

Individually quick frozen Blackberries

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.

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“Fresh blackberries are individually quick frozen (IQF) to give the perception of fresh fruit.”

Product group: Blackberries

The blackberry is a trailing bramble, usually spiny, of the genus *Rubus* of the *Rosaceae* (rose) family. Blackberries occur throughout the world, but commercial production is largely limited to the United States. Production of berries of all types is, however, increasing in South Africa. This is largely due to the release of commercial cultivars that have become accessible to South African growers, and the expanding export market.

The berry is a simple fruit, which is fleshy and succulent when mature and contains immersed seeds. Berry fruits are highly perishable and have a short shelf life. The edible quality is closely tied to the freshness of the fruit. For this reason, care must be taken in harvesting, storage, and marketing of fresh berries. Blackberries are best suited to processing into frozen and canned products. It is not viable to produce juice from the blackberry, as the seeds cause problems during processing and are difficult to remove.

Product description: IQF blackberries

Fresh blackberries are individually quick frozen (IQF) to produce a product that maintains its individual identity and gives the perception of "fresh fruit". This makes them ideal for use in muffins and other bakery products as well as fillings. Frozen blackberries can also be incorporated into a mixture of other IQF berries. The IQF method is best for the preservation of the cell structure, texture, colour, flavour and aroma of the berries.

Process description:

Harvesting of blackberries

The firm, ripe blackberries are picked by hand and placed in flat trays for transport and/or further processing. Unripe blackberries tend to turn red on freezing. The berries have to be processed as soon as possible after harvesting, to prevent enzyme damage and deterioration occurring.

In the past, machine harvested berries could only be used for processed products, where the integrity/shape of the fruit was not of prime importance. With the improved cultivars that ripen more uniformly and the advanced technology in harvesters, mechanical harvesting has become a viable option for large producers/processors.

Separation of blackberries (optional)

Separation involves dividing food into various fractions based on a difference in characteristics. The harvested berries are separated from any foreign materials such as sticks, stones and leaves using screens or sorting tables.

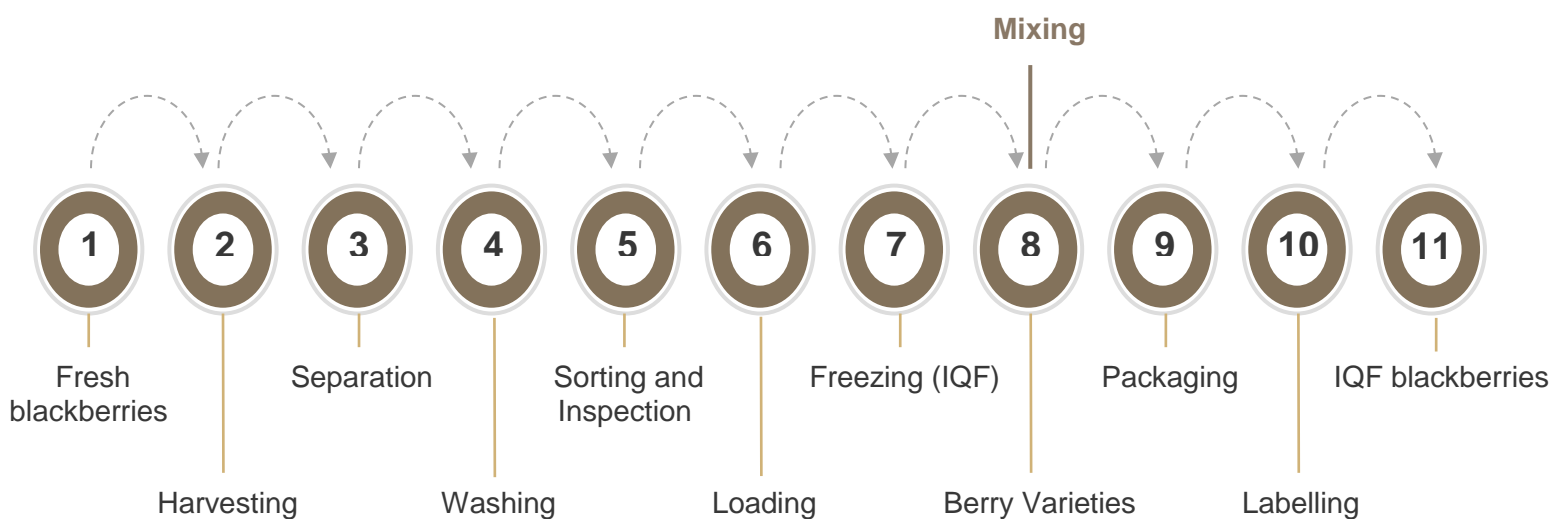
Washing of blackberries

The berries are washed in agitated or non-agitated water baths filled with potable water. Agitation is caused by pumping water through nozzles or by the mechanical action of paddles. The water may be recirculated but must be changed regularly to minimise the chance of any contamination spreading. Washing has the additional benefit of cooling the berries.

Sorting and inspection of blackberries

This is done to select the best suitable raw fruit that will result in the best quality end product. The clean blackberries are spread out on sorting tables and inspected for defects. Any damaged, spoilt, immature or misshaped berries are removed manually.

Process overview



Loading of berries prior to IQF (optional)

Washed berries tend to stick together in large chunks when frozen in cryogenic freezers. This can be eliminated by loading the berries onto special trays which spaces the berries out while they are being frozen. This also ensures better drainage for the berries and improved circulation of the freezing medium. This precaution is not necessary for fluidised bed air-blast freezing.

Individual quick freezing of berries

Individual quick freezing (IQF) preserves the intrinsic characteristic of the whole berries and causes less cellular damage - this results in a firmly textured final product compared to other techniques. 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 speed (2 - 5 m/sec) up through a 3 - 14 cm thick bed of berries contained in a trough with a perforated base. 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 them 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 onto the colder zone of the freezer to complete freezing.
- Cryogenic freezer: This process involves freezing of food with liquefied or solidified gasses (refrigerants). Most common refrigerants are solid carbon dioxide and liquid nitrogen (the boiling point of carbon dioxide is -79 °C and liquid nitrogen -196 °C). The refrigerant is in close contact with the fruit and rapidly removes heat energy from the food for 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 which evaporates 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 from 45 - 1350 kg/h are possible. A gaseous nitrogen freezer has the following benefits: greater flexibility, relative low capital costs, smaller weight losses from dehydration of the product, rapid freezing, exclusion of oxygen during freezing, low power consumption, rapid start-up and no defrost time. The main disadvantage is the relatively high operating cost linked to replenishing the refrigerant.



Loading berries.



Frozen berries

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

“Cryogenic freezer: This process involves freezing of food with liquefied or solidified gasses (refrigerants).”

Mixing of frozen berries/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 berries

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 fiber drums. Cartons with a wax or plastic-lining (bag-in-box packaging) and an exterior protective overwrap 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 of 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)

The packaging material or containers that are not pre-printed are labelled and coded with the necessary information. Various labelling and coding systems are available, depending on the type of label and container used.



Blackberries

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 blackberries** are prepared from fresh berries. The blackberries may either be packed in water or sugar syrup. The water packed product can be used as fruit fillings and toppings. The sugar syrup packed blackberries can be used as dessert fruit.
- **Frozen blackberries** are firstly packed in the retail container and then frozen (straight pack), with or without the addition of sugar. Unsweetened frozen blackberries are used in the preparation of wine and bakery fillings while the sweetened product is used as a base ingredient for making pie toppings, syrup fillings, soups and yoghurt flavouring. In-container freezing does not allow for rapid freezing as in the case of individually quick frozen (IQF) products. Slow freezing of whole berries produces a product that does not maintain its shape and individual identity. The product has considerable drip loss upon thawing.

Energy Advisory Services

Eskom's role is to aid the client with basic information in the decision making process. Thereafter the Eskom Advisor will fulfil the role of energy advisor as part of the team that the farmer selects.

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

Literature and reference sources:

- Arthley, D. & Ashurts, P.R. (eds) 1996. Fruit Processing. London: Blackie Academic & Professional.
- Falconer, S. 2003.
- SA farmers capitalise on “berried” treasure. *Farmer’s Weekly*, 28 March 2003.
- Fellows, P. 1988. Food Processing Technology: Principles and Practice. Chichester: Ellis Horwood, Ltd.
- Mallett, C.P. 1994. Frozen Food Technology. London: Chapman & Hall.
- South Africa - Agricultural Products Standards Act (No 119 of 1990) and regulations. Pretoria: Government Printers
- South African - Foodstuffs, Cosmetics and Disinfectant Act (no 54 of 1972) and regulations. Johannesburg: Lex Patria
- Woodroof, J.G. & Luh, B,S. 1986. Commercial fruit processing. 2nd ed. Connecticut: AVI Publishing co.
- Google free images: Product and other photos were sourced from google images using a filter: Modify, free to share and use commercially

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