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(54) Title: Flakes of starchy material

(57) Abstract:

Flakes consisting of fragments of a film obtained by drying on a drum of a puree of cooked tubers of yam, plantain and/or roots of cassava. The film weighs from 1.0 to 1.7g/dm². Most of the flakes are between 0.3 and 3mm in size. They have a bulk density of 350 to 550 g/l. They may be reconstituted by mixing with luke-warm water in a quantity of one volume flakes to one volume water. Simple kneading of this pasty mixture with the palm of the hand gives it the smooth appearance and elastic texture of traditional foutou.



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1 This invention relates to flakes of starchy material
consisting of fragments of a film obtained by drying a
puree of the cooked starchy material on a drum.

5 The invention also relates to a process for the pro-
duction of flakes of starchy material, in which tubers,
fruit and/or roots of a starchy plant are cleaned, trimmed,
peeled, cut up, cooked, reduced to puree, the resulting
puree is dried on a drum, a film of the dried puree is re-
moved from the drum and reduced to fragments.

10 The yam plays an important part in the feeding of native
populations of Africa in particular. In the popular dish
known locally as "foutou" or "iyan", the yam is eaten fresh
after having been cooked and pounded for a considerable
length of time.

15 However, the yam is a seasonal plant of which the
tissues and the starch degrade quickly in storage. It is
for this reason that another popular dish known locally as
"amala", which is a yam flour reconstituted in boiling water,
enables these tubers to be eaten for a longer part of the
20 year. Now, the traditional small-scale process for producing
this flour does not effectively utilize the tuber and in-
volves high losses of starting material. In addition, the
texture of the reconstituted product is too gummy.

25 It is for this reason that various researchers have
attempted, and described their efforts, to adapt recent
processes for the production of potato flakes to the pro-
duction of yam flakes with a view to enabling dishes similar
to foutou to be prepared rapidly or instantaneously by recon-
stitution with hot water and, optionally, pounding using a
30 pestle or kneading by hand. This attempted adaptation has
come up against problems of sticking encountered either
during production, particularly at the drying stage, or

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1 during reconstitution.

However, a recent product which enables these problems to be overcome while assuring easy reconstitution is described in European patent EP 141 977. This patent proposes
5 a dry starchy cake, particularly of yam, plantain and/or cassava, in a water-permeable bag. The bag is filled to approximately three quarters of its volume with granules of dry, compacted starchy flakes. To reconstitute the cake, the bag is immersed in cold water, brought to the boil,
10 left to simmer for fifteen minutes and the cake subsequently removed from the bag. The reconstituted cake assumes the shape of the expanded bag. It has a smooth appearance both to look at and to cut, its consistency is elastic, i.e. flexible and soft like that of traditional foutou.

15 Nevertheless, the process for producing this dry starchy cake in a water-permeable bag described in EP 141 977 is relatively complicated. This is because, compared with a process for the production of flakes by drying a puree of starchy material on a drum, it comprises an essential
20 additional step of compacting the flakes, an additional granulation step and filling of water-permeable bags.

The object of the present invention is to provide flakes of a starchy material, particularly yam, plantain and/or cassava, which may also readily be constituted in the form
25 of a product similar to traditional foutou, but which are considerably easier to produce than the dry starchy cake mentioned above.

To this end, the flakes of starchy material according to the present invention are characterized in that they consist of fragments of a film weighing from 1.0 to 1.7 g/dm²,
30 of which 80% are between 0.3 and 3 mm in size, and have a bulk density of 350 to 550 g/l.

Similarly, the process for producing the starchy flakes according to the invention is characterized in that the puree
35 is dried on a drum so that the film of dried puree weighs

1 from 1.0 to 1.7 g/dm² and the film removed from the drum is
reduced to fragments or flakes of which 80% are between 0.3
and 3 mm in size and which have a bulk density of 350 to 550
g/l.

5 The starchy material mentioned is preferably yam. Out
of the yam season, it may be replaced with advantage by plan-
tain and/or cassava.

It has been found that flakes having the characteristics
described above provide for the particularly easy preparation
10 of a product similar to traditional foutou. The flakes may
be reconstituted in particular by mixing with lukewarm water
in a quantity of one volume flakes to one volume water.
Accordingly, reconstitution does not involve the slightest
problem of dosage, irrespective of the container used. In
15 addition, an elastic texture similar to that of traditional
foutou may readily be obtained simply by kneading the mixture
of flakes and lukewarm water with the palm of the hand for
example.

The process for producing these flakes is much simpler
20 to carry out than the process for producing the dry starchy
cake mentioned above and does not suffer from the drawbacks
caused by sticky texture encountered in the prior art. It
may be assumed that these drawbacks are overcome by virtue
of the relatively heavy weight of the film produced on the
25 drying drum. This relatively heavy weight and a precise,
but easy-to-obtain granulometry together with a bulk density
which is also relatively high are thus the essential elements
which, surprisingly, are sufficient to achieve the objective
on which the invention is based.

30 Accordingly, the flakes according to the present inven-
tion consist of fragments of a film of starchy puree dried
on a drum having a weight of 1.0 to 1.7 g/dm². Most of the
flakes are between 0.3 and 3 mm in size and have a bulk den-
sity of 350 to 550 g/l. If these characteristics are not
35 observed, i.e. if the weight of the film is below 1.0 g/dm²

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1 or above 1.7 g/dm² and/or if too high a percentage of the
flakes are smaller than 0.3 mm or larger than 3 mm in size
and/or if the bulk density of the flakes is below 350 g/l
or above 550 g/l, the flakes cannot be reconstituted as
5 easily and there is a risk of sticky texture problems
arising.

The starting material used to carry out the process
according to the invention preferably consists of fresh yam
tubers of any origin. These fresh tubers generally have
10 a relatively high dry matter content of around 32 to 35%.
Extreme values of as low as around 28% or as high as around
42% may be encountered. The process according to the inven-
tion may readily be carried out with any of these tubers,
including those which have the lowest dry matter content and
15 which are the most difficult to treat by traditional methods.

The process according to the invention may also be
carried out using plantain and/or cassava roots which, on
their own or in admixture, form a recommended and adequate
substitute for yam out of the yam season.

20 The steps of cleaning, trimming, peeling and cutting up
are well known to the person skilled in the art and do not
present any particular problems. However, peeling with steam
is preferred to peeling with lye. It is also preferred,
optionally after the tubers, fruits or roots have been pre-cut
25 into pieces the size of a large potato for example, to peel
them and then cut them into slices 1 to 2 cm thick.

After they have been peeled and cut up, the tubers,
fruits or roots may be cooked in boiling water or in steam
for example. In one preferred embodiment of the process,
30 the tubers, fruits or roots are cooked with steam at atmos-
pheric pressure for 25 to 50 minutes. This cooking step may
be carried out continuously, for example in a perforated
conveyor belt cooker on which the slices are arranged in a
relatively thin layer, for example between 5 and 20 cm thick,
35 in order to ensure uniformity of the steam treatment.

1 The cooked tubers, fruits or roots may be reduced to
puree, for example in a traditional puree press, in which
the cooked pieces are pressed through a plate formed with
5 holes approximately 5 to 10 mm in diameter or slots approx-
imately 8 mm long having a total open area of approximately
40 to 60%.

 The puree may then be dried on a drum by disposing it
in the sump of a traditional two-drum dryer or in the dis-
tribution trough of a traditional single-drum dryer equipped
10 with several satellites. It is recommended to use a single-
drum dryer equipped with four or five satellites which fac-
ilitate the deposition of a sufficiently thick film of puree
on the drum. In one preferred embodiment of the process
according to the invention, which is particularly suitable
15 for imparting the desired properties to the film and to
the flakes, the puree is dried on a drum rotating at a speed
of 2 to 6 revolutions per minute and heated by steam at 3 -
10 bar to a residual moisture content of 4 to 15%

 The dry film detached from the drum by a scraper blade
20 may then be reduced to fragments or flakes in a hammer mill
equipped with a sufficiently fine grille or by breaking it
up into pieces which are passed through a grille by means of
rotating brushes for example. Thus, in one preferred embodi-
ment of the process according to the invention, the film is
25 reduced into fragments or flakes by passage through a 0.5 to
3 mm mesh grille.

 The product and the process according to the invention
are illustrated by the following Examples in which the per-
centages are percentages by weight.

30 EXAMPLE 1

 A mixture of yam varieties of the *Dioscorea rotundata*
species from the Ivory Coast is used as the starting material.
The mixture consists of fresh tubers of the Kponan (20%),
Sopéré Assawa (50%), Krenglé (15%) and Gnan (15%) varieties.

35 The tubers are cleaned, trimmed, cut up into pieces the

1 size of a large potato, steam-peeled and cut into slices 1
to 1.2 cm thick.

5 The slices are cooked for 40 minutes in steam at atmospheric pressure at 100°C in a perforated conveyor belt cooker on which the slices are arranged in a layer approximately 13 cm thick. The cooked slices are reduced to puree in a puree press. 0.05% $\text{Na}_2\text{S}_2\text{O}_5$ and 0.1% acidic sodium pyrophosphate are added to the resulting puree which has a dry matter content of approximately 33%.

10 The puree is dried on a drum 1.25 m in diameter and 5.5 m wide rotating at 2 r.p.m. The drum is heated from inside with steam under a pressure of 4 bar. It is equipped with five satellites distributed at intervals of 30° and has an effective drying surface of 17 m² between the distribution trough for the puree and the blade which detaches the
15 film of dried puree. This film weighs 1.5 g/dm² and has a residual moisture content of 6 to 7%.

The film is reduced to flakes by breaking up and passing the fragments through a 2 mm mesh sieve by means of rotating
20 brushes. Flakes are obtained of which more than 80% are between 0.3 and 2.0 mm in size and which have a bulk density of 448 g/l.

To reconstitute the flakes, 1 volume of lukewarm water (35°C) is added to the same volume of flakes while mixing
25 with a fork so that all the flakes are thoroughly covered with water. The whole is left standing for 1 minute. A paste is obtained to which the smooth appearance and elastic texture of traditional foutou is readily imparted by kneading with the palm of the hand.

30 EXAMPLE 2

The procedure is as described in Example 1 with the following differences:

35 The starting material consists of fresh yam tubers of the Kponan variety (instead of a mixture of varieties) from the Ivory Coast which have a dry matter content of approxi-

1 mately 35%.

The slices are cooked in steam at atmospheric pressure for 30 minutes at 98°C (as opposed to 40 minutes at 100°C).

5 The puree is dried on the drum rotating at 3.8 revolutions per minute (as opposed to 2 revolutions per minute) and heated with steam at 8 bar (as opposed to 4 bar).

The film detached from the drum weighs 1.7 g/dm². It is reduced to flakes by breaking up and passing the fragments through a 1.0 mm mesh sieve (as opposed to 2.0 mm).

10 Flakes are obtained of which more than 80% are between 0.3 and 1.0 mm in size. They have a bulk density of 500 g/l and may also be readily reconstituted in the same way as described in Example 1.

EXAMPLE 3

15 The procedure is as described in Example 1 with the following differences:

The starting material consists of fresh yam tubers of the Krenglé variety (instead of a mixture of varieties) from the Ivory Coast which have a dry matter content of approximately 35%.

20 The puree is dried on the drum equipped with four satellites (as opposed to five) rotating at 2.5 r.p.m. (as opposed to 2 r.p.m.) and heated with steam at 5.5 bar (as opposed to 4 bar).

25 The film detached from the drum weighs 1.1 g/dm². It is reduced to flakes by breaking up and by passing the fragments through a 1.0 mm mesh sieve (as opposed to 2.0 mm).

30 Flakes are obtained of which more than 80% are between 0.3 and 1.0 mm in size. They have a bulk density of 388 g/l and may also be readily reconstituted in the same way as described in Example 1.

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CLAIMS

1. Flakes of starchy material consisting of fragments of a film obtained by drying on a drum of a puree of cooked starchy material, characterized in that they consist of fragments of a film weighing 1.0 to 1.7 g/dm², of which 80% are between 0.3 and 3 mm in size, and have a bulk density of 350 to 550 g/l.
2. Flakes of starchy material as claimed in claim 1, characterized in that they may be reconstituted by mixing with lukewarm water in a quantity of one volume flakes to one volume water.
3. Flakes of starchy material as claimed in claim 1 or 2, characterized in that the starchy material is yam.
4. Flakes of starchy material as claimed in claim 1 or 2, characterized in that the starchy material is plantain and/or cassava.
5. A process for the production of starchy flakes in which tubers, fruit and/or roots of a starchy plant are cleaned, trimmed, peeled, cut up, cooked, reduced to puree, the resulting puree dried on a drum, a film of the dried puree is detached from the drum and then reduced to fragments, characterized in that the puree is dried on a drum so that the film of dried puree weighs from 1.0 to 1.7 g/dm² and the film detached from the drum is reduced to fragments or flakes, of which 80% are between 0.3 and 3 mm in size and which have a bulk density of 350 to 550 g/l.
6. A process as claimed in claim 5, characterized in that, after they have been peeled and cut up, the tubers, fruit and/or roots are cooked for 25 to 50 minutes in steam at atmospheric pressure.
7. A process as claimed in claim 5, characterized in that the puree is dried on a drum rotating at 2 to 6 revolutions per minute and heated by steam at 3 to 10 bar to a residual moisture content of 4 to 15%.
8. A process as claimed in claim 5, characterized in that

the film is reduced to fragments or flakes by passing it through a 0.5 to 3 mm mesh grille.

9. A process as claimed in any of claims 5 to 8, characterized in that the starchy material is yam.

10. A process as claimed in any of claims 5 to 8, characterized in that the starchy material is plantain and/or cassava.

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