2019-20

The Pharmaceutical and Chemical Journal, 2019, 6(2):20-24

Available online www.tpcj.org

Research Article

ISSN: 2349-7092
CODEN(USA): PCJHBA

Royal Jelly: Organoleptic Characteristics and Physicochemical Properties

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Abstract Royal Jelly is a material with a complex chemical structure formed by the young nurse honey bees as larva food. Royal jelly (RJ) has a complex composition of proteins, amino acids, sterols, phenols, sugars, minerals and other components. It has significant commercial requirement and today it is utilized in various sectors, such as pharmaceutical, food industries, cosmetics, manufacturing sectors. The main purpose of this work is to compare the organoleptic characteristics and physicochemical profile of the fresh royal jelly with lyophilized royal jelly to confirm that lyophilized RJ can also be useful. Results show organoleptic characteristics as well as biochemical properties of fresh as well as lyophilized royal jelly. From the results it was concluded that lyophilized royal jelly contains an up to similar amount of chemical constituents as fresh royal jelly. not much amount is destroyed by freeze drying thus lyophilized royal jelly can be stored for a longer duration at room temperature and can be used.

Keywords Royal jelly, organoleptic characteristics, physicochemical profile, lyophilized royal jelly

Introduction

Royal Jelly is a material with a complex chemical structure formed by the young nurse honey bees as larva food. It is secreted from hypopharingeal glands situated on the tops of the heads of worker honey bees. For the maturation process up to 2-3 days, royal jelly is the only food given to all young larvae, while for the queen larvae; it is the specific food for their whole life period. Queen honey bees live solely on royal jelly, which is responsible for its incredible size and longevity. They are average 42 percent larger and weigh 60 percent more than the worker bee. Miraculously, there life exceeded 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. Without royal jelly, queen bees would not succeed to develop properly. [1].

Royal jelly (RJ) has a complex composition of proteins, amino acids, sterols, phenols, sugars, minerals and other components[2]. This rich concentrated food is not just useful for the bees, but also for humans, due to the presence of 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. Even though some of the elements of royal jelly are found in microgram quantities, still they can act extremely with co-enzymes as catalysts or can act synergistically. Royal jelly has a rich amount of protein, vitamins B-1, B-2, B-6, C, E, niacin, pantothenic acid, biotin, inositol and folic acid. In fact, pantothenic acid is found in RJ are seventeen times much than found in dry pollen. [1]. For centuries, fresh royal jelly has been used as all natural energy boost and alternative medicine. Nutritionally, royal jelly filled with a wide range of vitamins, mineral and amino acids that have been revealed to increase energy reduce stress and boost the immune system. Occasionally these constituents are affected by various

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floral and regional sources as well as the storage period of royal jelly, which can affect its quality value. Beside the biological properties, royal jelly (RJ) has significant commercial requirement and today it is utilized in various sectors, such as pharmaceutical, food industries, cosmetics, manufacturing sectors.

It is hard to maintain the Fresh royal jelly for a longer period. Long duration of fresh RJ affects its constituents. Thus the lyophilized form can be used instead of fresh.

The main purpose of this work is to compare the organoleptic characteristics and physicochemical profile of the fresh royal jelly with lyophilized royal jelly to confirm that lyophilized RJ can also be useful.

Material and Methods

Material

Fresh Royal jelly samples (n=6) were collected from the hives with colonies of the most common honeybee species Apis mellifera located in Himayatbagh of Aurangabad region. Lyophilized royal jelly samples (n=6) were purchased from the different beekeeping farm from different regions of India. Fresh sample was kept in refrigerator at -4° C while lyophilized samples were kept at room temperature in the laboratory before analysis.

Parameters to be studied

1. Organoleptic characteristics of royal jelly
2. Moisture content (Sesta and Lusco,) [3]
3. Ash content (Ismail) [4]
4. Lipid content (Cheng et al) [5]
5. Total protein (Lowry et al) [6]
6. Total carbohydrate (DuBois et al) [7]
7. 10-HAD (Genc and Aslan) [8]
8. Total phenolic content (Vinson et al) [9]

Result and Discussion

Table 1 shows organoleptic characteristics of fresh as well as lyophilized royal jelly. Fresh RJ is a creamy whitish substance with a sour odor and spicy taste. Lyophilized royal jelly is a pale yellow powder with a rancid taste.

Table 1: Organoleptic characteristics of fresh and lyophilized royal jelly

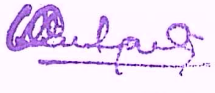
S. No.	Characteristics	Fresh	Lyophilized
1	Form	jelly, cream;	powder
2	Color	whitish	white-yellow
3	Odor	sour	-
4	Taste	spicy	rancid

Table 2 exhibited physic-chemical composition of fresh and lyophilized RJ.

Table 2: Physicochemical composition of fresh and lyophilized royal jelly

S. No.	Determinations (%)	fresh	Lyophilized Royal jelly
1	Moisture	60	3.8
2	Ash	1.22	2.59
3	Lipids	2.49	11.57
4	Total proteins	11.99	33.57
5	Carbohydrates	12.30	1.28
6	10-HDA	3.22	2.31
7	Total phenolic content	21.81	17.14

The total moisture content in fresh RJ was 60% while in lyophilized it was 3.8%. Ash content in fresh sample was 1.22% while in lyophilized sample it was 2.59%. The lipid content was 2.49% in fresh sample while 11.57 in lyophilized. Total protein content in fresh sample was 11.99% while in lyophilized Rj it was 33.57%.carbohydrates were 12.30% in fresh Rj but in lyophilized a carbohydrates were absent.3.22% of 10-HAD was present in fresh



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sample whereas 2.31% was found in lyophilized sample. Total phenolic content in fresh royal jelly was 21.81 while 17.14% in lyophilized royal jelly.

Fresh Royal jelly is a viscous jelly substance. It is partially soluble in water. Its color is whitish to yellow, the yellow color increasing upon storage. The odor is sour, with a sweet taste. The sensory characteristics are important quality criteria. Old improperly stored royal jelly tends to be darker and taste can develops as rancid. Therefore for optimal 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. [10].

Water content of RJ is an important quality criterion and its determination is always a part of the quality control on raw royal jelly. The content of the water in fresh royal jelly found to be over 60%, while in lyophilized sample it was reduced to 3.8% because during Lyophilization or freeze drying water is frozen, it removes from the sample, initially by sublimation (primary drying) and then by desorption (secondary drying) [11]. These values correlate favorably with Boselli et al [12]..

As a result of heating in the presence of oxidizing agents, the water and organic matter have been removed; remaining Ash is the inorganic residue, which provides a measure of the total amount of minerals within a food. By the results it was confirmed that Ash content of fresh RJ was 1.22% and 2.59 (lyophilized RJ). As proposed by Messia et al. [13].

As for any food or dietary products, the knowledge about the levels and composition of carbohydrates offers important information, such as its calories. Under the biochemical and physiological aspect, the sugars substances are extremely important for all living organisms which contribute to stimulating and regulating the metabolic processes. Fresh RJ sample comprises about 12.30% carbohydrates but in lyophilized sample carbohydrates were destroyed up to 1.28% by freeze drying. Similar results were observed by Olympia & marghitas [1].

The lipid portion of royal jelly consists primarily of organic acids, the majority 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 [14].

The major fatty acid component of royal jelly is 10-HDA (10hydroxy 2-decenoic acid). It has many pharmacological activities such as antitumor effects [15], collagen production-promoting effects [16], and antibiotic properties [17]. 10-HDA was found in high concentrations in both the samples of royal jelly.

The main protein components of royal jelly are major royal jelly proteins, accounting for 82% of total royal jelly protein, with molecular masses of 49–87 kDa assigned to one protein (and gene) family [18]. These proteins on a global scale are expected to have a significant impact on human immunotherapy and as potential proteinaceous antibiotics [19-20]. From a quantitative viewpoint, proteins represent the most important portion of the dry matter of fresh as well as lyophilized RJ. This substantiates previous findings in the literature by Boselli *et al* [12].

The polyphenols are reported to exhibit anticarcinogenic, anti-inflammatory, anti-atherogenic, antithrombotic, immune modulating and analgesic activities, among others and exert these functions as antioxidants .The phenolic compounds present in royal jelly are known to possess antioxidant properties and these properties may play a key role in the pharmacological activities [21]. Both the sample of royal jelly possessing phenolic content in it. The present study confirmed that both fresh as well as lyophilized royal jelly samples indicating presence of all organoleptic and physico-chemical properties.

Conclusion

We have obtained satisfactory results proving that sample of lyophilized royal jelly contains an up to similar amount of chemical constituents of as fresh royal jelly. not much amount is destroyed by freeze drying thus lyophilized royal jelly can be stored for a longer duration at room temperature and used for further chronic in vivo study.

Acknowledgements

The authors gratefully acknowledge the University Grant Commission, New Delhi Govt. of India for financial support and The Principal of the Y.B. Chavan College of Pharmacy, Aurangabad, India, for providing all the necessary facilities.

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