

Joint inventors:

PROCESS FOR PRODUCING AN EDIBLE PRODUCT

This invention relates to a process for producing an edible product and to the product thereby produced.

5 It is known that foodstuffs can be melt-spun with a carrier material to provide a product in which the foodstuff is distributed on and/or within a matrix of the carrier. The resulting product may be more easily handled than the foodstuff itself.

10 EP-A-0540460 teaches the melt-spinning of a mixture of maltodextrin with a variety of foodstuffs including peanut butter and dried soups. This technique requires the conditions of the melt-spinning process to induce flash flow of the feedstock and is typically carried out at temperatures of 130 to 180°C.
15 However, the process conditions must be carefully controlled and working outside these limits results in charring of the product and non-processability of the matrix material. A further disadvantage of the melt-spinning method is that it is inherently inefficient
20 in terms of the yield of the final product. A significant proportion of the foodstuff fails to become associated with the matrix material during the melt-spinning step and must be recovered for reprocessing or simply discarded.

25 WO 85/03414 discloses the encapsulation of a number of materials in a matrix containing a maltodextrin and hydrogen octenylbutanedioate amyloextrin. This reference teaches the encapsulation of flavourants and oils and there is no
30 mention of the encapsulation of foodstuffs. Similarly, EP-A-0158460 and US 5009900 describe the encapsulation of volatile flavourants in extruded glass matrices.

35 The present invention addresses the problem of providing an improved method for processing

foodstuffs with a matrix material which is both more efficient than the melt-spinning method and operable at a lower temperature.

5 According to the present invention there is provided a process for producing an edible product comprising mixing a foodstuff which is spreadable at room temperature with a matrix material selected from glucose solids, maltodextrin, starch and mixtures thereof, extruding the resulting mixture and
10 converting the extrudate to a powder.

 The process of the invention enables the conversion of moist, viscous pastes to free flowing powders.

15 The invention also provides an edible product producible by the process of the invention and comprising a foodstuff which is spreadable at room temperature distributed on and/or within the matrix material.

20 The foodstuff which is used in the process of the invention is spreadable at room temperature and may be sold as a spread for application to another edible substrate. The skilled person will appreciate that the spreadable foodstuffs will typically be viscous liquids, solid/liquid mixtures, semi-solids
25 and low melting point (i.e., less than 50°C) solids. It has been found that these foodstuffs are extrudable with glucose solids, maltodextrin or starch at much lower temperatures than are required for the melt-spinning process.

30 The foodstuff may contain animal and/or vegetable fat or oil such as beef or chicken fat. The inclusion of up to 10% starch in the product of the invention when it contains a fat or an oil provides an instant roux mix from which a roux may be formed by
35 adding hot water.

Chocolate spread, yeast extract, peanut butter and mixtures thereof are other preferred foodstuffs for use in the process of the invention. When these foodstuffs are incorporated into the product of the invention, the product may be converted to a spreadable paste on hydration. Flavourants, preservatives, stabilisers and other conventional food additives are optionally included in the product of the invention.

The preferred matrix materials for use in the invention are glucose solids or maltodextrin with maltodextrin being particularly preferred.

The most preferred maltodextrin for use in the process and product of the invention has a DE (Dextrose Equivalent) in the range of from 30 to 60. Maltodextrins of this type have a slightly sweet taste which can enhance the flavour of the product.

The product of the invention may comprise from 20 to 70% and preferably from 50 to 70% of the foodstuff. The relatively high loading of foodstuff allows the product to approach more closely the taste properties of the foodstuff itself and avoids the cost and volume problems associated with the use of large amounts of matrix material.

Mixing of the matrix material with the foodstuff is carried out to provide a substantially homogeneously distributed mixture of the foodstuff and matrix material. This may be achieved using a high shear mixer. The resulting feedstock may contain other additives such as flavourants or preservatives. The addition of up to 2% water to the feedstock has been found to aid the extrusion process.

The extrusion step of the process is carried out in a conventional extruder (preferably a twin-screw extruder).

It is an important advantage of the present invention that the process may be carried out under conditions which are much less detrimental to the matrix material and to the foodstuff than those which the mixture experiences in prior art processes. The process may be operated using an extruder having a barrel temperature of from 20 to 90°C. It has been found to be particularly preferable to carry out the process at a barrel temperature of from 30 to 70°C. Under these conditions, the resulting product retains a high degree of the flavour of the foodstuff.

Although the extrusion step may be carried out using an extruder having any suitable die, the die is preferably of a size such that the extrudate has a cross-sectional area of from 1 mm² to 400 mm². By maintaining the size of the extrudate within this range, it may be readily converted to a powder. It will be appreciated that the size of the extrudate need not be reduced if it has a suitably small cross-sectional area and fragments as it leaves the die either under the effect of gravity or by mechanical means such as a cutter. In most cases, however, the extrudate will require further treatment for conversion to a powder and this is conveniently effected using a mill. It is presently preferred that the extrudate has a cross-sectional area of about 50 mm² and is subsequently milled to produce free-flowing granules.

30 EXAMPLES

The ingredients used in the Examples were obtained from the following suppliers:

35 Smooth peanut butter - CPC International Inc., P O Box

8000, International Plaza, Englewood Cliffs, New Jersey 07632, U.S.A.

5 Maltodextrin 1940 (glucose solids) - Casco Inc., a division of CPC International Inc.

10 Nussani chocolate (a chocolate hazelnut paste with a fat content of 30%) - Dohler (UK) Ltd., 4 Vincent Avenue, Crownhill Business Centre, Milton Keynes, Buckinghamshire MK8 0AB.

Peppermint essence - Rayner & Co Ltd., London N18 1TQ.

15 Orange essence - Rayner & Co Ltd., London N18 1TQ.

Banana flavouring - E F Langdale Ltd., Chase Road, Northern Way, Bury St Edmunds, Suffolk IP32 6NT.

20 Chicken fat - Nortech Food Ltd., 172 Wakefield Road, Rothwell, Leeds.

Beef fat - British American Products, 400 Cleveland Street, Birkenhead, Merseyside.

25 Tomato serum - Makhteshim Chemical Works Ltd., POB 60, Beer-Sheva 84100, Israel.

30 Tomato starch - Deltown Specialities, 1712 Deltown Place, Fraser, New York 13753, U.S.A.

Modified starch - National Starch and Chemical, Prestbury Court, Greencourts Business Park, 333 Styal Road, Manchester M22 5LW.

35 Corn oil - CPC UK Ltd., Claygate House, Esher, Surrey.

Sugar - British Sugar plc, Colney, Norwich, Norfolk.

Vinegar - Nestle UK Ltd., St Georges House, Croydon,
Surrey CR9 1NR.

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Maltodextrin 01921 - Cerestar UK Ltd, Trafford Park,
Manchester M17 1PA.

Example 1

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A 1:1 mixture of smooth peanut butter and maltodextrin 1940 was formed by blending the two ingredients for 5 minutes in a high-shear Hobart® mixer fitted with a dough hook. The mixture was introduced into an MPF 50D twin-screw cooker extruder with a 25:1 L:D barrel (manufactured by APV-Baker). The solid feed was introduced through a variable-speed twin-screw K-Tron® solid feed hopper at a pre-set rate of 15 kg per hour while a single-head variable stroke, positive displacement pump was used for the liquid feed. The extruder barrel was heated by electrical cartridge heating and cooled using a Tricool® water recirculating chiller system. The temperatures in the barrel zones were controlled by West Octet® microprocessor temperature controllers. The extruder control panel gave readouts of torque and screw speed as percentages of maxima. The screw configuration used consisted initially of transport screws that carried the product from the feed port to the mixing section. The mix was then passed through two 30° reversing zones that were divided by a number of mixing sections. Further mixing sections were placed in the final zones of the extruder barrel before the product emerged at the die.

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Two 3 mm diameter circular dies were used.

Water was pumped into the extruder to aid the initial movement of product through the barrel. Once the barrel had been filled with the mixture, the water feed was stopped.

5 The extruded samples were collected on metal trays coated with aluminium foil. When the samples had hardened, the product was milled in a Retsch Mill ZM1. This mill was selected since it does not generate much heat during use and powders the extrudate by forcing it through a 2 mm grill at its highest setting.

 The temperature profile and screw speeds used are shown in Table 1.

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TABLE 1

Processing parameters for Example 1

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Temperature zone profile (°C)										Screw speed	Feed rate
1	2	3	4	5	6	7	8	9		(rev/min)	(kg/h)
20	20	20	40	40	50	50	60	70		350	15

25 The product emerged slowly from the extruder with a light brown/yellow colour, a soft consistency and no aeration.

Example 2

30 Example 1 was repeated but with the maximum temperature in the barrel lowered to 50°C. The temperature profile and screw speeds used are shown in Table 2.

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TABLE 2

Processing parameters for Example 2

5	Temperature zone profile (°C)									Screw speed	Feed rate
	1	2	3	4	5	6	7	8	9	(rev/min)	(kg/h)
	20	20	20	20	30	30	40	40	50	350	15

10 The sample emerged as a thin, light brown/yellow rope, which showed no oil separation. The rope hardened within approximately 10 minutes.

The extruded products of both Examples 1 and 2 milled easily and presented no problems such as blockage or oil separation during milling. The samples passed through the grill to form fine powders of a slightly paler colour than that of the extruded products.

20 Comparative Example for Examples 1 and 2

25 The 1:1 peanut butter:maltodextrin 1940 sample used in Examples 1 and 2 was processed using the process of EP-A-0540460 at 3600 rev./min. The material passed through the sample head with ease with minimal build-up on the ribbon. The processed sample emerged as fine spicules, although the accumulation of material along the ring of the collecting bin was noted.

30 The products of Examples 1 and 2 were assessed
for organoleptic qualities by a panel of experienced
assessors who commented on the peanut flavour of the
products and compared these with the product obtained
by the process of EP-A-0540460. The latter product
35 was noticeably sweet and, although the peanut flavour

was quite strong, it was considered to have a slightly stale note.

Example 1 samples had less initial sweetness than the prior art product and a very pleasant flavour, similar to that of fresh peanuts. Slightly malty flavour notes were also detected.

Samples from Example 2 had a salty peanut note with a quick flavour release. This product was considered to have the greatest peanut flavour and differed from material processed by the method of EP-A-0540460 because of the saltiness and 'peanut-butter-type' creaminess noted during assessment.

Example 3

The process of Example 1 was repeated using the following compositions (i) to (v) as feedstocks for the extrusion process:

Ingredients	(i)	(ii)	(iii)	(iv)	(v)
Peanut butter	45	15	50	50	-
Marmite® yeast extract	15	-	-	-	-
Nussani hazelnut					
chocolate paste	-	45	-	-	60
Banana flavouring	-	-	-	-	0.8
Peppermint essence	-	-	0.8	-	-
Orange essence	-	-	-	0.8	-
Maltodextrin 1940	40	40	49.2	49.2	39.2

All ingredients combined readily in the Hobart® mixer, forming soft masses, which fed smoothly from the barrel. All samples emerged from the extruder die as thin ropes with colours characteristic of the constituent ingredients. Those

5 samples containing peanut butter at a level of 50%
((iii) and (iv)) showed signs of slight oil separation
at the beginning of the process but this occurred
quite briefly and did not hinder the successful
preparation of the products.

10 The samples were milled to produce fine
powders which were found to have good flavour and
texture characteristics when rehydrated with water at
a level of 17.5%.

Example 4

15 Chicken fat and beef fat were separately
combined with maltodextrin 1940 at a level of 20%.

Each fat was melted before blending to achieve
a more uniform mix. The unprocessed material had a
moist, crumbly consistency, which was easy to feed.
Both samples processed readily and emerged from the
extruder as a shiny mass having a deep grey colour.

20 Fat content measurements were carried out on
both the unprocessed and processed materials. The
results were compared with those obtained from the
analysis of corresponding samples prepared using the
process disclosed in EP-A-0540460, and are given in
25 Table 3.

TABLE 3

30 Comparison of fat content of samples prepared using
present invention and EP-A-0540460

	EP-A-0540460	Present Invention
35 Unprocessed beef sample	20.5	18.2

Processed beef sample	10.4	15.8
Unprocessed chicken sample	20.0	21.2
Processed chicken sample	9.6	14.5

5 Using the process of EP-A-0540460, up to 50% of the fat in the original material was lost during the process, with a maximum of 10% fat incorporated into the carrier.

10 In comparison, 75% of the fat in the unprocessed extruded sample was incorporated by the process of the invention, with a total of 15% encapsulated.

15 Example 5

20 A formulation for a pizza topping was developed consisting of at least 20% tomato serum (5 - 15%) and tomato starch (10 - 20%) together with corn oil (2%), vinegar (2%), sugar (4%), modified starch (5 - 15%), maltodextrin 01921 (40 - 60%) and minor flavour ingredients (4 - 6%). The unprocessed material had a moist, crumbly consistency, hardened rapidly upon standing and was very difficult to use. The material was processed at slightly higher
25 temperatures than in previous examples to remove excess moisture from the mass allowing it to harden. The processing conditions used in this example were as follows:

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Temperature zone profile (°C)										Screw speed	Feed rate
1	2	3	4	5	6	7	8	9		(rev/min)	(kg/h)
20	30	40	50	80	90	110	130	150		350	15

35 The molten product emerging from the die had a bright

red colour, hardened rapidly upon cooling and was milled to a fine powder. Upon rehydration with water at a level of 3:1, a smooth paste formed.

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CLAIMS

- 1 A process for producing an edible product
comprising mixing a foodstuff which is spreadable at
5 room temperature with a matrix material selected from
glucose solids, maltodextrin, starch and mixtures
thereof, extruding the resulting mixture and
converting the extrudate to a powder.
- 10 2 A process as claimed in claim 1, wherein the
mixture is extruded using an extruder having a barrel
temperature of from 20 to 90°C.
- 3 3 A process as claimed in claim 2, wherein the
barrel temperature is from 30 to 70°C.
- 15 4 A process as claimed in any one of claims 1 to
3, wherein the extrudate is milled to produce free-
flowing granules.
- 5 5 A process as claimed in any one of claims 1 to
4, wherein the matrix material is maltodextrin or
glucose solids.
- 20 6 A process as claimed in any one of claims 1 to
5, wherein the foodstuff contains animal and/or
vegetable fat or oil.
- 7 7 A process as claimed in any one of claims 1 to
6, wherein the product comprises up to 10% starch.
- 25 8 A process as claimed in any one of claims 1 to
5, wherein the foodstuff is selected from chocolate
spread, yeast extract, peanut butter and mixtures
thereof.
- 9 9 A process as claimed in any one of claims 1 to
30 8, wherein the extrudate has a cross-sectional area of
from 1 mm² to 400 mm².
- 10 10 A process as claimed in any one of claims 1 to
9, wherein the product comprises from 20 to 70% of the
foodstuff.
- 35 11 A process as claimed in claim 10, wherein the



product comprises from 50 to 70% of the foodstuff.

12 An edible product producible by a process
according to claims 1 to 11 and comprising a foodstuff
which is spreadable at room temperature distributed on
5 and/or within a matrix material selected from
glucose solids, maltodextrin, starch and mixtures
thereof.

13 Product as claimed in claim 12, wherein the
10 matrix material is glucose solids or maltodextrin.

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