

FOOD PRODUCT AND PROCESS FOR PREPARATION THEREOFFIELD OF THE INVENTION

The present invention relates to thickened foodstuffs with improved storage stability and having a smooth texture.

BACKGROUND TO THE INVENTION

5

Traditional thickened foodstuffs such as Chef Sauces, soups & gravies are based on starch as a thickening agent. Within the process of preparation, the sauce, soup or gravy is heated such that starch granules are swollen irreversibly and the amylose content of the starch granule is preferentially solubilised. In this way the granule birefringence and crystallinity disappear and a viscous paste is formed. The swollen starch granules, upon cooling, show a strong tendency to associate with each other. This phenomenon is called retrogradation. With traditional chef sauces, the sauce is used shortly after preparation and therefore the natural starches used cause no problem.

10

15

20

25

However, in manufactured foodstuffs the starch has to survive extremes in terms of processing (ie. high temperatures and high shear) and then remain stable for long periods of storage time. Storage may be under frozen, chill or ambient conditions. The thickened foodstuff then needs to be stable on re-heating for consumption. The required product stability is not possible using traditional native starch thickened systems. Manufactured sauces have to date solved this problem by one of two solutions;

30

(a) The addition of gelatin to the native starch thickened foodstuff. This assists in limiting the extent of retrogradation damage. However, gelatin is expensive and



comes from an animal source and is therefore unsuitable for vegetable/kosher foods. Furthermore the addition of gelatin does not enable the foodstuff to retain the desired viscosity when subjected to the required processing conditions (high temperatures and high shear).

(b) Use of chemically modified (cross-linked and derivatised) starches.

The use of such modified starches causes a number of problems and concerns such as;

- (i) they give a starchy taste and texture, probably due to some (limited) retrogradation on storage
- (ii) they are seen by consumers as chemicals; and
- (iii) the final sauces are not as smooth as home-made sauces. This is probably due to limited swelling or retrogradation of the starch polymers which results in hard included particles.

It is therefore desirable to be able to replace modified starch thickening agent in foodstuffs.

DISCLOSURE OF THE INVENTION

Accordingly the invention provides a thickened foodstuff having improved storage stability and retention of smoothness upon reheating comprising a non-pre-gelatinised amylose polymer containing component and a second biopolymer selected from iota carrageenan, kappa carrageenan, xanthan, maltodextrins, pectins, alginates, guar gum, agar, gum arabic, locust bean gum, carboxymethyl cellulose, hydroxymethyl cellulose and mixtures thereof; wherein the amylose polymer containing component is

present as a dispersed phase.

5 We have found that such thickened foodstuffs have a surprisingly smooth and good texture after frozen, ambient or chill storage.

10 The reheated thickened foodstuffs of the invention retain their good textural properties, ie absence of lumpiness/sliminess and freeze-reheat stability, after dilution or drying.

15 Furthermore such thickened foodstuffs may be subjected to high temperature and or high shear process conditions without loss of product quality. The foodstuff may be thickened by the amylose polymer containing component and/or the second biopolymer. Advantageously the foodstuff is thickened by the second biopolymer because such a system further reduces the problems associated with use of native starches detailed above, ie. the amylose polymer containing
20 component provides the required mouthfeel characteristics alone.

25 Without wishing to be bound by theory, it is believed that the second biopolymer enables control of retrogradation damage by forming a continuous phase with the amylose polymer being present as discrete particles within this continuous phase and thus unable to form the network which results in the foodstuff having properties typically associated with retrogradation damage.

30

Preferably the second biopolymer is selected from iota-carrageenan, kappa-carrageenan, pectins, maltodextrins, xanthan and mixtures thereof.

35

Most preferably the second biopolymer is selected from pectins, maltodextrins and mixtures thereof.





Suitable maltodextrins are those having a dextrose equivalent (DE) value of 0.5 and 5. Preferred maltodextrins have a DE value of approximately 2.

5 In order to obtain the required microstructure as defined (the amylose polymer containing component being present as a dispersed phase) a minimum concentration of the second biopolymer must be utilised. This minimum concentration will be readily determined by the skilled person, and is,
10 for examples as follows;

) Kappa-Carrageenan - 0.5% by weight of the foodstuff
Agar, xanthan, guar gum, locust bean gum - 0.2% by weight of the foodstuff.

15 Pectin & Alginate - 0.75 to 1% by weight of the foodstuff
Maltodextrins - 8-10% by weight of the foodstuff
Iota Carrageenan - 0.3% by weight of the foodstuff
Carboxymethylcellulose & Hydroxypropyl Methyl Cellulose -
0.5% by weight of the foodstuff.

20

The amylose polymer containing component of the thickened foodstuff may be obtained from any suitable source. Generally the amylose polymer containing component will be provided by a native starch, or a material comprising
) 25 native starch such as flour. Suitable native starches are for example, corn or maize starch, tapioca starch, wheat starch, rice starch, barley starch, pea starch, grain sorghum starch, potato starch and mixtures thereof.

30 It is an essential feature of the invention that the amylose polymer containing component is not pre-gelatinised. By pre-gelatinised is meant that prior to the addition of the second biopolymer component the amylose polymer containing component has not been heated above its
35 gelatinisation temperature. It is thus essential that the amylose polymer containing component is only heated above its gelatinisation temperature when in the presence of the



second biopolymer.

The amylose polymer containing component will usually be present at a level up to about 10% by weight of the final product. Furthermore the amylose content of the amylose polymer containing component is preferably less than 30%, when the amylose polymer containing component is a native starch.

Examples of the thickened foodstuffs according to the present invention are gravies; soups; sauces; dressings, spreads, mayonnaise; and the like.

The thickened foodstuffs according to the present invention may further comprise one or more components selected from fats; fat substitutes or replacers; animal protein; plant protein; fungal protein; vegetables; herbs; spices; dairy material; egg material; acidifying agents; emulsifiers; flavouring agents; flavouring precursors; sweetening agents; colouring agents; salt; minerals; vitamins; antioxidants; stabilizers, and mixtures thereof.

The fat (which includes oils) may be of vegetable or animal origin and may be a synthetic fat. It may be a single fat or fat fraction or a mixture of fats and/or fat fractions. At least part of the fat may be replaced by a low-calorie fat substitute or fat replacer. Particularly suitable fat replacers are the edible polyesters of polyhydric alcohols having at least four free hydroxyl groups, such as polyglycerols, sugars or sugar alcohols, and saturated or unsaturated, straight or branched alkyl chain C_8 - C_{24} fatty acids. The polyhydric alcohol fatty acid polyesters include any such polyesters or their mixtures of which an average of at least 70% of the polyhydric alcohol hydroxyl groups have been esterified with the fatty acids. Fatty alkyl ether derivatives of glycerol, esters of C_8 - C_{24} fatty alcohols and polycarboxylic acids, waxes and

microcrystalline cellulose can also be used for replacing or substituting at least part of the fat.

5 The animal protein may be the meat of mammals (such as beef, pork, lamb meat), poultry (such as chicken and turkey) and fish. Mixtures of meat may also be used.

10 The vegetable protein may be soyabean protein; the fungal protein can be myco-protein. Vegetables such as red peppers, onion may be used. The dairy material may be milk, cheese or yoghurt. The acidifying agents or acidulants may be innocuous acids such as acetic acid, citric acid, succinic acid, malic acid, vinegar or lemon juice. The stabilizers may be hydrocolloids and gums.

15 The emulsifiers are preferably selected from alkali metal or hydrogen C_{12} - C_{24} fatty acid acyl lactylates, such as sodium stearyl-2-lactylate; monoglycerides of, preferably saturated, C_{12} - C_{24} fatty acids, such as glycerol
20 monostearate; diacetyl tartaric acid esters of mono- and/or diglycerides of C_{12} - C_{24} fatty acids; succinylated monoglycerides of C_{12} - C_{24} fatty acids, and mixtures thereof.

25 The invention additionally comprises a process for the preparation of a thickened foodstuff having improved storage stability and retention of smoothness upon reheating comprising a non-pre-gelatinised amylose polymer containing component and a second biopolymer, which process includes causing the amylose polymer containing component
30 in solution to separate from a solution of the second biopolymer to form a dispersed phase.

The preparation process therefore comprises the steps of;

35 (i) preparation of a dispersion comprising the second biopolymer

This Sheet Has Been Replaced



(ii) mixing the second biopolymer dispersion to the amylose polymer containing component, the temperature of the second biopolymer dispersion during mixing being below the gelatinisation temperature of the amylose polymer containing component;

(iii) heating the mixture to a temperature of above the gelatinisation temperature of the amylose polymer containing component for sufficient time to substantially gelatinise the amylose polymer containing component; and

(iv) cooling the mixture as required and optionally freezing.

Preferably the dispersion of the second biopolymer described in step (i) is at a temperature of less than or equal to 55°C, most preferably from 40 to 55°C.

The amylose polymer containing component may be admixed to the second biopolymer dispersion either in powder form or as a dispersion. When the amylose polymer containing component is added as a dispersion, the dispersion is prepared at a temperature below the gelatinisation temperature of the amylose polymer containing component, preferably at a temperature of less than or equal to 55°C, most preferably at a temperature of from 20 to 40°C.

Preferably the mixture formed in step (iii) is heated to from 55°C to less than 160°C, most preferably from 85°C to 100°C, even more preferably to approximately 95°.

The preparation process may optionally include the additional step of subjecting the mixture comprising the second biopolymer and the amylose polymer containing component to shear immediately prior to cooling the mixture as required.





Preferably the shear force is effected by homogenisation, however, high-shear intensive mechanical mixing may alternatively be applied, such as milling in, for example, a colloid mill or by use of a scraped surface heat exchanger.

Preferably the amylose containing component is totally gelatinised by the heating step (iii).

Preferably the preparation process is conducted under conditions such that some of the starch granules retain their particulate nature. This provides particularly advantageous properties of taste and oral texture to the foodstuff.

Examples

Examples 1 to 13; Comparative Examples A to D

Examples of storage stable aqueous phases in which a natural German wheat starch is protected from freeze-thaw damage by the presence of a second biopolymer.

Example 1

A 1% Iota-carrageenan (X0908 90% i-carrageenan) solution was prepared by adding 5g of powder to 500 cm³ of a 0.4% NaCl solution, and heated up to 95°C with continuous stirring until the biopolymer was completely dissolved. The solution was allowed to cool to 40°C and 25g of natural German wheat starch (5%) was added to the biopolymer solution with continual stirring. The mixture was heated to 95°C and held at this temperature with gentle stirring for 10 minutes, until the starch was fully gelatinised. An aliquot of the mixture was bagged into a plastic sachet and placed in a -18°C freezer for 48 hrs. This sample was then

reheated by placing the sachet into a pan of water at 95°C for 20 minutes. Light microscopy studies were carried out on both the fresh and freeze-thawed/reheated samples using a Leitz ortholux II Microscope fitted with a video camera JVC KY F30B and linked to a Sony 5200 UP video printer. Samples were placed on a glass slide and stained using 0.2% Grams Iodine solution. A coverslip was placed on top and excess iodine was removed from the edges using absorbent paper. The slides were placed on the holding stage of the microscope and were viewed with a X10 objective giving a total magnification of X160.

Example 2

A 1% solution of Kappa-carrageenan (X6960 90% k-carrageenan) was prepared as in Example 1. The rest of the procedure was the same.

Example 3

A 2% solution of DE 35 Pectin (X2918, Hercules - CPF) was prepared as in Example 1. The rest of the procedure was the same.

Example 4

A 2% solution of "Slendid" Pectin (DE 10, LM Pectin Ex. Hercules - CPF) was prepared as in Example 1. The rest of the procedure was the same.

Example 5

A 1% solution of Xanthan (Keltrol F, Kelco) was prepared by dissolving in deionised water instead of a 0.4% salt solution using the same procedure as in Example 1. The rest of the procedure was the same.



Example 6

5 A 1% solution of locust bean gum (Sanofi Bio-industries) was prepared as in Example 5. The rest of the procedure was as in Example 1.

Example 7

10 A 1% solution of guar gum was prepared as in Example 5. The rest of the procedure was as in Example 1.

Example 8

15 A 1% solution of Agar (Luxara 1253, Branwells, UK) was prepared as in Example 5. The rest of the procedure was the same as Example 1.

Example 9

20 A 1% solution of alginate (Manugel DMB, Kelco) was prepared as in Example 5. The rest of the procedure was the same as in Example 1.

Example 10

25 A 10% solution of Maltodextrin (DE2) (Paselli SA2, Avebe) was prepared as in Example 5. The rest of the procedure was the same as in Example 1.

Example 11

30 A 0.5% solution of Kappa-Carrageenan (x6960 90% k-Carrageenan) was prepared as in Example 1. The rest of the procedure was the same.

35

This Sheet Has Been Replaced



Example 12

5 A 1% solution of DE 35 pectin (x2918, Hercules-CPF) was prepared as in Example 1. The rest of the procedure was the same.

Example 13

10 A 0.2% solution of Xanthan (Keltrol F, Kelco) was prepared as in Example 1. The rest of the procedure was the same.

Comparative Example A

15 A 1% solution of Gellan was prepared as in Example 5. The rest of the procedure was the same as for Example 1.

Comparative Example B

20 A 0.25% solution of Kappa-Carrageenan (x6960 90% k-Carrageenan) was prepared as in Example 1. The rest of the procedure was the same.

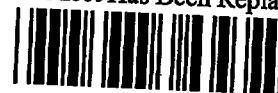
Comparative Example C

25 A 0.1% solution of Xanthan (Keltrol F, Kelco) was prepared as in Example 1. The rest of the procedure was the same.

Comparative Example D

30 A 0.5% solution of DE35 Pectin (x2918, Hercules-CPF) was prepared as in Example 1. The rest of the procedure was the same.





Results

Examples 1-13

5 Microscopy studies showed that the amylose polymer was present as discrete particles within the continuous phase comprising the second biopolymer. The discrete amylose polymers were retained on freezing and thawing.

10 Comparative Examples A to D

Microscopy studies showed that the amylose polymer was not present as discrete particles within the continuous phase comprising the second biopolymer. The compositions were not freeze-thaw stable.

Examples 14 to 15

20 Incorporating Kappa carrageenan or DE 35 Pectin as the second biopolymer and a natural wheat starch as the amylose component into a model oil-in-water emulsion to illustrate the advantages of the invention.

Example 14

25 Kappa carrageenan (1%) was dispersed in deionised water (73.0%) along with sodium chloride (0.4%) and sodium caseinate (0.5%), and heated to 95°C with continuous stirring to solubilise the k-carrageenan and sodium caseinate. This solution was allowed to cool to 40°C and then German wheat starch (3.5%) was added to the solution with stirring. The biopolymer/starch solution was heated to 95°C and held at this temperature for 10 minutes with continuous stirring, until the starch was gelatinised.

30

35 Sunflower oil (15%) was heated to 80°C and the biopolymer/starch solution (at 80°C) was added to the oil. A Silverson Laboratory mixer with tubular attachment

(2.45cm od) was used at maximum speed setting to convert the crude oil-in-water emulsion into a fine o/w emulsion with typical emulsion appearance. The o/w model system was finally titrated with white wine vinegar to a final pH value of 5. Light microscopy studies were carried out on both fresh and freeze-thawed/reheated samples as described in Example 1.

10 Example 15

2% DE 35 pectin and 3.5% German wheat starch were incorporated into the oil-in-water model emulsion and prepared as in example 19.

15

Results

Microscopy studies showed that the amylose polymer was present as discrete particles within the continuous phase comprising the second biopolymer. The discrete amylose polymers were retained on freezing and thawing.

20

Example 16

25

A low fat mayonnaise was prepared to illustrate the advantages of the invention. The product involved natural wheat starch as the amylose component and iota carrageenan as the second biopolymer.

30

This Sheet Has Been Replaced

35



Table 1: Composition

=====			
	Ingredient	%	g
=====			
5	Deionised water	76.231	3811.556
	Sucrose	9.000	450.000
	Sodium Chloride	1.500	75.000
	Glacial Acetic Acid	0.660	33.000
	German Wheat Starch	5.000	250.000
10	Sunflower Oil	5.000	250.000
	Egg Yolk Powder	0.400	20.000
	Mayonnaise gewurtz	0.005	0.200
	Lemon Aroma	0.005	0.250
	Dijon Mustard	1.200	60.000
15	Iota-Carrageenan (Hercules X-0908)	1.000	50.000
=====			
	Total	100.000	5000.000
=====			

20

A hot premix was prepared as shown in scheme 1. Deionised water was heated to 60°C in a jacketed tank fitted with a slow speed paddle stirrer and iota carrageenan dissolved in it (Silverson mixer, 5 min.) followed by sucrose and sodium chloride (Silverson, 3 min, 60°C). The solution was cooled to 40° and german wheat starch dispersed into it (Silverson, 3 min.). The dispersion was then heated to 95°C for 3 to 5 minutes to effect gelatinisation of the starch. After cooling to 80°C the mixture was acidified to pH 3.7 and the flavours and oil added. The hot pre-mix was then cooled to 5°C by processing through scraped surface heat exchanger and pin mixing units. The processing conditions are given in table 2.

25

30

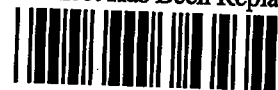
 This Sheet Has Been Replaced


Scheme 1: Pre-Mix Preparation

=====		
ACTION	TEMP (°C)	OBSERVATION
=====		
5		
	DEIONISED WATER	>60
	↓	
10	IOTA-CARRAGEENAN	>60
	(Silverson, 5min.)	Lumpy, Thick, Aerated
	↓	
15	SUCROSE, SODIUM CHLORIDE	
	(Silverson, 3-5 min.)	60
	↓	
	COOL	40
	↓	
20	GERMAN WHEAT STARCH	40
	(Silverson, 3-5min.)	White, V.Thick, Lumpy
	↓	
	COOK	95
25	(Hand Stir, 3 min.)	Low Viscosity, Smooth
	↓	
	COOL	80
	↓	
30	ACIDIFY	pH = 3.7
	↓	
	ADD FLAVOURS	
	(Egg, Mayo>, Lemon, Mustard)	
	↓	
35	ADD SUNFLOWER OIL	
	↓	
	RE-HEAT PRE-MIX	>85
		Very Smooth, creamy, Thick
	↓	
40	PROCESS TO DRESSING	5
	↓	
	PACK AND STORE	5
		Good Appearance, Very Smooth, Thick, Elastic, High Opacity, Excellent Mouthfeel.
45	=====	

This Sheet Has Been Replaced



Table 2: Processing

=====			
Unit		Temperature (°C)	
5	Used	Set	Measured
=====			
	Pre-mix Jacket	>85	85.0
10	A1 Jacket	-13	-13.0
	C1 Jacket	-7	- 7.5
	A2 Jacket	0	0.1
	A3 Jacket	2	1.9
	A1 Inlet		55.0
15	A1 Exit		17.6
	C1 Exit		6.0
	A2 Exit		5.8
	A3 Exit		4.9
20	A1 Rotor Speed (rpm)	3800	3 8 00
	C1 Rotor Speed (rpm)	4000	4 0 00
	A2 Rotor Speed (rpm)	1200	1 2 00
25	A3 Rotor Speed (rpm)	1200	1 2 00
=====			
30	The product was an excellent mayonnaise having a smooth, glossy appearance with a delicate pale yellow colour of high opacity. The texture was smooth, thick and elastic with an excellent mouthfeel and breakdown properties.		
35	Examination of the product by light microscopy revealed that amylose material was present as dispersed particulates. Freeze-Thaw stability was good as judged by		

having an unchanged microstructure and smooth texture after 60 hr. of frozen storage in a +60 > -20 > +60°C temperature cycle.

5 Examples 17 & 18

Examples showing high shear stability

10 Example 17

Low methoxy pectin (DE35, X3953, Hercules Ltd) (10.0g) was dispersed in deionised/distilled water (365.0g) using the vortex of a Silverson Laboratory mixer fitted with tubular attachments (1.9cm od). Sodium caseinate (2.5g) and Duchi B Alt (5.0g) was also added to the biopolymer solution then heated at 95°C to allow caseinate and pectin to solubilise, with continuous stirring. The solution was cooled to 46°C. German Wheat starch (15.0g) was added (as a slurry in 50.0g water) to the pectin/caseinate solution and stirred to form a biopolymer/starch dispersion.

25 The dispersion was heated to 95°C to allow the starch to gelatinise and was then added to a container of Sunflower Oil (75.0g) preheated to 80°C, with continuous mixing. Deionised water (15.0g) was used to wash any gelatinised starch left in the biopolymer/starch container and the washings added to the container of sunflower oil.

30 A Silverson laboratory mixer was used to shear (Maximum rpm) the biopolymer/starch oil mixture for 3 minutes at 95°C. The model sauce so formed was cooled to 45°C before the system was acidified from pH 6.5 to pH 5.5, using white wine vinegar (1.2ml). Finally the sauce was sealed in 250g sachets and frozen at 18°C.

35

This Sheet Has Been Replaced



Example 18

A sauce was prepared as in Example 25 but low methoxy pectin was replaced by Kappa-carrageenan (5.0g).

5

Results

The frozen sauces were prepared for microstructure examination, rheology testing and sensory evaluation by heating the frozen sachets in boiling water for 30 mins before removing and testing.

10

Starch was observed to be still granular and undamaged in form. The sauces were very smooth tasting.

15

Example 19

A white sauce was prepared from the formulation below by proportioning an aqueous and oil phase into a high speed C-Unit (crystalliser unit) with subsequent pH adjustment with addition on white wine vinegar.

20

Sauce Formulation:**Ingredient****Amount (%w/w on product)**

25

Oil Phase**Sunflower Oil****15.0**

30

Aqueous Phase**Iota carrageenan****1.0****Starch****3.0****Sodium Caseinate****0.5**

35

Duchi B ALT flavour**1.0****Deionised water****79.5****White wine vinegar****to pH 5.5**

40

This Sheet Has Been Replaced



Sunflower oil (Craigmillar, UK) containing 65% unsaturates, 11% saturates and a low level of cholesterol was heated to 60°C in a stirred pre-mix tank.

5 Half the amount of deionised water was pre-heated to 60°C in a pre-mix tank and iota-carrageenan dispersed into it using a Silverson mixer. Sodium Caseinate (Spray Bland, DMV, Holland) and remaining aqueous phase ingredients were dispersed in the remaining water at 60°C using a Silverson.
10 The two solutions were then combined in a pre-mix tank and cooled to 45°C. Natural starch was added and the dispersion heated at 95°C (Jacket 104C) and maintained at this temperature with stirring for 30 mins.

15 After cooling the aqueous phase to 60°C the oil and water phases were combined via a proportioning pump in a high speed crystalliser unit (C-Unit, no cooling) operated at 4000 rpm and with the oil phase being injected midway along the unit.

20 The emerging sauce was cooled to 60°C, mixed with white wine vinegar in a pre-mix stirred vessel until a pH of 5.5 was achieved and then packed into hermetically sealed vessels (Kilner jars or retortable pouches).

25 A smooth sauce was produced in which starch present in a partially swollen granular but undamaged form and which has a viscosity similar to a commercially produced white sauce.

30 Example 20; Comparative Examples E & F

These Examples illustrate that addition of the second biopolymer to a starch containing solution has no detrimental effect on the viscosity when the solution is
35 subjected to temperature and shear conditions, whereas the addition of gelatin prevents the starch-containing solution from retaining its viscosity.



Example 20

Potato starch (Farina) (2.5g) was added to a Rapid Visco-Analyser (RVA) stirring pot. 22.5g of a 1% iota-carrageenan solution in distilled water was added to the dry starch and mixed using the RVA paddle until the starch was homogenously dispersed and a smooth paste was formed. The RVA pot was placed into the RVA machine and a temperature-time profile set up (35 to 95°C at a heat rate of 1.5°C/min). The temperature was then maintained at 95°C for 5 min.

Comparative Example E

Example 20 was repeated except 22.5g distilled water replaced the iota-carrageenan solution.

Comparative Example F

Example 20 was repeated except 22.5g 4% gelatin solution in distilled water replaced the iota-carrageenan solution.

Results

A much lower product viscosity was obtained with the starch/gelatin mixture than either starch alone or starch/second biopolymer mixture.

This Sheet Has Been Replaced



CLAIMS

1. A thickened foodstuff having improved stability and retention of smoothness upon reheating comprising a non-pre-gelatinised amylose polymer containing component and a second biopolymer selected from iota carrageenan, kappa carrageenan, xanthan, maltodextrins, pectins, alginates, agar, Gum Arabic, Locust bean gum, Guar gum, carboxymethyl cellulose, hydroxy propyl methyl cellulose, and mixtures thereof; wherein the amylose polymer containing component is present as a dispersed phase.

2. A thickened foodstuff according to claim 1 wherein the second biopolymer is selected from iota carrageenan, kappa carrageenan, pectins, maltodextrins, xanthan, and mixtures thereof.

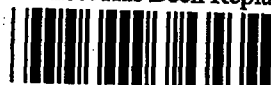
3. A thickened foodstuff according to claim 1 or claim 2, wherein the foodstuff additionally includes an emulsifier.

4. A thickened foodstuff according to claim 3, wherein the emulsifier is selected from alkali metal or hydrogen C_{12} - C_{24} fatty acid acyl lactylates, monoglycerides of, preferably saturated C_{12} - C_{24} fatty acids, diacetyl tartaric acid esters of mono- and/or di-glycerides of C_{12} - C_{24} fatty acids, succinylated monoglycerides of C_{12} - C_{24} fatty acids, and mixtures thereof.

5. A process for preparation of a thickened foodstuff having improved storage stability and retention of smoothness upon reheating comprising:

(i) preparation of a dispersion comprising a second biopolymer selected from iota carrageenan, kappa carrageenan, xanthan, maltodextrins, pectins, alginates, agar, gum arabic, locust bean gum, guar gum, carboxymethyl cellulose, hydroxy propyl methyl cellulose and mixtures





thereof;

(ii) mixing the second biopolymer dispersion to an amylose polymer containing component, the temperature of the second biopolymer dispersion during mixing being below the gelatinisation temperature of the amylose polymer containing component.

(iii) heating the mixture to a temperature of above the gelatinisation temperature of the amylose polymer containing component; and

(iv) cooling the mixtures as required and optionally freezing.

15

6. A process according to claim 5 wherein the dispersion of the second biopolymer described in step (i) is at a temperature of less than or equal to 55°C.

20

7. A process according to claim 5 or 6 wherein the dispersion of the second biopolymer described in step (i) is at a temperature of from 40 to 55°C.

25

8. A process according to any one of claims 5 to 7 wherein the amylose polymer containing component is admixed to the dispersion of the second biopolymer as a dispersion having a temperature below the gelatinisation temperature of the amylose polymer containing component.

30

9. A process according to claim 8 wherein the dispersion of the amylose polymer-containing component is at a temperature of less than or equal to 55°C.

35

10. A process according to claim 8 or 9 wherein the dispersion of the amylose polymer containing component is at a temperature of from 20 to 40°C.



11. A process according to any one of claims 5 to 10 wherein in step (iii) the mixture is heated to from 55°C to less than 160°C.
5. 12. A process according to any one of claims 5 to 11 wherein in step (iii) the mixture is heated to from 85°C to 100°C.
- 10 13. A process according to any one of claims 5 to 12 wherein in step (iii) the mixture is heated to a temperature of approximately 95°C.
- 15 14. A process according to any one of claims 5 to 13 additionally comprising subjecting the second biopolymer and amylose polymer containing component mixture to shear immediately prior to cooling the mixture as required and optionally freezing.
20. 15. A process according to any one of claim 5 to 14 wherein the amylose polymer containing component is totally gelatinised.

This Sheet Has Been Replaced

