



Product characteristics for dried mangoes

The quality, taste and texture of dried mangoes can vary a lot depending on the mango variety, the use of preservatives and sugar levels. Dried mangoes from West Africa have a good taste, which is a good opportunity. However, the drying technique needs more sophistication in order to compete with Asian producers.

This module gives an overview of the:

1. Types of dried mangoes in the EU market
2. Product quality and health properties
3. Packaging

1. Types of dried mangoes in the EU market

There are three main types that can be distinguished:

1. **Sweetened dried mangoes.** These can be slices, chunks, diced pieces or granules that are made by soaking mango pieces in water with sugar (syrup) for some time. Afterwards they have been dried, the residual moisture content ranges between 10 - 15%. The pieces remain fairly soft but lose much of their flavour as they are highly enriched with sugar.

They represent an estimated 35% of EU imports of dried mangoes (see figure 1). Major producing and exporting countries are Thailand and Philippines and the mangoes used are different Asian varieties such as Nam Dock, Sindhri, Chausa etc.

Sweetened mangoes are mainly sold in large quantities to food processors and are primarily intended for mixtures of dried fruit, breakfast cereals, energy bars and other industrial applications.

2. **Conventional dried mangoes** with sulphite and preservatives to ensure a longer shelf life. These can be slices, thin crisps or chunks that are naturally sweet, as they are dryer than sweetened dried mangoes. The texture is tougher depending on the drying technique and the mango variety. The pieces are homogeneous and can be kept for 6 - 12 months.

This type is sometimes referred to as 'conventional' dried mangoes. They are mainly produced in Asia, Latin America and in South Africa and represent an estimated 50% of EU imports of dried mangoes. The dried mangoes from Africa are mainly the Kent and Keitt varieties and - to a lesser extent - Tommy Atkins, which are more fibrous.

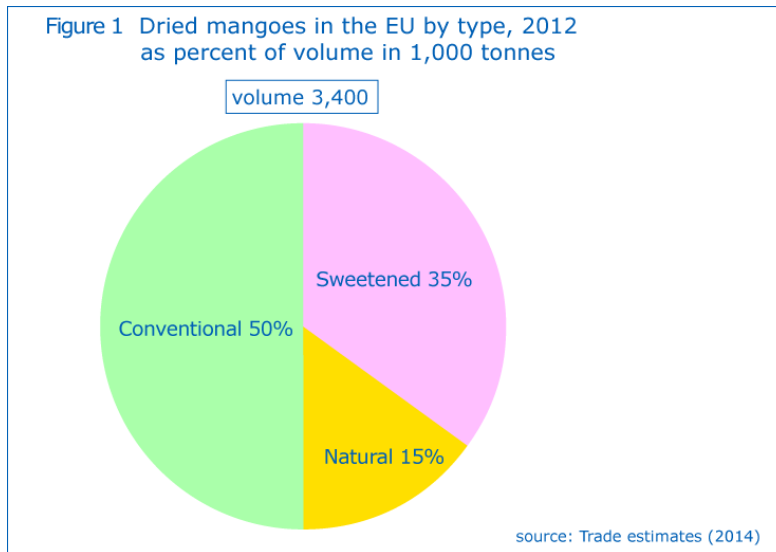
The residual moisture content of 14 - 18% does not give stickiness to the dried mangoes, which is often a critical issue in dried fruit. In addition, the flavour and aroma of conventional dried mangoes are more intense than sweetened dried mangoes. They are mainly used in food processing for the production of breakfast cereals (muesli) or energy bars as a natural sugar substitute. They can also be found in super/hypermarkets, green grocers, delicatessen stores or ethnic stores where they are sold as a snack in consumer packs or in loose form.



Sweetened dried



Conventional dried with additives



3. **Natural dried mangoes** are primarily sold as a snack. They are preservative-free, unsulphured, have no added sugar, dyes or other additives and are made with mangoes from certified organic farms or from Fair trade farms.

The production is usually on a small scale in developing countries by cooperatives or by families in rural areas and they are mainly sold direct to Fair trade or organic shops, or indirectly via specialised health food importers. The growth of the organic market presents good opportunities for West African exporters. However, more competition can be expected from larger companies in Asia or EU importers who increasingly target conscious consumers or dieters and also introduce natural dried mangoes.

They can be (naturally) sun dried or air-dried. Depending on the drying technique, the mango slices are often different in terms of shape, colour and quality. Because they are a more natural product, their conservation time is shorter than the other types. The original taste of the mango is much stronger and they are less sweet but tougher than the other types. Sometimes their appearance is sticky which makes them less attractive to some consumers.

Natural dried mangoes accounted for approximately 15% of EU imports in 2012. They mainly come from West African countries. Varieties processed are mainly Amélie, Keitt, Kent or Brooks, which is slightly sweeter than the other varieties.



Natural dried mangoes

2. Product quality and health properties

The taste of dried mangoes ranges from fresh/sweet to very sweet where much of the original mango taste is lost. The taste, softness and stickiness highly depend on the production technique, slice thickness and their intended use - as an ingredient or snack.

Production techniques

Conventional and natural dried mangoes are made from juicy sun-ripened mangoes from owners' orchards, nearby growers, or from organic/Fair trade farms. Afterwards, the following steps are involved to produce the dried mangoes:

- **Cleaning and cutting.** The mangoes are cleaned and cut into flat slices, thin crisps, in cubes or in chunks and then put into a dehydrator where

they lose their excess moisture. It is important that the slices or pieces are not too thick or too thin. A rubbery texture is often preferred. If the slices are too thin, it might turn out crispy and not rubbery.

- **Arrange on a frame.** The slices are arranged on a drying frame consisting of a nylon mesh over a large metal screen, which is supported by a wooden frame (0.75 cm x 1 m).
- **Some pre-treatment** to the slices is done, so that the vitamins will not be lost along with the water content that is being extracted out of the fresh mangoes.
- **Water extraction.** Dehydrator machines or cabinet dryers are usually shaped like an oven with several trays that are stacked on to each other. Water extraction is done slowly inside the machine with heat as its driving force, thus resulting in evenly dried pieces of fruits.
- **Dehydration techniques.** The most common drying techniques are traditional sun drying and air-drying by ovens, which is common in West African countries. Other drying techniques are tunnel dehydration or vacuum drying. Osmotic dehydration is a new technique and suitable for larger quantities. This is often done in Asian countries.
- **The drying process** starts with a temperature of 80°C and the oven temperature is slowly reduced to 65°C after 8-12 hours.
- **Control of moisture content and the humidity** of the drying air is essential. Even if the temperature is high, the drying of the mango slices is often not uniform with some slices too dry or too dark. In addition, the texture of slices can be inconsistent with some too firm.
- **Preservation.** After dehydration, the *natural dried mangoes* are covered with a thin layer of oil made from rice bran. This is done to preserve all the useful properties of the product and to make the dried mangoes look attractive and appetizing. *Conventional dried mangoes* use preservatives and additives.
- **Packing and storage.** Afterwards, the dried mangoes are packed in large vacuum bags and stored properly under temperatures, which are not too high. The packing must be done within 2 days before the slices start to darken.

Sweetened mangoes are dried by dipping mango slices (6 – 8 mm) for 18 hr (ratio 1:1) in a solution containing 40° Brix sugar, 3000 ppm SO₂, 0.2% ascorbic acid and 1% citric acid. This method is described as producing the best dehydrated product. Drying is achieved using an electric cabinet through flow dryer operated at 60°C. The product shows no browning after 1 year of storage.

Colour and softness

The colour of the dried mango plays a crucial role in the consumers' buying decision. People prefer the yellow/light brown colour of the mango and associate the dark brown colour with the dried mango being too old. The same applies to the hardness of the mango slices. If they are too tough or chewy, even if they can be made softer in hot water, consumers are likely to find them unattractive.

Health properties of dried mangoes

Dried mango slices have more calories than fresh mango. They are a good source of vitamins (A, B and D) and they can:

- Vitalize a person's eyesight, immune system, digestion and cognitive function.
- Satisfy hunger pangs by slowing digestion and preventing blood sugar spikes, which leave people feeling tired and hungry.



Arrange on frame



Drying process



Packing in large volume bags

- Help people to keep 'regular' (1/2 cup serving = 3.7 gram of dietary fibre). Their dietary fibres can help with weight-loss as part of a balanced diet and regular exercise programme.
 - Be consumed for endurance exercising due to the antioxidant Quercetin.
- Dried mangoes are also a good source of minerals (calcium, iron and phosphorus). The health benefits of dried mango are numerous and recently some studies showed that eating a few slices per day strengthens the heart muscle, helps to normalize sleep, and prevents different kinds of cancer, in particular those related to the reproductive system. These benefits are a great help in working out your USP (Unique Selling Proposition) to buyers.

3. Packaging

Broadly speaking, two main kinds of packaging can be distinguished:

Bulk packaging which is to importers/wholesalers or food processors. The dried mangoes are most often in the form of thin and long strips, packed in (vacuum) plastic bags of 2 kg or 5 kg (e.g. from Thailand) or in bags of 2.5 kg (South Africa). The plastic bags are usually transported in carton boxes.

More information about labelling on the plastic bags can be found in the Module 'Buyer requirements for dried mangoes'.

Consumer packaging for dried mangoes sold as a snack which can be done by the West African exporter or the importer/packer in Europe. There are many variations with small plastic/foil bags or pouches being most common. The weight of dried mango packs varies from 60 to 200g. This can be coloured single/share/family bags or transparent bags, showing the product, and with a cardboard strip of cardboard on top with the necessary explanation. For example, the product name, its origin, addresses of the production unit or of the importer and other useful information (brand, ingredients etc.). Resealable bags are more common to keep the dried mangoes fresher for longer. This helps consumers to portion the dried mangoes instead of throwing them away. More clever packaging will definitely boost your products' green credentials through helping to combat food waste.

Dried mangoes are also sold loose in transparent plastic boxes or cases (see photo below-right).



Bulk package 5 kg (Thailand)



Bulk package - bags packed in boxes



Foil bag with carton cover



Resealable sharing pack



Loose sales to consumer by weight (in plastic box)

This survey was compiled for CBI by **Searce** in collaboration with Pierre Gerbaud

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