Potato Chips (GB: Crisps)
Systems

(Potato) Chips (GB: Crisps), A Product Description

Definition

Chips are thin potato slices that are fried while floating in hot oil. The raw potato slices are fried until they have reached a moisture content of approx. 2 per cent.

Quality-relevant factors

colour
flavour
texture/consistency
crispness
oil content

Colour

The colour is determined by the content of reducing sugars in the potatoes. Potatoes with a low content of reducing sugars provide for a good-looking golden quality. You will get dark-brown chips if the content of reducing sugars in the potatoes is too high. As to colour and taste, such products are not acceptable. Therefore, one should not process potatoe sorts with a sugar content exceeding 0.5 per cent. A good-looking quality can only be realised from potatoes with a low content of reducing sugars (<0.25 per cent).

Taste

The taste of the potato chips will also be influenced by the applied vegetable oil as well as by spicing (paprika, salt, garlic etc.).
The taste can likewise be affected by too high an oil content. If the potatoes have a very high dry matter content and are cut as smoothly as possible, they will absorb less oil.

Texture/Consistency

The sort features of the potatoes affect the consistency of the chips.

Crispness

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Crispness is attained by the evaporation of water during the frying process. It can be affected by insufficient packing and long storage times.

Sorting and peeling of potatoes for the chips production

Sorting

Normally preference is given to the sorting size of 40 - 60 mm (minimum potato diameter). Smaller potatoes enhance waste peeling, bigger ones result in too big slices which are liable to breaking easily and bring about more difficulties in packing.

Peeling

As a rule, peeling is done by means of carborundum machines, because, for instance, steam peeling might cause an inconvenient cooking fringe around the potatoes. The potatoes are peeled in a very superficial way so that the peeling waste will amount to some 6 - 10 per cent only. During the subsequent inspection only foul and bad potatoes will have to be sorted out, in the majority of cases.

DORNOW supplies discontinuously working batch peelers and continuous roller peeling machines that can be operated without water/waste water, which can save a lot of costs.

Cutting and washing the slices

The waste from cutting and washing depends on the cutting size, the consistency and structure of the raw potatoes. One has to reckon with 6 per cent or more.

Cutting

A smooth cut is required, with a cutting size of between 1.2 and appr. 2.5 - 3.0 mm for each slice. Thicker slices are likely to break less frequently and will absorb less oil. The potato chips (GB: crisps) produced in batch fryers are normally cut thicker. These thick cut potato chips („hand made“ chips) have already gained great popularity in the USA and in the UK.

Washing

After the cutting the slices are thoroughly washed in order to remove the starch that becomes disengaged. Starch affects the oil.

Drying and frying of (potato) chips

Drying

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Before being fried, the washed chip slices ought to be drained off carefully or, in centrifuges, be freed from the adherent water, as dry slices fry better and faster. The frying fat can go bad more rapidly by too wet material.

Frying

The (potato) chips are fried, at temperatures between approx. 140 - 180 degrees centigrade, in DORNOW batch ovens (big fryers)or in continuous fryers, after removing the wash water. The frying time will depend largely on the moisture content of the potatoes and on the wash water still adherent to them. Generally it takes some 2 to 3 minutes. In a batch oven the frying process ends as soon as the foaming on the surface of the oil has stopped.

To avoid a too intense brown colouring of the slices in some of the potato sorts, one can also fry, if necessary, at a lower temperature. The proportion between the oil and the weight of the raw slices should be 20:1. It is preferable to carry out frying tests with every fresh supply of potatoes for the purpose of studying the consistency of the material.

Salt and flavouring

After draining off the adherent oil and removing the bad-looking slices one can add salt (1.5 kg - 2 kg for each 100 kg of chips) or other spices like paprika, onion, cheese, „barbecue“ etc. to the still warm products.
The spices, especially salt, must not contain moisture.

Oil and oil sorts

Peanut oil is preferably used, but also maize and cotton seed oil.

It is easily possible that in the oil a hydrolysis process starts (decomposition of the fat to free fatty acids and glycerine), caused by an overheating of the oil and water adherent to the slices. The content of free fatty acids in a good oil should not exceed 0.05 to 0.1 per cent.
A daily cleaning of the oil is indispensable.

Cooling

The cooling of the (potato) chips is done on special cooling conveyor belts. The thin slices cool down pretty fast.

Packing

If vacuum-packed the chips will remain crispy at least for 6 weeks. The packages should be double-walled and put in cartons after filling.

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Requirements for the raw material

Potato sorts

The potatoes should preferably be equally shaped and - as already mentioned - be purchased in sorting sizes of between 40 and 60 mm.

The dry matter content (part of solid matter) should be as high as possible.

In Germany and Holland the „Saturna“ sort is preferably used.

Other sorts are suitable, too. By means of laboratory equipment* one can check the suitability on a small scale. - Attention, if you have little experience with raw material: never buy big quantities - the properties of the potatoes can change during storage!

Growing and fertilizing

Early growing (planting) with pre-germinated potatoes has proved good for the dry matter content of the gathered products.

The type of soil, too, influences the quality of potatoes. Loamy soil will have an especially favourable effect as regards a high dry matter content.

Nitrogenous fertilizer and also intense potash fertilization have proved inappropriate as to the dry matter content, in contrast, however, to phosphate fertilization.

In order to receive, if possible, an equal potato quality with every harvest brought in, potatoes are often cropped on a contractual basis. The farmer has to abide by certain rules, determined by contract, regarding cultivation, growth and harvest.

* = DORNOW supplies the machinery

Sugar content

The sugar content of the potatoes is supposed to be as low as possible. It depends primarily on the sort. But also the storage can, under certain unfavourable circumstances, contribute to a higher sugar content. A given potato sort which has shown good properties for some time after the harvest, can, at the end of the storage time, lose its quality in such a way that it is no longer suitable for the production of chips.

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Reaping

The harvest of the chips potatoes should not take place until they have completely grown ripe.

It will have a positive effect if the leaves of the potato plant slowly wither so that the nutritive substances from the leaves can go back into the potatoes.

Storage

The storage temperature should be fixed between 8 and 12 degrees centigrade. Germicides prevent the potatoes from germinating at these temperatures.

It will have a positive effect to increase the storage temperature to 20 degrees centigrade some two or three weeks before processing. This causes the retrogression of the superfluous sugar.

Ordinary composition of the (potato) chips (approximate values)

Moisture:	2.0 %
Fat:	42.1 %
Raw protein:	5.0 %
Ashes:	3.5 %
Crude fibre:	3.2 %
Carbohydrates:	44.2 %

Produce of related stock

Potato sticks (potato strips, cross-section about 5 x 5 mm with a length of approx. 40-50 mm) can be compared with chips and produced in a similar way.

A list of interesting articles and essays regarding the topics of the preparation and processing of tubers and vegetables and associated specialist areas can be found at our Internet site at www.dornow.de, Treatises.

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For more information: www.dornow.de

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