

BEE POLLEN AND ITS PHARMACOLOGICAL PROPERTIES

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ABSTRACT. Bee pollen is a natural honey bee product that is considered a valuable resource for nutrients and energy. It is a health-enhancing value because of its wide variety of primary and secondary plant metabolites and enzymes and co-enzymes. Therefore, bee pollen is especially appreciated by consumers and used as an alternative drug. It has antimicrobial, antioxidant, anti-inflammatory, antianemic, anticarcinogenic, cardioprotective, hepatoprotective, and immune-enhancing effects. In this paper, bee pollen will be evaluated briefly in terms of chemical content, biological effects and toxicity.

1. INTRODUCTION

Pollen is the microspores (2.5-250 µm in size) which are produced in the anthers of stamens of the seed plants (Spermatophyta) and which play a role in the growth of the plant. In addition, each species has its own pollen structure. Pollen of the anemophilous plants may cause various allergic reactions in humans, while pollens of the entomophilous plants are collected by the bees and used as a valuable food. Bee pollen defined as the “life-giving dust” since historical times. This pollen is a natural product of flower pollens with nectar, salivary substance of the *Apis mellifera*, and agglutination of the honey enzymes (amylase, catalase) and is used as food for all the developmental stages in the hive. The surface of the collected pollen

pollen is covered with a thin layer of honey and wax. The resultant substance is anaerobic fermentation and is protected by lactic acid. This product is the main source of protein for bee colony and also constitutes the main source of nutrient and mineral substances for royal jelly produced by worker bees. The amount and quality of pollen collected by honey bees affects reproduction and longevity, ultimately affecting colony efficiency. Special group of worker bees that collect pollen is called pollen-bees [1-5]. The color of pollen varies from bright yellow to black. The pollen usually comes from the pollen of a plant. However, it is sometimes seen that bees collect pollen from many different plant species. The color of bee pollen also changes according to the color of pollen source [1, 4].

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2. HISTORY

The use of bee pollen by humans has a long history. It has been accepted as a therapeutic agent in ancient Egypt, Greece, Roman and Chinese civilizations and has taken its place in alternative medicine today. It is also involved in trade as food support to strengthen the body in various health problems. It is also recommended in children with lack of appetite, eating and developmental disorders [2, 5].

In the analysis of plant pollen species forming bee pollen, light microscopy has been used since the 1950s to at least carry out family and genus determination. The shape, size, weight and color of the pollen grains vary according to the plant from which they are obtained. Bee pollen, nutritional values and physicochemical parameters, which are also accepted as human food, are standardized according to the food codex of the countries where they are consumed. The medical value of pollen in Germany has been officially approved and included among the German Commission E Monographs. It is also used in clinical practice in the treatment of different pathophysiological diseases in Chinese Medicine [5, 6].

3. CHEMICAL COMPOUNDS AND THERAPEUTIC EFFECTS

The main chemical composition of bee pollen formed in granular form has a very large content when working with spectroscopic and chromatographic methods. The minimum and maximum values of this broad content may vary; however, the main chemical components of bee pollen are carbohydrates (polysaccharides, reducing sugars, starch), fibers (soluble and non-soluble), proteins (essential or non-essential amino acids, enzymes and co-enzymes) and lipids (fatty acids, sterols, fitosterols, triglycerides) which are primary metabolites. In addition to primary metabolites, bee pollen also contains phenolic compounds, vitamins [provitamin A (β -carotene), vitamin E (tocopherol), vitamin C, niacin, thiamine, biotin and folic acid] and minerals (Ca, Cu, Fe, I, K, Mg, P, Se, Zn etc.) and lycopene, zeaxanthin and organic carotenoid pigments are also rich in terms. This chemical composition of the bee pollen is the reason for its nutritional importance. The therapeutic property of bee pollen and its food-important composition are based on the plants from which it is obtained. At the same time, climate, soil type, the efficiency of the worker bee are also effective. In addition, the quality of the bee pollen product offered to trade, the way the product is obtained and storage factors are also affected. Therefore, bee pollen products standardized for treatment should be used [2, 4, 5, 7].

Freshly prepared pollen by bees carries about 20-30 g of water per 100 g. This humidity creates an ideal culture medium for microorganisms such as bacteria and fungi. To prevent this situation, bee pollen collected daily should be stored in the freezer. Pollen is dried generally in electric ovens, where humidity can continuously escape. To obtain the best product, collected bee pollen should be dried in maximum 40 C° ovens. The amount of water after drying drops to around 6% [2].

This rich chemical composition of bee pollen is the reason for its nutritional and therapeutic importance. It has antimicrobial, antioxidant, anti-inflammatory, antianemic, anticarcinogenic, cardioprotective and hepatoprotective effects due to its secondary metabolites such as flavonoid (apigenin, quercetin, naringenin, genistein ect.) and phenolic acids (benzoic acid, phenil acetic acid, caffeic acid, klorojenic acid, cinnamic acid ect.) and micronutrients (Cu, Fe, Ca, K, Mg, Mn, P, Se, Zn, ect.). In addition, it supports the bone tissue, antiatherosclerotic, has supportive and regulatory properties of the immune system. Daily use of bee pollen can regulate bowel function, effectively reduce capillary fragility, and can have beneficial effects on the cardiovascular system, vision and skin. These therapeutic effects have been demonstrated in several *in vitro* and *in vivo* studies [1, 2, 4, 5, 7].

In the German Commission E Monographs, it is recommended to use 30-40 g of pollen or equivalent preparations in a roborant for feebleness and loss of appetite. Bee pollen is more effective than flower pollen. Therefore, when used for therapeutic purposes, it should be started with low doses and used for short term. It can be consumed by adding to milk, fruit or juice or it can be consumed by mixing 1:1 or 1:4 to products such as honey, jam and yogurt. The usual recommended daily dose for adults in therapeutic applications is 20-40 g; for children 7.5-15 g. Can be taken three times before meals. The duration of treatment is 1-3 months. It can be used up to 2-4 times a year, especially in seasonal passages [2, 6]. Bee pollen can be stored for 12 months in a light-free, cold and dry environment [2].

Traditionally, bee pollen is known to be used in the prostate gland inflammation. It has been found to be effective in inflammation of non-bacterial prostate in clinical studies. In the clinical studies, the use of bee pollen at a dose of 5-10 g / kg for two weeks in the benign prostatic hyperplasia has been found to support treatment [2, 5, 7].

In pharmacological studies on rats and rabbits, bee pollen has been found to be hypolipidemic in experimental animals. This effect was also supported by clinical studies. Bee pollen has been shown to have therapeutic efficacy in patients with hyperlipidemia and arteriosclerosis. Due to these effects, it has gained importance as a protective from heart disease [1, 2, 5, 7].

4. TOXICITY

Although bee pollen is a product produced by bees, it may be contaminated with heavy metal residues and pesticide residues due to environmental factors such as air pollution. To avoid this contamination, the production areas must be at least 3 km from the roadside and pesticide use areas [2].

Bee pollen is well tolerated by human organism, however, in the person with allergy sensitivity the presence of allergenic pollens such as the pollen of the Compositae species may cause allergic reaction to bee pollen. Asthma patients are not recommended to use. Bees usually do not take grass pollen, so grass pollen in the structure of bee pollen is not found. However, they can sometimes carry fungal spores from infected plants. There may be microbial contamination and exposure to pesticide residues. Furthermore, bee pollen can carry toxic compounds such as hepatotoxic pyrolizidine alkaloids (especially family pollen of Boraginaceae). In this case, the product must be analyzed before it is placed on the market and used with caution [2].

5. CONCLUSIONS

Natural nutritional supplementation and as an alternative treatment agent bee pollen should be used as a preventive and health protective substance because it contains all the primary and secondary plant components necessary for healthy and normal development of the organism with all necessary amino acids and fatty acids. The pollen composition and chemistry have not yet been standardized and are not described in pharmacopoeias. Potential risks of consuming organic bee pollen include fungal mycotoxins, pesticides, toxic metals, allergic and toxic pollens. Bee pollen products should be analysed very well in order to avoid the toxic effects caused by these substances.

Although bee pollen is also used in our country for food support and therapeutic purposes. In Turkey, there is no standardization of the market provided bee pollen

products, besides there is also a lack of clinical studies. In our country, detailed pharmacological and clinical studies on this natural product should be done.

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