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A STUDY ABOUT PHYSICOCHEMICAL COMPOSITION OF FRESH AND LYOPHILIZED ROYAL JELLY

UN STUDIU DESPRE COMPOZIŢIA FIZICO-CHIMICĂ A LĂPTIŞORULUI DE MATCĂ PROASPĂT ŞI LIOFILIZAT

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This paper contents a summery about physicochemical composition of frash and lyophilized royal jelly. Royal jelly (RJ) is a yellowish and creamy secretion from hypo pharyngeal and mandibular glands of young worker bees (Apis mellifera L.) to feed all larvae for the first three days of their life and the queen bee for both her larval life and adulthood.. Royal jelly is a honey bee secretion that is used in the nutrition of the larvae. Queen bees are made, not born, and their feeding with royal jelly is the key to that process. The geographical authenticity of royal jelly can be determined also by pollen analysis (Ricciardelli d'Albore et al., 1978; Ricciardelli d'Albore, 1986). The physicochemical composition of pure royal jelly are analyzed by determining moisture, ash, lipids, proteins, carbohydrates, 10-HDA; and for lyophilized royal jelly are analyzed by determining ash, lipids, protein, carbohydrates, 10-HDA, sugars. 10-HDA content is the criteria of royal jelly quality analysis and it is a freshness parameter(Antinelli J.F., Sarah Zeggane, Renee Davico, Catherine Rognone, Jean Paul Faucon, Louisette Lizzani)
Key words: royal jelly, composition, quality parameters

Royal Jelly is a substance of complex chemical structure produced by the young nurse bees as larva food. Although it is not quite as well known as bee pollen, royal jelly equals pollen in its salutary effects. The young nurse bees make royal jelly; it is a secretion from glands on the tops of their heads. For 2-3 days, royal jelly is the only food given to all young larvae in their maturation process, while for the queen larvae; it is the specific food for their whole life period. The queen (fed only on royal jelly for her entire life) reaches maturity 5 days earlier than the worker bees; and, when she is fully grown, her weight is double that of the working bee. As incredible as this may seem, she can lay that many eggs for five years. Any creature that has that amount of energy and vitality has to be respected.

Without this special food, queen bees would fail to develop properly. Royal jelly is a thick, extremely nutritious, milky-white, creamy liquid secreted by the hypo pharyngeal glands of the nurse bees. Queen bees live exclusively on royal

jelly and it accounts for their incredible size and longevity. They average 42 percent larger and weigh 60 percent more than the worker bee. Amazingly, they live 40 times longer than worker bees, seven years as compared to seven weeks. In the wild, queen bees will produce 2000 eggs per day with each day's brood equal to 2- 1/2 times her own body weight.

This rich concentrated food is not just useful for the bees. It contains remarkable amounts of proteins, lipids, sugars, vitamins, hormones, enzymes, mineral substances, and specific vital factors that act as biocatalysts in cell regeneration processes within the human body. Although some of the elements found in royal jelly are in microgram quantities, they still can act supremely with co-enzymes as catalysts or can act synergistically. (That is, the elements' action combined is greater than the sum of their actions taken separately.) Royal jelly is rich in protein, vitamins B-1, B-2, B-6, C, E, niacin, pantothenic acid, biotin, inositol and folic acid. In fact, it contains seventeen times as much pantothenic acid as that found in dry pollen.

For centuries, fresh royal jelly has been used as all natural energy boost and alternative medicine. As far as nutrition goes, it is packed full of a wide spectrum of vitamins, mineral and amino acids that have been shown to increase energy, reduce stress and boost the immune system.

Organoleptic properties of royal jelly:

- Form: jelly, cream;
- Color: from white to white-yellow;
- Odor: sour;
- Taste: spicy, acid;
- Defects: after longer storage the color of royal jelly will turn to yellow and the taste can become rancid.

Royal jelly is a viscous jelly substance. It is partially soluble in water with a density of 1.1 g/ml. Its colour is whitish to yellow, the yellow colour increasing upon storage. Its odour is sour and pungent, the taste being sour and sweet. The sensory characteristics are an important quality criteria. Old royal jelly, which has not been properly stored, tends to be darker and a rancid taste can develop. For optimum quality it should be stored in frozen state. The viscosity varies according to water content and age - it slowly becomes more viscous when stored at room temperature or in a refrigerator at 50ºC. The increased viscosity appears to be related to an increase in water insoluble nitrogenous compounds, together with a reduction in soluble nitrogen and free amino acids (Takenaka et al., 1986). These changes are apparently due to continued enzymatic activities and interaction between the lipid and protein fractions (Anna Gloria Sabatini et all)..

The parameters investigated concerned in the above mentioned studies concern the organoleptic characteristics and physical properties as well as the following composition factors:

Table 1: Literature determination compounds of royal jelly

Water (2002)	content determined by freeze-drying (e.g. Messia et al., 2005), Karl Fischer (Ferioli et al., 2007), vacuum oven, dessication (Garcia-Amoedo et al.,2002)
Total protein	nitrogen determined with the Kieldahl method (Lercker et al., 1992-93) and free amino acids determined by chromatography (Boselli et al., 2003)
Sugars	determined by gas chromatography (Lercker et al., 1992-93) or HPLC (Sesta, 2006)
Lipids	determined as free and total organic acids by gas chromatography (Lercker et al., 1992-93) or as total lipids, by solvent extraction (Karaali et al., 1988)
10-HDA	determined by HPLC (Bloodworth et al., 1995; Genc and Aslan, 1999)
Minerals	determined by atomic absorption (Benfenati et al., 1986)
Acidity	titration method (e.g. Serra-Bonvehi, 1992)
Sediment analysis	microscopical analysis (Ricciardelli d'Albore, 1986)
Furosine,	(Marconi et al., 2002)

Water content shows to be fairly uniform, greater than 60%, and with an activity (a_w) above 0.92, in spite of which RJ displays considerable microbial stability.

From a quantitative viewpoint, proteins (27-41%) represent the most important portion of the dry matter of RJ. The amino acids present in the highest percentages were proline, lysine, glutamic acid, β-alanine, phenylalanine, aspartate and serine (Boselli et al., 2003). The concentration of series D amino acids was below the detection limit of the method (0.1mg/g of RJ) in all samples. The study aimed to assess how this parameter evolved during storage of the product(Anna Gloria Sabatini et all)..

The lipid portion in fact consists primarily of organic acids (80-90%), most of which free, with a rather unusual structure rarely encountered in nature: they are in fact mono- and dihydroxy acids and dicarboxylic acids with 8 and 10 carbon atoms, which show a characteristic arrangement (Lercker et al., 1992-93). Hydroxy acids with 10 carbon atoms (10-hydroxydecanoic and 10-hydroxy-2-decenoic acid) above all can be found in high concentrations. Not only may they be ascribed a role as a marker component, but they have also been identified as responsible for important biological activities tied to the development strategies of the colony (Anna Gloria Sabatini et all).

Ash content represents 0.8-3% of RJ (fresh matter) (Messia et al., 2003). The major elements are, in descending order: K, Ca, Na, Mg, Zn, Fe, Cu and Mn (Nation and Robinson, 1971; Ivanov and Chervenakova, 1985; Benfenati et al., 1986), present in specific ratios such as K/Na and Ca/Mg (Sabatini et all).

Table 2: Literature determination percent compounds of frash and lyophilized royal jelly

	Royal jelly fresh	Royal jelly lyophilized
Water %	60 - 70	< 5
Lipids %	3 - 8	8 – 19
10-Hydroxy-2-decenoic acid %	> 1.4	> 3.5
Protein %	9 – 18	27 – 41
Fructose + glucose+ sucrose %	7 - 18	-
Fructose %	3 – 13	-
Glucose %	4 - 8	-
Sucrose %	0.5 – 2.0	-
Ash %	0.8 - 3.0	2 – 5
Ph	3.4 - 4.5	3.4 – 4.5
Acidity (ml 0.1N NaOH/g)	3.0 - 6.0	-
Furosine (mg/100g protein)	< 50	-

In conclusion 10-HDA content decreased when royal jelly is adulterated; the absence of 10-HDA showed a total substitution of royal jelly **(**Garcia – Amoedo L.H., Almeida Muradian Ligia Bicudo, 2007).

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