnesium (mg)	375	0.53 to 8.0
0.6 to 2 mg Riboflavin (mg)	1,4	4.28 to 14.28	1,1 to 17 mg Iron (mg)	14	0.78 to 12.14
4 to 11 mg Niacin (mg)	16	2.5 to 6.87	3 to 25 mg Zinc (mg)	10	3.0 to 25.0
0.2 to 0.7 mg Vitamin B6 (mg)	1,4	1.428 to 5.0	0,2 to 1,6 mg Copper (mg)	1	2.0 to 16.0
300 to 1000 µg Folic acid (µg)	200	15.0 to 50.0	2 to 11 mg Manganese (mg)	2	10.0 to 55.0
50 to 70 µg Biotin (µg)	50	10.0 to 14.0	0,5 to 2 mg Pantothenic acid (mg)	6	0.83 to 3.33

**Table 2.** Daily reference intakes for vitamins and minerals of bee pollen production (adults).

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