Individually quick frozen Raspberries

Agricultural Processing Brochure

South African farmers facing current economic realities are searching for new options to maintain and expand their businesses. One of the many opportunities to grow markets, turnover and profits is by adding value to farm produce. Options need to be selected carefully based on sound information and knowledge of the opportunities presenting themselves.

Please note the **Disclaimer** on page 7

Brochure content

"Raspberries are individual quick-frozen to maintain their individual identity"

Introduction

Product group: Raspberries

The raspberry plant, a member of the genus Rubus, family Rosaceae, is widely cultivated for its fruit. Together with the blackberry, it comprises the group of plants commonly called brambles. Synonyms include Raspbis, Hindberry, Bramble of Mount Ida, (Danish) Hindebar, (Dutch) Braamboss, and (German) Hindbur. Raspberries are considered as a high value crop. This can be attributed to its unique flavour, high production costs and ease of spoilage.

The crowns and roots of brambles are perennial. The thorny canes, or fruiting portions of the plants, however, are biennial, bearing in their second year and then dying. The berries grow on these 0.5 - 1 m thorny canes or "cane berries".

Raspberries are native to many parts of the world, since they are exceptionally hardy. Varieties include red, purple, and black raspberries. Commercial cultivation has been limited by the plant's vulnerability to virus diseases and by the high costs of manual harvesting. Production of berries of all types is, however, increasing in South Africa. This is largely due to the release of good commercial cultivars that have become accessible to South African growers and the expanding export market.

Product description: IQF Raspberries

Raspberries are "individually quick-frozen" to produce whole raspberries which maintain their individual identity.

The product is just right for use in muffins and other bakery products. The criteria for the selection of raspberry cultivars for freezing are as follows:

- uniformity of shape and size;
- firm texture;
- deep colour;
- rich flavour.

The quality of the end product is evaluated based on the percentage drip after thawing, maintenance of shape, colour and taste.

Process description:

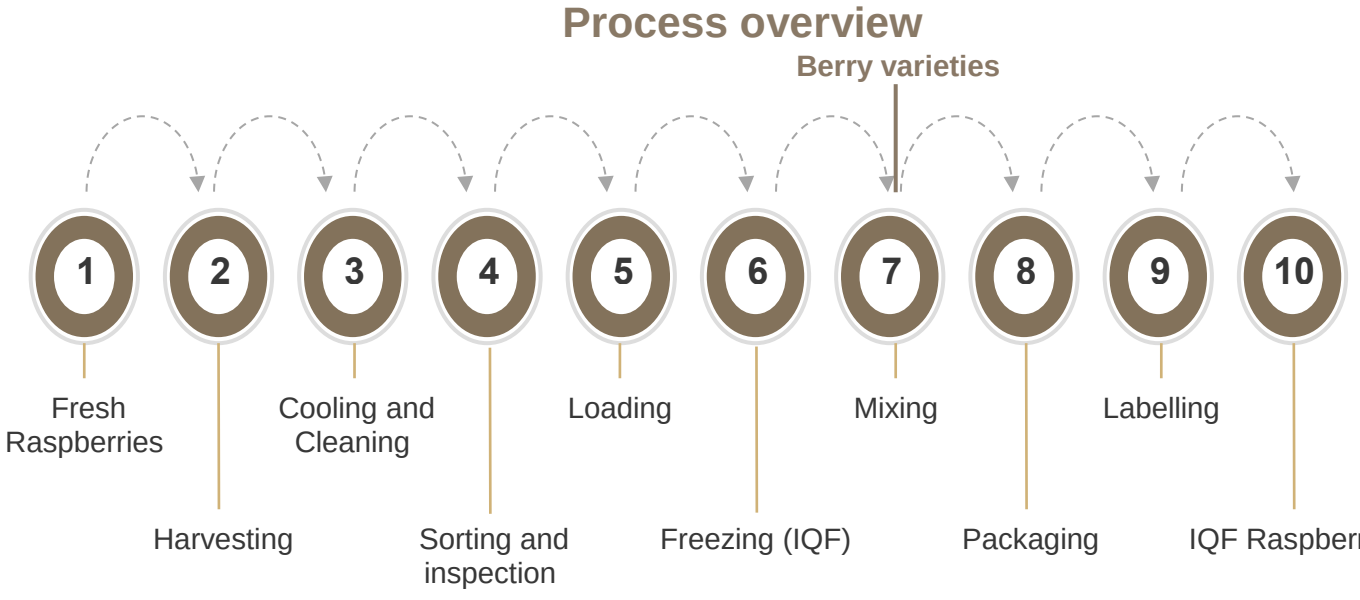
Harvesting Raspberries

The raspberries are harvested in the firm, ripe stage. The raspberries may be picked by hand and placed in flat trays for transport and/or further processing. However, with the improved cultivars that ripen more uniformly and advanced technology of harvesters, mechanical harvesting has become a more viable option for large producers and processors. To obtain maximum quality of the product, it is advisable to harvest these berries during cooler periods of the day - evening, night or early morning.

Cooling and cleaning of Raspberries

The berries must be cooled to between 0 - 5 °C as soon as possible after harvesting and kept at this temperature range until processing commences. Hydrocooling is the most effective method to achieve rapid cooling. Water has the advantage of acting as cooling, cleaning and transportation medium. The trays of berries are dumped gently into a tank containing cold, potable water (0 - 5°C) as soon as possible after harvesting and kept at this temperature range until processing commences. Hydrocooling is the most effective method to achieve rapid cooling. Water has the advantage of acting as cooling, cleaning and transportation medium.

The trays of berries are dumped gently into a tank containing cold, potable water (0 - 5°C). The water acts as cushion against any possible mechanical damage, while cooling and cleaning the berries. The berries are transported by the water via a trough or closed pipe from the tank to a vibrating, sloping riddle or screen on which it is sprayed with potable water to complete the cooling and cleaning process.



From here the clean berries are delivered to the sorting tables/belts via perforated racks/conveyors that also allow draining of cleaning water. The cleaning water may be recirculated after filtration and treatment. Although forced air-cooling can be used instead of hydrocooling, it requires additional cleaning (aspiration and screening) steps to remove foreign matter. The trays of berries are placed in a chamber where chilled air is drawn into the cold room through the trays. The temperature of the fruit must decrease to between 2 - 4 °C within 1 hour of harvesting. Berry fruits are not usually washed, unless they contain significant impurities, in which case washing is performed by passing the fruit on belts under low-pressure water sprayers.

Cleaning berries

Sorting and inspection of Raspberries

This is done to select the best suitable raw materials for manufacturing the value-added end product. The clean raspberries are spread out on sorting tables and inspected for defects. Any damaged, spoilt, immature or severely misshaped berries are removed manually.

Loading berries

Loading of berries prior to IQF (optional)

Washed berries tend to stick together in large chunks when frozen with cryogenic freezers. This can be eliminated by loading the berries onto special trays that maintain the berries in spaced relation to each other while they are being frozen. At the same time, better drainage from the berries and improved circulation of the freezing medium is achieved. This precaution is not necessary for fluidised bed air-blast freezing.

Frozen berries

Individual quick freezing of Raspberries

Individual quick freezing (IQF) preserves the intrinsic characteristic of the whole raspberries and causes less cellular damage and results in a firmer textured final product. The products can be frozen as loose pieces before packaging or in carton boxes. Prepackaging freezing is preferred because it is faster. Individual quick-freezing can be done with fluidised bed air-blast freezers or with cryogenic freezers.

- **Fluidised bed air-blast freezer**: The product is frozen with air at -30 to -40 °C that is passed at high velocity (2 - 5 m/sec) up through a 3 - 14 cm thick bed of berries contained in a trough (V) with a perforated base. The product being frozen shows turbulent movement (like a liquid - free-flowing). Products are frozen within 3 - 15 minutes. The berries may be given a thin ice glaze to minimise freezer burn and clumping during freezing. This involves wetting the berries before passing it through the pre-chilling zone of the freezer so as to freeze a thin ice layer around each berry. The glazed berries are then moved to the colder zone of the freezer to complete freezing.

> “Fluidised bed air-blast freezer: The product is frozen with air at -30 to -40 °C.”

- **Cryogenic freezers:** This involves freezing of food with liquefied or solidified gasses (refrigerants). Most common refrigerants are solid carbon dioxide and liquid nitrogen (boiling point of carbon dioxide is -79 °C and liquid nitrogen -196 °C). The refrigerant is in close contact with the food and rapidly removes energy from the food to absorb its latent heat of vaporisation or sublimation, to provide high heat transfer coefficients and rapid freezing. The choice of a refrigerant depends on the price and availability of the carbon dioxide and nitrogen. Liquid carbon dioxide is sprayed onto food to form a layer of snow on the product that evaporates (sublimates) on contact. In liquid- nitrogen freezers, packed or unpacked products are put on a perforated belt moving through a tunnel, where it is cooled by gaseous nitrogen and then frozen by liquid- nitrogen sprays. The temperature is allowed to equilibrate at the required storage temperature before it is removed from the freezer. Production rates of 45 - 1350 kg/h are possible. The use of a gaseous nitrogen freezer is advantageous because of its greater flexibility, relatively low capital costs, smaller weight losses from dehydration of the product, rapid freezing, exclusion of oxygen during freezing, low power consumption and rapid start-up and no defrost time. The main disadvantage is the relatively high cost of replenishing the refrigerant.

Mixing of frozen berries and currants (optional)

Different types of frozen berries and currants may be mixed together to produce interesting new product varieties. The combination of the various frozen berries used, depends on the end use of the product and the requirements set in Regulations regarding control over the sale of frozen fruit and frozen vegetables in the Republic of South Africa..

Packaging of individually quick frozen Raspberries

Packaging is defined as the containment of a food product in a protective barrier that prepares goods for transport, distribution, storage, retailing and end-use. The frozen berries are immediately packed into suitable containers and hermetically sealed. A great variety of packaging containers may be chosen from, provided the packaging material and seal are moisture proof and can withstand the frozen storage conditions. Suitable retail containers include polyethylene and polypropylene bags and tubs. Large quantities can be packed in drums or barrels, which can be either steel with a plastic lining or fibre drums. Cartons with a wax or plastic-lining (bag-in-box packaging) and an exterior protective over-wrap can also be used. The packaged product should be stored at around - 23 °C. Temperature fluctuations should be avoided since this reduces the storage life due to the rapid build- up of water on the internal surface to the package and subsequent clumping of the individual fruit.

Vacuum packaging would add to the preservation of the berry flavour and colour and thus extend the keeping quality of the product.

Labelling of packaging (optional)

Frozen fruit and vegetable products must be correctly labelled according to the requirements set out in the Regulations regarding control over the sale of frozen fruit and frozen vegetables in the Republic of South Africa.

Storage of frozen fruit products

The recommended storage temperature for frozen products is -18 to -20 °C. The storage life of frozen products is extended at lower storage temperatures. Temperature fluctuations reduce the storage life due to a rapid build-up of water on the internal surface of the package and an accelerated growth of ice crystals in the product and colour degradation.

Legislation for fruit products

Labelling in South Africa is controlled by legislation. Anyone who wants to use the information provided in this document must familiarise him/herself with all the applicable laws that apply to the producing, processing, manufacturing and storage of the products referred to in this document.

Other processing options

Below are other processing options not covered in this report:

- **Canned Raspberries** Red raspberry cultivars are preferred for canning. The raspberries may either be packed in water or sugar syrup. The water packed product can be used as pie fillings and toppings. The sugar syrup packed berries can be used as dessert fruit.

- **Frozen Raspberries Straight pack:** Straight pack raspberries are frozen in the container. This product is used to make fillings, toppings, syrups and soups. Yoghurt manufacturers can also use it as a fruit flavour. Fresh raspberries are crushed and pulped to a puree. Some of the fibrous matter and seeds may be removed, depending on the final use of the puree. The frozen packs are used extensively by commercial pie bakers

- **Frozen Raspberry puree** Fresh raspberries are crushed and pulped to a puree. Some of the fibrous matter and seeds may be removed, depending on the final use of the puree. The frozen packs are used extensively by commercial pie bakers.

- **Raspberry concentrate** is produced through the evaporation of raspberry puree to reduce the water content. The concentrate may be aseptically packed or frozen to extend the storage life.

- **Raspberry jam** is produced from fresh or frozen raspberries harvested at full maturity. Jam is a product that consists of whole fruit, pieces of fruit, fruit pulp or fruit puree of one or more types of fruit with fruit juice or concentrated fruit juice as an optional ingredient, and may contain permitted food additives and sweeteners.

- **Raspberry juice** may be manufactured from fresh or frozen raspberries. A wide range of juice and related products can be manufactured. Both clarified and cloudy raspberry juice can be manufactured. This report will deal with the clarified product.

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For more info visit: http://www.eskom.co.za/sites/idm/Business/Pages/Alternativefunding.aspx

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