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73 Titulaire(s) :

Société dite : SOCIETE DES PRODUITS
NESTLE S.A.
P.O. Box 353
1800 VEVEY (CH)

72 Inventeur(s) :

MAHR Birgit
Gabelsbergstrase 9
84453 MÜHL DORF
(DE)

74 Mandataire : CABINET CAZENAVE
B.P. 500
YAOUNDE - Cameroun

54 Titre : A shelf stable nutritious food product and process for its preparation.

57 Abrégé : The invention concerns a shelf stable water-based nutritious food product which comprises cooked and ground whole soy; and in which the product has no characteristic soy off-flavor and dry soy mouthfeel. The invention concerns further a shelf stable, emulsion-based, nutritious food product which comprises cooked and ground whole plant seeds or cooked/uncooked, ground whole legumes, and sufficient endogeneous emulsifier from the plant seed to stabilise the emulsion.

The plant seed is taken in the group consisting of sunflower seeds, rape seeds, palm kernels and peanuts or mixture thereof.

A shelf stable nutritious food product and a process for its preparation

Field of the Invention

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This invention relates to shelf stable and nutritious food products which are based on edible plant seeds, and to processes for their preparation.

10 Background of the Invention

Plant seeds, such as soy beans, lupines, cow peas, sunflower seeds, chick peas and peanuts, have long been used as foods, or as a basis for preparing foodstuffs. 15 They are commonly available and hence inexpensive, and are a good source of nutrition for humans and animals. In domestic situations, plant seeds are usually prepared by soaking them in water and then cooking them. Thereafter they are usually ground and combined with 20 other ingredients to prepare a meal. An example is humus, which is prepared from chick peas and is a traditional foodstuff in the Mediterranean area. These foodstuff require time to prepare and are not shelf stable. At best, they may be store for short periods in 25 a refrigerator.

Shelf stable food stuffs, based on plant seeds, are also commercially available. A very common example is peanut butter; a product which usually contains less than about 2% by weight of water. Spread products based on 30 sunflower seeds are also commercially available. These products also contain high levels of lipids; especially in the form of added lipids. The water content is

usually low. This tends to result in these products being reasonably expensive.

Many products based on soy beans are also commercially available. The soy material which forms the
5 basis for these products is usually obtained as a by-product of oil processing, or from soy milk production.

The by-products of oil processing are usually in the form of protein concentrates or isolates. Various exogenous ingredients, such as oils, emulsifiers and
10 stabilisers, are then added to the soy protein to form a food base. Further, flavours and sweeteners may then be added to the food base to provide a shelf stable, food product. An example of such a process is described in US patent 3851070; the final product being a spread.
15 However, all products produced from soy protein concentrates and isolates have a characteristic soy off-flavour and a dry or chalky mouthfeel. The off flavour may be masked to some extent by adding flavouring agents to the products; although the masking is rarely complete.
20 There have also been attempts to solve the off flavour problem by special processing. For example, in US patent 4915972, oxygen levels are reduced during milling of the soy beans. These attempts have not been entirely successful. Further, the problem with the dry or chalky
25 mouthfeel has not been satisfactorily solved. Also, much of the nutritional value of the original soy bean is lost.

The soy milk products are usually prepared by dehulling soy beans, milling them with water, and then
30 separating off insolubles. The resultant milk is then further processed. For example, it may be dried to produce a soy milk powder. The powder may then be used in much the same manner as the soy protein concentrates

and isolates mentioned above to produce soy based, food products. These products have the same disadvantages; namely soy off flavour and dry or chalky mouthfeel. Alternatively the soy milk may be precipitated with salts and acids to produce Tofu. Tufu has the typical soy off flavour and is not shelf stable.

Accordingly, there remains a need for shelf stable, nutritious food products which are based on plant seeds, which have good flavour profiles and mouthfeel, and which contain sufficient moisture to render these products relatively inexpensive.

Summary of the Invention

In one aspect, this invention provides a shelf stable, water-based, nutritious food product which comprises cooked and ground whole soy; and in which the product has no characteristic soy off-flavour and dry soy mouthfeel.

It is surprisingly found that if whole soy is used in the preparation of the product, the product obtained has a good flavour profile and mouthfeel. Without wishing to be bound by theory, it is believed that the various components of the soy bean interact to produce a good flavour profile and mouthfeel. When one of these components are removed, the system is out of balance and the flavour and mouthfeel suffer.

This approach of preparing shelf stable products from whole plant seeds leads to substantial other advantages.

In another aspect, this invention provides a shelf stable, emulsion-based, nutritious food product which comprises: cooked and ground whole plant seeds with high

lipid content, and sufficient endogenous emulsifier from the plant seed to stabilise the emulsion.

In yet another aspect, this invention provides a shelf stable, emulsion based nutritious food product which comprises: ground whole plant seeds with high lipid content, and a lipid component provided essentially by endogenous lipids.

It is surprisingly found that if whole plant seeds are used in the preparation of the product, the product contains sufficient endogenous emulsifier and/or lipids that further addition of emulsifier and/or lipids is unnecessary; although more can be added if desired. Further, as explained above, the product has a good flavour profile and mouthfeel.

In a further aspect, this invention provides a shelf stable, emulsion based nutritious food product which comprises: ground whole plant seeds with high lipid content, and less than about 20 % by weight of lipids.

Further, this invention provides a shelf stable water-based nutritious food product which comprises: ground whole legume and sufficient endogenous emulsifier from the legume to stabilise the product. If desired, the whole legume may be cooked.

All the food products have the advantage of containing all of the nutritional components of the original plant seeds. This is especially advantageous for soy based products. Further, the products are water based, or emulsion based. Hence they may be produced inexpensively. Therefore, the products offer inexpensive and wholesome nutrition.

In a further aspect, this invention provides a method of conveniently providing nutrition from soy without characteristic soy off taste and dry mouthfeel by

administering a shelf stable, water-based, product containing cooked, ground whole soybeans.

5 In a further aspect, this invention provides a method of providing all the nutritional components of whole soy beans by administering a shelf stable food product containing cooked, ground whole soybeans.

10 This invention also provides a process for the preparation of the food products. The process comprises cooking the plant seeds, milling or comminuting them, filling them into containers (with or without the addition of other ingredients such as flavours, spices, etc), and sealing the containers.

15 **Detailed description of preferred embodiments of the invention**

Various specific embodiments of the invention are now described for the purposes of illustrating the invention. In this specification, the following definitions apply:-

"High lipid content" means a lipid content of at least 30% by weight.

"Water-based" means the product contains at least 25 % of water.

25 The food products are prepared from whole plant seeds. These plant seeds may be selected from any suitable plant seeds such as soy beans, sunflower seeds, rape seeds, palm kernels, peanuts, chickpeas, lupines, and the like. Mixtures of these seeds may also be used.

30 The plant seeds may contain their hulls, or may be dehulled prior to use. For soy beans, it is preferable to use soy beans which contain their hulls because the flavour profile and mouthfeel are much better. However,

dehulled soy beans also give acceptable products. If the seeds are dehulled, this may be carried out in a dry condition prior to cooking or may be carried out in a wet condition after cooking.

5 If the seeds are in a dried form, they are best soaked before being further processed. Depending upon the type of seeds used, the seeds are then cooked. This may be carried out using any suitable cooking technique; preferably a wet cooking technique. For example, the
10 seeds may be cooked in hot water under atmospheric conditions; for example at about 85°C to about 100°C. Alternatively, the seeds may be cooked under pressure or using steam; for example at about 100°C to about 150°C. It will be appreciated that the exact temperatures may be
15 selected as desired and according to the type of seed being cooked. Similarly, the cooking times may be selected as desired and according to the type of seed being cooked. In an industrial setting, cooking times of about 10 to 60 minutes are common. Any suitable cooking
20 equipment may be used.

Cooking is, however, not necessary for certain types of seed. For example, sunflower seeds need not be cooked. Consequently, for these types of seeds, the cooking step may be omitted.

25 If desired to obtain certain flavour profiles, the seeds, whether cooked or not, may then be roasted.

The seeds are then milled or comminuted. The milling or comminuting may take place continuously or non-continuously as desired. Any suitable equipment may
30 be used; for example a colloid mill, a carborundum mill, ball mill or the like.

The ground seeds may contain sufficient endogenous emulsifiers to stabilise the final products without the

need to add emulsifiers. These endogenous emulsifiers usually take the form of seed proteins and lecithins. For example, the endogenous emulsifiers from soy beans include soy proteins and soy lecithins. If it is desired
5 to add exogenous emulsifiers, these may be added to the ground seeds. Suitable exogenous emulsifiers include any food grade emulsifiers such as, for example, milk proteins, eggs, egg yolks, egg whites, lecithins, mono- or di-glycerides, polysorbates, etc. Combinations of
10 these emulsifiers may also be added. It is possible to add the exogenous emulsifiers at later points during processing if desired; but before any final mixing or homogenisation step.

The ground seeds contain sufficient endogenous
15 lipids to provide products with good flavour profiles and mouthfeel. However, it is possible to add exogenous lipids to the ground seeds if desired. Any suitable food-grade lipids may be used. For example, sunflower oil, soy oil, rape seed oil, olive oil, palm fat, cocoa
20 fat, etc may be used. It is possible to add the exogenous lipids at later points during processing if desired; but before any final mixing or homogenisation step.

Acids may be added to the ground seeds for flavour
25 and stability reasons. The acids may be added directly in the form of edible acidifiers. Examples of edible acidifiers include lactic acid, acetic acid, citric acid, lemon juice, vinegar, any other food acids and mixtures of these acidifiers. Alternatively, the acids may be
30 provided indirectly by subjecting the ground seeds to fermentation; especially using micro-organisms which produce acids. The acids may also be added at other stages during production. For example, the acids may be

added during soaking of the plant seeds. Alternatively, the acids may be add prior to, or during, comminution or milling.

5 If the acids are added for the purposes of enhancing shelf stability, sufficient acids are added to reduce the pH of the final product to below about pH 6.5 ; more preferably to about 3.5 to about 5.5. If the acids are added for flavour reasons, sufficient acids are added to obtain the desired flavour profile. Preferably the acids
10 provide about 0.25% to about 3% by weight of the final product; for example about 0.5% to about 2% by weight.

Salt may also be added to the ground seeds for flavour and stability reasons. If the salt is added for the purposes of enhancing shelf stability, sufficient
15 salt is added to form a microbial barrier. Preferably, the amount of salt added is about 0.25% to about 5% by weight; for example about 0.5% to about 4% by weight . Ordinarily, the amount of salt added will also be dictated by flavour considerations. The precise amount
20 needed may be readily set by a person skilled in the art.

Various other ingredients to influence flavour and texture may be added as desired. For example, sweeteners, starches and thickeners may be added. Any
25 suitable sweeteners may be used, for example fructose, glucose, saccharose, dextrose, and artificial sweeteners, or combinations of these sweeteners. The starches may be any suitable native and modified starches, like modified waxy maize or native tapioca starch. Similarly, any
30 suitable edible thickeners may be used; for example pectin, xanthan, guar gum, carrageenan, galactomannans, and the like. Mixtures of thickeners may also be used. Flavouring agents such as spices, etc may also be added.

The sweeteners, starches and thickeners may also be added at other stages during production.

Water may be added if desired. If the plant seeds have been soaked and wet cooked, this need not be necessary. Preferably, the final product has a water content of about 15% to about 70% by weight; for example about 20% to about 60% by weight. The amount of water needed will be governed to some extent by the desired product form. However, the amount of water may be readily set by a person skilled in the art.

If desired, the mixture of ground seeds and other ingredients may be subjected to homogenisation or emulsification. Ordinarily, this will not be necessary unless exogenous lipids are added. Suitable emulsifiers and homogenisers may be used. For foamed products such as mousses, gases such as air, nitrogen, and the like may be added.

It is also possible to carry out the process by adding enzymes to the seeds or to the mixture containing said seeds or to carry out the process by making a fermentation with microorganisms to improve texture and taste. This fermentation can be carried out before or after the milling or comminuting of the seeds.

The mixture may then be pasteurised or sterilised as is conventional. For example, pasteurisation may be carried out at raised temperatures of about 80°C to about 100°C; with or without applying high shearing forces. The pasteurised mixtures may then be filled into suitable containers and the containers sealed. Filling may be cold filling, hot filling or aseptic filling as desired. It is also possible to fill the mixture into the containers and then subject the mixtures to pasteurisation or sterilisation.

Any suitable containers may be used; for example glass jars, plastic jars, cans, tubes, pouches, and sachets. The containers may be multi-serve or single serve containers. Further, multiple single-serve
5 containers, such as sachet strips, may also be used.

The products preferably contain about 5% to about 45% by weight of total lipids; for example about 10% to about 40% by weight of total lipids. If oil rich plant
10 seeds are used, for example sunflower seeds, rape seeds, and palm kernels, the product may contain significant amounts of lipids; for example more than about 30% by weight of total lipids. This is especially the case if exogenous lipids are added. However, if no exogenous
15 lipids are added, the product may be arranged to contain less than about 20% by weight of lipids.

Because the products contain both water and lipids, they have lipid droplets dispersed in a water base or are in the form of emulsions which contain significant amounts of lipid.

20 The products are shelf stable and may be stored under ambient conditions for periods of at least about 6 months; more preferably at least about 12 months.

The products may be provided in any suitable product form. For example, the products may be provided in the
25 form of spreads, toppings, sauces, seasonings, soups, mayonnaise, mousses, desserts, paps, and the like.

In the case of a shelf stable food product in the form of a sweet spread or topping, the composition contains at least 10 % cooked or uncooked soy, plant
30 seeds or legumes, at least 10 % sugar, up to 5% starch or other thickeners, up to 30 % oils or fats and up to 5% endogeneous and/or exogeneous emulsifier.

In the case of a creamy low or medium fat mayonnaise, the composition contains at least 5 % cooked or uncooked soy, plant seeds or legumes, between 0 and 15 % sugar, between 0 and 4 % salt, between 0 and 40 % oils or fats, between 0 and 5% starch or other thickeners, between 0 and 5 % endogeneous and/or exogeneous emulsifier and comprising further between 0 and 5 % mustard and between 0 and 5 % vinegar.

In the case of a spicy seasoning, spread, topping or pap, the composition contains at least 10 % cooked or uncooked soy, plant seeds or legumes, between 0 and 20 % sugar, between 0.5 and 6 % salt, between 0 and 35 % oils or fats, between 0 and 5% starch or other thickeners, between 0 and 5 % endogeneous and/or exogeneous emulsifier and comprising further between 0 and 5 % vinegar.

In the case of of a shelf stable ketchup or sauce, the composition contains at least 10 % cooked or uncooked soy, plant seeds or legumes, at least 10 % sugar, between 0 and 3 % salt, between 0 and 5 % oils or fats, between 0 and 5% starch or other thickeners, and comprising further between 5 and 15 % vinegar.

In the case of a sweet or culinary mousse or dessert, the composition contains at least 5 % cooked or uncooked soy, plant seeds or legumes, at least 10 % sugar, between 0 and 1.5 % salt, between 0 and 5% starch or other thickeners, between 20 and 40 % oils or fats, between 0 and 5 % endogeneous and/or exogeneous emulsifier and comprising further between 0 and 3 % vinegar, between 0,5 and 2 % gelatine or another jelling agent and between 0 and 7 % foaming agent.

Examples

1. Sweet chocolate spread from Lupines

The way of proceeding is following :

- 5 a) Soaking of whole lupines in water and dehulling of the wet lupines.
- b) Cooking of the dehulled lupines during 15 minutes at 85 °C with water and lactic acid in a mixer.
- c) Mixing and coarse milling of the dehulled hot lupines with water and lactic acid.
- 10 d) Milling of the coarse base with a mill . This results in a smooth lupines base.
- e) Mixing of this base with the other recipe ingredients, that is sugar, cocos fat and flavors.
- f) Heating to 85°C under high shear.
- 15 g) Hot filling into glass jars.

The final product has a viscosity of 26.70 Pas. measured at a shear rate of 10 /s. The recipe is given in the following table.

Lupines spread	%
lupines	13
water	47
fat	15
sugar	21
salt	0,5
acids	0,5
flavors	3
	100

20

The spread was stored at room temperature for a period of 12 months. The product was then opened and tested. No spoilage was detected and the sensory
25 deterioration was low.

2. Culinary topping from cowpeas

The way of proceeding is following :

- 5 a) steaming of the dehulled cowpeas
- b) mixing of the steamed cowpeas with water, lactic acid and enzyme in a mixer. Coarse milling with a knife. Enzymatic fermentation.
- 10 c) Milling of the coarse milled and enzymatically treated base with a mill .
- d) Production of the base emulsion containing sunflower oil, water, whey protein and vinegar with a mayonnaise line.
- 15 e) Mixing of the milled cowpeas base with the base emulsion and processing of this mixture with a high pressure homogeniser.
- f) Addition of this mixture to the other ingredients (sugars, aroma and flavors) and heating under shear to 90°C.
- 20 g) Hot filling into plastic jars.

The final product has a viscosity of 21.80 Pas measured at a shear rate of 10 /s. The recipe is given in the following table.

Cowpeas Topping	%
dehulled cowpeas	15
water	30
fat	30
emulsifier	1
sugar	20
salt	0,5
acids	0,5
spices	3
	100

3. Ketchup from fermented soybeans

The way of proceeding is following :

- a) steaming of whole soybeans.
- 5 b) mixing of the steamed soybeans with sugar, water and lactic acid and coarse milling in a mixer with a knife.
- c) Milling of this base with a mill .
- d) Addition of the Lactobacillus bouillon and
10 fermentation.
- e) Heating to stop the fermentation.
- f) Addition of this fermented soya matrix to all other ingredients (sugar, vinegar, water, salt, flavors), heating to 85°C and hot filling into single serve
15 sachets of 25 ml.

The final product has a viscosity of 2.80 Pas measured at a shear rate of 10 /s. The recipe is given in the following table.

Soya ketchup	%
soybeans	12
water	51
sugar	30
salt	2,2
acids	1,5
spices	3,3
	100

20

The spread was stored at 20° for a period of 15 months. The product was then opened and tested. No spoilage was detected and the sensory deterioration was
25 still acceptable.

4. Low fat- Mayonnaise with lupines

The way of proceeding is following :

- a) soaking of whole lupines in water and steaming of said whole lupines.
- b) mixing of the steamed lupines with water and sugar and coarse milling in a mixer with knife.
- 5 c) Milling of the coarse base with a mill.
- d) Mixing of the milled base with all other ingredients (sugar, sunflower oil, mustard, vinegar, whey protein, flavors).
- 10 e) Heating of the emulsion to 80°C and hot filling.
- The final product has a viscosity of 41.40 Pas measured at a shear rate of 10 /s. The recipe is given in the following table.

<i>Lupines mayonnaise</i>	<i>%</i>
<i>lupines</i>	<i>13</i>
<i>water</i>	<i>55</i>
<i>oil</i>	<i>13</i>
<i>sugar</i>	<i>15</i>
<i>salt</i>	<i>1,5</i>
<i>acids</i>	<i>0,5</i>
<i>spices</i>	<i>2</i>
	<i>100</i>

5. Mousse from soybeans

The way of proceeding is following :

- 20 a) steaming of dehulled soybeans.
- b) mixing of steamed soybeans with water, sugar and acid in a mixer and coarse milling with a knife.
- c) Fine milling of the coarse base with a mill.
- 25 d) Preparing the base emulsion containing sunflower oil, vinegar, water and emulsifier.
- e) Mixing the soya base with the base emulsion

f) Adding to this mixture all other ingredients (sugar, flavors, foaming agent) and processing with a high pressure homogeniser.

g) Pasteurisation at 90°C.

5 h) Cooling to 30°C.

i) Foaming with Nitrogen in a dispersing machine, Overrun 30%.

j) Aseptically cold filling.

10 The final product has a viscosity of 24.40 Pas measured at a shear rate of 10 /s. The recipe is given in the following table.

<i>Soya mousse</i>	<i>%</i>
<i>dehulled soybeans</i>	<i>10</i>
<i>water</i>	<i>25</i>
<i>fat</i>	<i>30</i>
<i>emulsifier + foaming agent</i>	<i>2</i>
<i>sugar</i>	<i>27</i>
<i>salt</i>	<i>0,5</i>
<i>acids</i>	<i>0,5</i>
<i>spices</i>	<i>5</i>
	<i>100</i>

15 Before mixing with the base emulsion the soya base was tasted by a trained sensory panel. No soya off taste or dry mouthfeeling was detected. A comparative soya base was prepared using a soy concentrate. This comparative base was rated to have a green soya off-taste and a strong dry mouthfeeling.

20

6. Salty spicy spread from cowpeas

The way of proceeding is following :

25

- a) Weighing of cowpeas and water in a mixer
- b) Indirect heating to 100°C without milling the cowpeas,
- c) Coarse milling with a knife and cooling down

- d) Addition of enzymes to the mixer. Enzymatic fermentation for 30 minutes.
- e) Addition of acids
- f) Milling of the coarse milled and enzymatically treated matrix with a mill.
- g) Production of the base emulsion with a mayonnaise line.
- h) Mixing of the cowpea base with the emulsion base and all other ingredients (water, sugar, tomato paste, salt and flavors) in the mixer and heating under shear to 90°C (pasteurisation).
- i) Hot filling into stand up pouches.

The final product has a viscosity of 14.70 Pas measured at a shear rate of 10 /s. The recipe is given in the following table.

Cowpeas spread	%
cowpeas	12
water	36,3
tomato paste	4
fat	30
emulsifier	1
sugar	7
salt	3,5
acids	1,2
spices	5
	100

The spread was stored at 30°C for a period of 12 months. The product was then opened and tested. No spoilage was detected and the sensory deterioration was still acceptable.

7. Granular cowpeas spread

The way of proceeding is following :

- a) Weighing of cowpeas and water in the mixer
- b) Indirect heating to 90°C without milling the cowpeas,

- c)Cooling down (without milling)
- d)Addition of enzymes to the mixer. Enzymatic fermentation.
- e)Remove water and store cooked whole cowpeas.
- 5 f)Production of the base emulsion with a mayonnaise line.
- g)Mixing of the cooked cowpeas and the emulsion base with all other ingredients (sugar, salt, flavors) in the mixer and heating under low shear to 85°C (pasteurisation).
- 10 h)Hot filling into plastic jars.

The final product has a viscosity of 14.70 Pas measured at a shear rate of 10 /s. The recipe is given in the following table.

Granular Cowpeas spread	%
cowpeas	21
water	30,1
fat	30
emulsifier	1
sugar	7
salt	3,5
acids	1,7
spices	5,7
	100

8. Spicy spread from soybeans

The way of proceeding is following :

- 20 a)Weighing of soybeans and water in a mixer
- b)Pressure cooking without milling the soybeans
- c)Coarse milling with a knife and cooling down
- d)Mixing of the soya base with all other ingredients (water, flavors).
- 25 e)Milling of the coarse milled base with a mill .
- f)Pre-pasteurisation of spice mix (85°C, 5 minutes)
- g)Mixing of soya base and spice mix.

h) Cold filling.

The recipe of the spread is given in the following table.

Soya spread	%
non-dehulled soybeans	23
water	60
sugar	7,5
salt	3
acids	1,8
spices	4,7
	100

Before mixing with the other ingredients the soya base was tasted by a trained sensory panel. No soya off taste or dry mouthfeeling was detected. A comparative soya base was prepared using a soy concentrate. This comparative base was rated to have a green soya off-taste and a strong dry mouthfeeling.

The spiced spread was prepared with the base from the whole soybeans as well as with the base from the protein concentrate. The trained sensory panel was able to distinguish the 2 products and clearly detected a dry mouthfeeling for the product with protein concentrate but not for the product produced from whole beans.

9. Pap from sunflower seeds

The way of proceeding is following :

- a) Weighing of sunflower seeds and water in the mixer
- b) Indirect heating to 130°C without milling the sunflower seeds,
- c) Addition of sugar, salt and acids to the sunflower seed base ingredients.
- d) Milling of the coarse milled base with a mill.

e) Pasteurisation of the milled base and the other ingredients (sugar, flavors) in a mixer at 85°C, 3 min

f) Hot filling into a strip of single serve sachets.

The recipe of the pap is given in the following table.

5

Sunflower seed pap	%
dehulled sunflower seeds	28
water	41
sugar	24,8
salt	3
acids	1,2
spices	2
	100

10 The pap was stored at room temperature for a period of 12 months. The product was then opened and tested. No spoilage was detected and the sensory deterioration was still acceptable.

15 10. Mild spread from peanuts

The way of proceeding is following :

- a) Weighing of peanuts and water in the mixer
- 20 b) Indirect heating to 100°C without milling the peanuts,
- c) Addition of all other peanuts spread ingredients (sugar, salt, water, acids, spices) .
- d) Milling of the coarse milled base with a mill.
- e) Pasteurisation of the spread
- 25 f) Hot filling.

The recipe of the spread is given in the following table.

Peanut spread	%
peanuts	40
water	40
sugar	13
salt	3,6
acids	1,3
spices	2,1
	100

The spread was stored at room temperature for a period of 12 months. The product was then opened and tested. No spoilage was detected and the sensory deterioration was still acceptable.

11. Spread from soybeans with reduced acidity

The way of proceeding is following :

- a) Weighing of soybeans and water in a steam cooker
- b) Steam treatment for 15 minutes
- c) Preparing of the soya pulp in a bowl cutter
- d) Mixing of soya pulp, starch slurry and other ingredients (oil, vinegar, sugar, emulsifier, flavors) in a heater
- e) Emulsification with the colloid mill
- f) Sterilisation of the spread
- g) Aseptic filling into jars.

The recipe of the spread is given in the following table.

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<i>Soya spread</i>	<i>%</i>
<i>dehulled soybeans</i>	<i>16</i>
<i>water</i>	<i>34</i>
<i>oil</i>	<i>32</i>
<i>emulsifier</i>	<i>1</i>
<i>sugar</i>	<i>5</i>
<i>starch</i>	<i>2</i>
<i>salt</i>	<i>1</i>
<i>acids</i>	<i>1</i>
<i>spices</i>	<i>8</i>
	<i>100</i>

5 The spread was stored at room temperature for a period of 12 months. The product was then opened and tested. No spoilage was detected and the sensory deterioration was low.

Claims

- 1) A shelf stable water-based nutritious food product
5 which comprises
 - cooked and ground whole soy; and in which
 - the product has no characteristic soy off-flavor and dry soy mouthfeel.
- 10 2) A shelf stable nutritious food product according to claim 1 , which contains sufficient endogeneous emulsifier from the soy to stabilise the product.
- 15 3) A shelf stable, emulsion-based, nutritious food product which comprises :
 - cooked and ground whole plant seeds with high lipid content, and
 - sufficient endogeneous emulsifier from the plant seed to stabilise the emulsion.
- 20 4) A shelf stable, emulsion based nutritious food product which comprises :
 - ground whole plant seeds with high lipid content, and
 - a lipid component provided essentially by endogeneous
25 lipids.
- 30 5) A shelf stable, emulsion based nutritious food product which comprises :
 - ground whole plant seeds with high lipid content, and
 - less than about 20 % by weight of lipids .
- 6) A shelf stable nutritious food ingredient according to any of claims 3 to 5, wherein the plant seeds are

sunflower seeds, rape seeds, palm kernels and peanuts or mixture thereof.

- 5 7) A shelf stable water-based nutritious food product which comprises :
- cooked and uncooked, ground whole legume and
 - sufficient endogeneous emulsifier from the legume to stabilise the product.
- 10 8) A shelf stable nutritious food product according to claim 7, wherein the legumes are lupines, cowpeas, chickpeas or mixture thereof.
- 15 9) A shelf stable nutritious food ingredient according to any of claims 1 to 8, wherein the whole soy, plant seeds or legume are dehulled .
- 20 10) A shelf stable nutritious food ingredient according to any of claims 1 to 8, wherein the whole soy, plant seed or legume contain hulls.
- 25 11) A shelf stable nutritious food product according to any of claims 1 to 10, containing further a food acidifier which is lactic acid, acetic acid or citric acid, lemon juice, vinegar, any other food acid or combinations thereof.
- 30 12) A shelf stable nutritious food ingredient according to any of claims 1 to 11, containing further an exogeneous emulsifier.
- 13) A shelf stable nutritious food product according to any of claims 1 to 12 in the form of a spread, a

mayonnaise, a seasoning, a sauce, a soup, a pap or a mousse.

5 14) A process for the preparation of a nutritious food product, the process comprising :

- cooking whole soy, plant seeds or legumes and
- milling the soy, plant seeds or legumes,
- adding all the other ingredients,
- filling the mixture into a container for providing a shelf-stable product and
- 10 - closing the container.
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15 15) A process for the preparation of a shelf-stable nutritious food product, the process comprising :

- 15 - cooking whole soy, plant seeds or legumes and
- comminuting the whole soy, plant seeds or legumes for providing a granular soy, plant seeds or legumes,
- adding all the other ingredients,
- filling the mixture into a container for providing a shelf-stable product and
- 20 - closing the container.

16) A process according to claims 14 or 15 comprising further:

- 25 - acidifying the soy, plant seeds or legumes either before or after milling.

17) A process according to claim 14 or 15, wherein the container is a jar, sachet, can or pouch.

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18) A process according to any of claims 14 or 15, wherein the cooking of the whole soy, plant seeds or legumes

is carried out by atmospheric cooking or steam cooking.

- 5 19) A process according to any of claims 14 or 15, further comprising fermenting the soy, plant seeds or legumes before or after the milling .
- 10 20) A process according to any of claims 14 or 15, further comprising a roasting step of the cooked soy, plant seeds or legumes.
- 15 21) A process according to any of claim 14 or 15, wherein atmospheric cooking is carried out for between 15 and 60 minutes.
- 22) A process according to any of claim 14 or 15, wherein the steam cooking is carried out at 110-130°C for between 10 and 40 minutes.
- 20 23) A method of conveniently providing nutrition from soy without characteristic soy off taste and dry mouthfeel by administering a shelf stable water-based product containing cooked, ground whole soybeans.
- 25 24) A method of providing nutrition from the whole soy beans by administering shelf stable food product containing cooked, ground whole soybeans.
- 30 25) A shelf stable food product comprising a single serve sachet containing a food product according to any of claims 1 to 13.

- 26) A food product according to claim 25 in the form of a strip of sachets, each sachet being separatable from adjacent sachets in the strip.