Royal Jelly: Collection and Processing

Prepared by CBRTI, KVIC
Commercial production and processing of Royal jelly

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World scenario
Royal jelly production technique was mainly developed in Japan during the 1940s. One must always remember that this country is still the highest royal jelly importing country with more than 400 metric tons per year. Then, with the cost of labour getting higher and higher, the Japanese trained and settled beekeepers in Taiwan. Royal jelly production is over 350 metric tons per year in Taiwan. It is the second world producer after China, which produces over 600 metric tons a year under similar working conditions. Half the production is exported to Japan and Europe; the rest is eaten locally. The royal jelly from Taiwan is said to be of a better quality than that produced in China or Thailand. It is sold for twice the price on the world market. The Taiwanese are now facing the same situation as the Japanese of 50 years ago and are now creating production units in China and Thailand for similar reasons. That is why Mr. Chen, one of the Asian royal jelly tycoons, has transported 600 complete hives by air from Taiwan to the North of Thailand. That was done for the very first time. From this embryonic bee-farm a 2000 colony royal jelly production unit was created, which uses the same methods and techniques as used by Taiwanese.

The average bee farm is comprised of only 200 up to 250 hives. The average harvest amounts to 600 kg kilograms of Royal jelly per season. In Tiwan Every day for nine months, one-third of the stock is worked on for grafting and royal jelly harvesting. Three or four bars containing 34 plastic cells are introduced into each hive. The transfer of the two-day-old larvae is made with a bamboo pin. About 1700 larvae are grafted per hour and per head. Three days later, the royal jelly is collected with small bamboo spoons. The royal jelly is harvested and stored in freezers before being sent to Japan or Europe. Another three days later, this very apiary will undergo the same operation again. Average 400mg royal jelly is
collected from one cell. About 2 kg royal jelly is produced from and apiary consist of 50 to 60 hives.

**Introduction**

Royal Jelly is a viscid, pearly white cohesive substance. It is a complex mixture of nutritious material. It was known that royal jelly is secreted by the hypopharyngeal glands of young worker bees. But real fact is that royal jelly is a mixture of honey and secretions from Hypopharyngeal glands and Mandibular glands of worker bees. Bees use Royal jelly to feed young larvae and the adult queen bee.

Royal jelly is produced commercially by stimulating colonies to produce queen bees outside the conditions in which they would naturally do so (swarming and queen replacement). The larvae in the queen cells are continuously fed by royal jelly. Maximum quantity of royal jelly accumulates in the queen cell at the age of 5 days larvae. In this situation harvesting of royal jelly becomes possible before it is consumed. It requires minimum investment but is only possible with movable comb hives. For grafting larvae expert personnel are required, who are able to devote considerably more time than is commonly required for the production of other bee products.

**Production Techniques**

A well-managed hive during a season of 5-6 months can produce approximately 900 gm of royal jelly. The most rational and economic methods for large scale production are variations of the Doolittle method of queen rearing. Usually, the starter colony is omitted and cell cups, with transferred larvae, are directly introduced into the finisher colonies. Strong queen right colonies are preferred.

**Requirements**

- The basic requirements are movable comb hives, Colony strength on 6/10 frames with over population of nurse bees with abundant pollen availability.
Artificial queen cell cups preferably food grade plastic fixed on bars are used for grafting of larvae. The inner surface of plastic cups is 10 mm diameter and 15 mm height.

Other tools required are transfer needle, a spoon or suction device to remove royal jelly, dark glass vials and a refrigerator.

Special hive modifications may be used for large scale production like insertion of feeder. Feeding with sugar syrup (1:1 in sugar/water) increases cell acceptance, even when flowers are available.

The commercial production of royal jelly requires a methodical approach, good organization and precise timing. Constant attendance is essential. Royal jelly production requires expertise and patience and demands considerably more time than is commonly required for the production of other bee products. Bee colonies can be utilized for royal jelly production in off season for honey flow.

**Procedure**

Transfer two days old larvae to queen cell cups attached to the bar of the queen cell frame. Each queen cell frame may contain 30 to 90 cells. Care should be taken while grafting the larvae neither the larvae position changed nor injured.
- Insert the grafted frame in strong queen right colonies in the centre near the open brood as soon as possible, so the bees attend the frame soon.
- Feed with sugar syrup (1:1 in sugar/water) to increases cell acceptance.
- Remove the frames with the grafted cells After 3 days (72 hr) are removed for harvesting.
- Open, narrow part of the cells is cut to facilitate and speed up collection.
- Remove the larvae with a pair of soft forceps, taking care not to harm them and contaminate the jelly
- Extract royal jelly by emptying each cell with a small spatula or by sucking device.
- The cells are immediately ready for another rearing cycle.
- The royal jelly must be filtered using a fine nylon net (nylon stockings are excellent) to eliminate fragments of wax and larvae. Metal filters should not be used.
- The jelly should be placed into dark glass vials or food-grade plastic containers, avoiding any excessive exposure to air.
- It should be refrigerated immediately.
- Any material or equipment contacting royal jelly- including hands-must be clean and disinfected using heat or pure alcohol.
Individual queen cells should not contain less than 200 mg of royal jelly. Low cell content means that there are too many cells for the colony or that the colony is not in a condition to provide more royal jelly. There are racial differences in productivity and specially selected strains can be obtained. In the first cycle acceptance rate is low but increases in further cycles. Acceptance rate should be 60 to 80 percent less than 60 percent is not rational. The Acceptance rate and the royal jelly yields are higher in early winter and winter. These techniques are suitable for both small and quite large entrepreneurs. Depending on the intended market, the approach can be either one of low cost or one in which all collecting, processing and distribution takes place in highly controlled environments.

**Storage Processing**

Since the product is perishable, producers must have immediate access to proper cold storage (e.g. a household refrigerator or freezer) in which the royal jelly is stored until it is sold or conveyed to a collection centre. Royal jelly has a limited shelf-life. Early beliefs in the extreme instability of royal jelly activity, based on the alleged rapid loss of the “queen determination” factor have not been confirmed. Since neither the mode of activity nor the actual effects of royal jelly are known, there are no data available on changes in its biological effectiveness on human after long term storage.

Information is, however, available on changes in composition due to long term storage, such as a higher acid titre, a large insoluble protein fraction, less free amino acids, less glucose oxidise and others. Such changes make it appear likely that also biological activity is influenced by storage. Refrigeration and freezing delay and reduce the chemical changes.

On the basis of the above factors we can conclude that refrigeration of royal jelly at 0-to 5°C is a minimum precaution. Still better is storage, whenever possible, at temperatures below -17°C, which is attainable in most household freezers. Since royal jelly is an emulsified product and not cellular tissue, freezing presents no particular problem and common household freezers can be used.

As there are no criteria for establishing “safety” limits for product activity, storage and shelf-life should be kept as brief as possible. For products sold in Europe, the average recommended storage time after production is 18 months under refrigeration. For products
stored at -170°C, Shelf-life can be extended to 24 months. After defrosting and packaging, the product should not be stored in a refrigerator for more than 12 months. To increase the shelf-life, royal jelly is dried at –40 to -80°C in Freeze dryer. At -80°C with the help of vacuum pump water molecules are removed. Dried royal jelly is powdered and packed in airtight bottles. Freeze-dried royal jelly and royal jelly based products are generally stored at room temperature, sometimes for several years. Freeze-dried royal jelly is certainly more stable than the fresh product, but it was reported that only during the first two months of storage at room temperature no signs were observed of any deterioration. Therefore, Freeze-dried royal jelly and powdered royal jelly based products can be stored at room temperature, but cold storage is recommended to minimize changes and products should be kept on the shelf for longer periods.

**Freeze drier**

**Fresh Royal jelly**

Like all other bee products, royal jelly has its own microbiological protection and presents few microbiological storage problems when it is in its natural state. This protection however is not absolute and certain hygiene precautions must be observed during production and storage. Hygienic working conditions and clean containers are a minimum requirement, and
airtight containers should be used to provide additional protection not only against contamination but also against oxidation.

**Composition of Royaljelly:**

The principle constituents of royal jelly are water, protein, sugars lipids and minerals. Hydroxy acids with 10 carbon atoms (10-hydroxydecenoic and 10-hydroxy-2-decenoic acid) can be found in high concentrations. They are ascribed a role as a marker component and they have also been identified as responsible for important biological activities tied to the development strategies of the colony. At present some countries like Switzerland, Bulgaria, Brazil, Japan and Uruguay have defined national standards for Royal jelly. A group of the International Honey Commission is dealing presently with royaljelly Standardisation.

**Characteristics of Royal Jelly By International Honey Commission**

- **Moisture**: 60 - 70 %
- **Protein**: 9 – 18 %
- **Lipids**: 1 - 10 %
- **Sugar**: 7 - 18 %
- **Mineral**: 0.8 - 3.0 %
- **Others**: Vitamins, Biopterin, Nucleotides, etc.

**Training**

Beekeepers need to be trained in royal jelly collection methods, so that they will be aquainted to produce royal jelly in commercial way. The Central Bee Research and Training Institute, initiated experimental production of royal jelly using *Apis mellifera* colonies at its field centres Jammu, Hadwani (Uttarakhand) and Vijayarai (Andhra Pradesh). More success rate is obtained in Vijayarai due to climate and abundant pollen availability. The situation is almost that of in Taiwan. It was found that there is a scope to produce royal jelly in Vijayarai during September to December. Two batches of training were conducted in Vijayarai to train the beekeepers in collection and preservation of royal jelly with practicals. There is scope in other states also, during the blooming period of Mustard, Coconut, Maize,
Jowar, etc. CBRTI provides training at the beekeepers apiary but minimum 10 beekeepers are ideal in a batch.

Ideal apiary at Vijayarai for Royal jelly collection

Royal jelly deposited frame removed for harvesting
Royaljelly training At Vijayarai, Andhra Pradesh