# Individually quick frozen Black currants

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 6

## Brochure content



"Fresh black currants are individually quick frozen (IQF) to give the perception of fresh fruit."

## Introduction

### *Product group: Black currants*

Black currants are from the botanical species Ribes nigrum of the family Saxifrabaceae. They also go by the name of Quinsy berries. Black currants are in clusters with every single fruit attached to the main stem.

The fruit has a black skin, green flesh and the seed is enclosed in a fleshy pericarp. The strong flavour and high acidity of black currants make them unacceptable for fresh consumption, and they are mainly processed into canned, pulped or frozen fruit.

Production of berries in general is 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.

Berry fruits are highly perishable and have a short shelf life. Thus, edible quality is closely tied to freshness of the fruit. For this reason, care must be taken in the harvesting, storage, and marketing of fresh berries.

### *Product description: IQF black currant*

Fresh black currants are individually quick frozen (IQF) to produce a product that maintains its individual identity and gives the perception of "fresh fruit". This makes it ideal for inclusion into muffins and other bakery products as well as fillings.

Frozen black currants can also be incorporated into a mixture of other IQF berries/currants. The IQF method is used since it preserves the cell structure, texture, colour, flavour and aroma of the currants best.

## Process description:

### *Harvesting of currants*

The firm, ripe currants are picked by hand and placed in flat trays for transport to the processing site. In the past, machine harvested currants could only be used for products where the integrity/shape of the fruit was not of prime importance. The currants had to be processed as soon as possible after harvesting; otherwise enzyme damage and deterioration occurred.

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.

### *Cooling and cleaning of currants*

The currants must be cooled to between 0 - 5 °C as soon as possible after harvest and kept in this temperature range until processing starts.

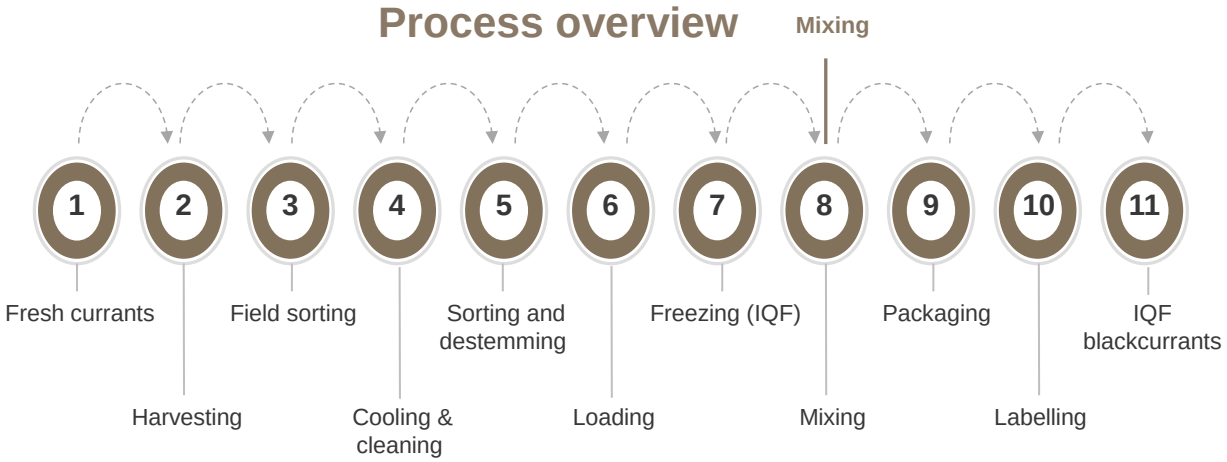
Hydrocooling is the most effective method to achieve rapid cooling. Hydrocooling uses cold water to cool, clean and transport the currants. The trays of freshly harvested currants are dumped gently into a tank containing cold, potable water (0 - 5 °C). The water cushions the currants against possible mechanical damage. The currants flow via a trough or closed pipe to a vibrating, sloping riddle or screen where the currants are sprayed with potable water to complete the cooling and cleaning process. From here the clean currants are delivered to the sorting tables/belts via perforated racks/conveyors that also allow for draining of cleaning water. The cleaning water may be reused 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 currants 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.

### *Sorting and destemming of currants*

From here the clean currants are delivered to the sorting tables/belts via perforated racks/conveyors that also allow draining of water. Sorters remove all the damaged, spoilt and immature currants along with foreign matter.

Destemming can be done manually or mechanically. Soft rubber-coated rollers perform mechanical destemming.



## *Loading of currants on trays for IQF (optional)*

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

## *Individual quick freezing of currants*

Individual quick freezing (IQF) preserves the intrinsic characteristic of whole currants 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. Pre-packaging 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 currants 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 currants may be given a thin ice glaze to minimise freezer burn and clumping during freezing. This involves wetting the currants before passing them through the pre-chilling zone of the freezer so as to freeze a thin ice layer around each currant. The glazed currants are then moved into the colder zone of the freezer to complete freezing.

- Cryogenic freezers: This involves freezing of food with liquified 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 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. The use of a gaseous nitrogen freezer is advantageous because of its greater flexibility, relative 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.

*Loading currants*

*Frozen currants*

> “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, R727/1998.*

## *Packaging of individually quick frozen currants*

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 frozen fruit and vegetable products*

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. Please also refer to the disclaimer on the last page.

## *Other processing options*

Listed below are other processing options for blackcurrants not covered in this report, but available from Eskom.

- **Black currant jam** is defined as the product that consists of whole fruit, pieces of fruit or fruit pulp that is cooked with sugar until syrup with the desired solids content is formed. Upon cooling it becomes a soft gel. Blackcurrant jam is produced from fresh or frozen blackcurrants harvested at the mature ripe stage to ensure maximum flavour, colour and pectin development
- **Black currant jelly** is produced by concentrating and gelling unsweetened blackcurrant juice or syrup. It is served as a condiment with various meat dishes.
- **Black currant juice** is the crushed and pasteurised liquid derived from fresh or frozen blackcurrants which can be used as a beverage or in sauces, flavourings and fillings.
- **Canned black currants** are prepared from fresh, ripe currants. The currants 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 currants can be used as dessert fruit.

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

***Literature and reference sources:***


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