

## Comparative evaluation of chemical composition for three categories of royal jelly

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### Abstract

The chemical composition of royal jelly was investigated. This type of work was extremely valuable for practical application in food science and therapy. Royal jelly has been accepted and used as nutritive substances complex benefic for health. Our principal objective was the characterization of physico-chemical parameters for Transylvanian royal jelly. 15 Romanian royal jelly samples were collected from different Transylvanian areas directly from the local beekeepers (5 samples), fresh packed (5 samples) and lyophilized (5 samples) from specialized store.

**Keywords:** Romanian royal jelly, nutritional evaluation, extraction, total lipids, water content

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### 1. Introduction

Known as “youth elixir”, royal jelly is highly appreciated in natural medicine, and also in cosmetic industry, with a value assured by its complex and rich chemical composition.

Royal jelly, the principal food source of the queen honey bee, is produced by the hypopharyngeal and mandibular glands of the worker honey bees (*Apis mellifera*). 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; as a secretion from glands on the top of their heads.

Royal jelly is an emulsion of proteins, sugars and lipids in a water base, and is synthesized by the bee from pollen. People use royal jelly as a nutritional supplement and dietetic aliment for many years.

Royal jelly present quality of the biological and physiological exception of the reason for which is marketed widely is being used in various domains, such as the pharmaceutical, food (nutritional supplements) and cosmetics companies [1].

Royal jelly is a complex matrix, containing various components: 60–70% water, 12–15% protein, 10–16% sugars, 3-7% lipids and small quantities of vitamins, mineral salts and free amino acids [2-7], enzymes, hormones, antibacterial and antibiotic components. It contains B vitamins complex, including high concentrations of pantothenic acid (vitamin B5) and pyridoxine (vitamin B6). The lipid fraction mostly contained acidic polar compounds [8,9]. Royal jelly is the only natural source of pure acetylcholine. Decreased levels of acetylcholine are part of the pathology of Alzheimer's disease. Modern nutritional research confirmed that royal jelly is important to the life activities of the human body.

Considering its nutritional composition and according to non-scientific studies, royal jelly has been used as food in human diets providing a well-being sensation and contributing to functional and harmonious balance of the human body.

The purpose this study was to investigate the physico-chemical composition of three categories of Romanian royal jelly, normally fresh (from the hive), fresh pecked and lyophilized royal jelly.

## 2. Materials and methods

**Equipments.**Total lipids content measurements were performed on a Soxhlet Velp Scientific apparatus, using also FDI Binder-Germania oven. Samples of royal jelly were extracted by petroleum ether from Merck. Ultrapure water is obtained with Ultra Clear Direct UV SG Wasseraufbereitung-Germania. For pH values of sample was measured using a C532 Consort pH-meter. All weight measurement were done using Ohaus-Germania balance.

**Samples of royal jelly.** In this study 3 categories of royal jelly were investigated. Fresh royal jelly was obtained from local beekeepers, selected from stationary apiaries and stored as soon as possible at -20°C until use. Fresh packed and lyophilized samples were purchased from specialized stores (CasaBio Cluj-Napoca, Romania). All samples were collected from Transylvania region, Romania (Table 1).

The parameters investigated the above mentioned studies concern the organoleptic characteristics and physicochemical properties as well as the following composition factors. These methods were applied to different types of royal jelly: fresh and lyophilized.

Moisture contents were determined followed a gravimetric method: in a glass capsule of with flat bottom, 10 cm diameter is weighed a precise amount of sample and dried in the oven at 65 °C temperature until constant mass.

Dry matter of the sample was obtained by subtracting the moisture content from 100. pH values were determinate potentiometrically with a C532 Consort pH-meter: pH was registered a 5% water solution of royal jelly.

Regarding total lipid content, the working protocol was conducted as follows: all lipids were extracted from royal jelly samples with organic solvent-petroleum ether. Lipid extraction was done from dry matter of each sample. Total lipid fraction was extracted using Soxhlet apparatus, set to the program for six hours, 30 minutes for immersion and 30 minutes during the recovery of solvent.

All determinations were performed in triplicate and results are expressed as mean ± standard deviation. The data were analyzed by an analysis of variance (one way ANOVA)(p<0,05) and means compared using Tukey Test. Results were processed by Microsoft Excel and Origin software.

**Table 1.** Description of royal jelly samples

No.	Samples of royal jelly (RJ)	Sample ID	Geographical origin	Harvesting period
1	Fresh RJ	LM 01	Valea Broștilor, Jud. Cluj	June 2008
2	Fresh RJ	LM 02	Cojocna, Jud. Cluj	June 2008
3	Fresh RJ	LM 03	Valea lui Mihai, Jud. Bihor	June 2009
4	Fresh RJ	LM 04	Bistrița, Jud. Bistrița - Năsăud	June 2009
5	Fresh RJ	LM 05	Bistrița, Jud. Bistrița - Năsăud	June 2009
6	Liophilized RJ	LM 06	S.C. Complex Apicol Harnaj	July 2009
7	Liophilized RJ	LM 07	S.C. Complex Apicol Harnaj	July 2009
8	Liophilized RJ	LM 08	S.C. Complex Apicol Harnaj	July 2009
9	Liophilized RJ	LM 09	S.C. Complex Apicol Harnaj	July 2009
10	Liophilized RJ	LM 10	S.C. Complex Apicol Harnaj	July 2009
11	Fresh packed RJ	LM 11	Bocșița, Jud. Sălaj	June 2009
12	Fresh packed RJ	LM 12	S.C. Apisano Baia Mare	June 2009
13	Fresh packed RJ	LM 13	Bocșița, Jud. Sălaj	June 2009
14	Fresh packed RJ	LM 14	Bocșița, Jud. Sălaj	June 2009
15	Fresh packed RJ	LM15	S.C. Apisano Baia Mare	June 2009

**Table 2.** General biochemical composition of royal jelly produced in Transylvania, Romania

	Sample ID of royal jelly	pH values	Moisture content ± SD (%)	Dry matter (%)	Total lipids content ±SD (%)
Fresh royal jelly	LM 01	3,65	58.06±1.51	41,94	18.18±0.18
	LM 02	3,95	56.92±2.79	43,08	18.84±0.15
	LM 03	3,67	59.22±2.82	40,78	18.45±0.06
	LM 04	3,87	61.10±1.77	38,90	19.62±0.23
	LM 05	3,51	59.87±1.35	40,13	19.02±0.13
Lyophilized royal jelly	LM 06	4,01	1.70±0.10	98,30	17.27±1.00
	LM 07	3,78	1.83±0.12	98,17	17.37±0.79
	LM 08	3,74	2.37±0.15	97,63	16.88±0.64
	LM 09	3,96	2.03±0.21	97,97	16.20±0.90
	LM 10	3,88	1.97±0.21	98,03	16.61±1.22
Fresh royal jelly, packed	LM 11	4,20	58.48±2.74	41,52	17.53±0.23
	LM 12	4,12	63.88±3.28	36,12	17.58±0.42
	LM 13	3,90	64.10±1.30	35,90	16.93±0.39
	LM 14	3,62	65.01±1.41	34,99	17.67±0.15
	LM15	3,74	63.28±0.96	36,72	17.60±0.24

#### 4. Conclusion

All the results obtained were in accordance with the requirements of Brazilian legislation for royal jelly quality control.

Royal jelly is a supplementary aliment with a high nutritive value containing lipids, sugars, proteins, mineral elements and vitamins. Royal jelly consumption helps the revival of the organism, maintains the health of the bone system and articulations. Royal jelly also helps rebuild the weaken organisms and it is indicated in the treatment of nervous affections and cardiac insufficiency.

Known and unknown substances from royal jelly, through their specific mechanisms, constitute and determine the high value of this bee product as natural product used more and more in many malady treatments as prophylactic and vitality product.

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