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Preparation of beverages

5 The present invention relates to ready-to-serve heat treated protein containing beverages such as cafe au lait, and processes for their preparation.

10 It has hitherto not been possible to produce an acceptable ready-to-serve cafe au lait (coffee with milk) product involving high temperature processing followed by aseptic packaging owing to the development of poor physical stability defects including creaming, sedimentation and gelation. In addition, the coffee flavour intensity and quality tend to deteriorate significantly upon storage. These stability problems occur due to the
15 different chemical compositions of coffee and milk which render them detrimental to each other in maintaining consistent physical and flavour shelf stability. In cafe au lait these detrimental relationships are further complicated by additives such as buffering agents,
20 hydrocolloid stabilisers and/or emulsifiers.

25 We have now devised a ready-to-serve heat treated milk protein containing beverage in which the above physical stability defects can be alleviated and in which the flavour intensity and quality can be improved.

30 Accordingly, the present invention provides a ready-to-serve heat treated beverage comprising a beverage vehicle containing milk protein, a beverage base containing coffee or tea, a buffering agent, kappa carrageenan in an amount up to 0.010% and a chelating agent for
35 cations in an amount up to 0.25% containing at least 0.005% of sodium alginate and/or propylene glycol alginate, the said amounts being by weight based on the total weight of the beverage.

The beverage may be coffee with milk (cafe au lait), flavoured cafe au lait, tea with milk, mocha, orange cappuccino, butter rum, amaretto, etc.

The beverage vehicle may be milk or a mixture of milk and water. The beverage vehicle ^{preferably} has a pH above 6.63. The milk may be semi skimmed milk, skimmed milk or whole milk and preferably has a typical pH value of 6.6-6.8 especially for a coffee beverage. The mixture of milk and water may be, for example, dry milk solids and milk fat recombined with water.

The beverage base may conveniently be in particulate form, for instance instant coffee powder or a blend of coffee powder and cocoa powder e.g. mocha.

The proportions of beverage base and beverage vehicle are generally conventional according to the desired properties of the final product.

If desired, sugar or artificial sweetening agent may be present in the beverage. The amount of sugar or sweetener used is chosen according to the desired flavour and sweetness of the final product.

The kappa carrageenan is a stabiliser which reduces the extent of the physical stability defects such as fat separation or fat creaming, sedimentation and protein gelation. The chelating agent is used for binding cations such as potassium, magnesium and calcium ions which form carrageenan-mineral complexes which tend to gel and cause sediment. The chelating agent is used in an amount up to 0.25% containing at least 0.005% of sodium alginate and/or propylene glycol alginate by weight used on the total weight of the beverage product. Other suitable chelating agents may also be used with sodium alginate and/or propylene glycol alginate. Examples of suitable chelating agents are phosphates such as disodium phosphate, sodium tripolyphosphate, sodium hexametaphosphate or glass polyphosphate, and metal binding hydrocolloids such as anionic polysaccharides e.g. propylene glycol alginate, sodium alginate, preferably low calcium alginates. The phosphates also act as buffering agents. The total amount of chelating agent

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used is generally from 0.08% to 0.22%, preferably from 0.12% to 0.18% by weight based on the total weight of the beverage
5 product. The actual amount of chelating agent used is desirably the amount which reduces the physical stability defects most

successfully and may vary depending on the formulation and the coffee source. The amount of propylene glycol alginate or sodium alginate is preferably from 0.01% to 0.04% by weight based on the total weight of the beverage.

The amount of kappa carrageenan used is preferably from 0.001 to 0.008% and especially from 0.002% to 0.006% by weight based on the total weight of the beverage.

The buffering agent is necessary to protect the proteins from heat coagulation and is conventionally disodium phosphate. In a coffee and milk drink, the buffering agent should be capable of buffering the coffee acids e.g. to a pH ranging from 6.4 to 7.0 and preferably from 6.6 to 6.8 thus preventing milk protein aggregation and subsequent precipitation during heat treatment. If the amount of milk is increased the amount of buffer may be reduced owing to the buffers such as phosphates and citrates indigenous to milk. Generally, the amount of buffer ranges from about 0.10 to 0.25% by weight based on the total weight of the beverage.

Lecithin may advantageously be added to reduce the rate of creaming and improve stability. The amount of lecithin used may be up to 0.2% by weight, preferably from 0.05 to 0.1% by weight based on the total weight of the beverage. Flavouring materials may be added to the beverage, if desired.

The present invention also provides a process for the preparation of a ready-to-serve heat treated beverage which comprises mixing a beverage vehicle containing milk protein, a beverage base containing coffee or tea a buffering agent, kappa carrageenan in an amount up to 0.010%, and a chelating agent for cations in an amount

- up to 0.25% containing at least 0.005% of sodium alginate and/or propylene glycol alginate, the said amounts being by weight based on the total weight of the beverage, then heat-treating and homogenising the mixture. The heat treatment of
- 5 the beverage may be a standard retort sterilisation but is preferably a commercial sterilisation process using aseptic technology e.g. ultra high temperature (UHT) treatment, preceded or followed by homogenisation.
- 10 The UHT treatment may be carried out for example, at 135° to 150°C for from 2 to 30 seconds. The duration of the preheat treatment at about 80°C is not critical and may be from 10 to
- 15 heating by steam injection or steam infusion.

The beverage may be homogenised before or after the heat treatment, for example, in the pressure range of from 170×10^5 to 450×10^5 Pa (170 to 450 bars), preferably from 200×10^5 to

20 350×10^5 Pa (200 to 350 bars) and especially from 250×10^5 to 320×10^5 Pa (250 to 320 bars). The high pressure during homogenisation reduces creaming and slows milk protein gelation in milk containing beverages. The temperature during the homogenisation may be from 55°C to 85°C but advantageously it

25 is from 60°C to 70°C.

Afterwards, the beverage is aseptically packaged, for example, in plastics containers, such as Tetra Pak or Combi Bloc, or in cans or glass bottles and can be successfully stored at room

30 temperatures for extended periods of time e.g. 5-12 months. The beverage may be consumed cold or it may be heated for consumption, for instance, in a microwave oven.

The following Examples further illustrate the present

35 invention.

Examples 1 to 3

A ready-to-serve cafe au lait was prepared in which the ingredients indicated in Table I were blended in the proportions shown.

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TABLE I

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		<u>Example 1</u>	<u>Example 2</u>	<u>Example 3</u>
	<u>Ingredient</u>	wt %	wt %	wt %
10	Pasteurised whole milk	15.000	60.000	75.000
	Coffee powder	1.500	1.200	1.400
	Granulated sugar	6.000	4.500	3.500
	Disodium phosphate dihydrate	0.088	0.170	0.120
	Monosodium phosphate monohydrate	0.053	-----	-----
15	Kappa-carrageenan	0.003	0.005	0.005
	Sodium alginate	0.030	0.030	0.015
	Water	77.326	34.095	19.960
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20		100.000	100.000	100.000

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20 parts of water at 55°C were metered into a liquefier tank. The kappa carrageenan and sodium alginate were blended well with 0.5 parts of sugar in a plastic bag. The preblend was added slowly to the water in the liquefier over a period of 40 seconds, an additional 5 seconds was allowed for liquefying and then the mixture was agitated for 5 minutes for equilibration. The remaining water was added cold together with the milk (pH 6.65) and allowed to mix for 5 minutes. The remaining sugar was added with the liquefier on for a few seconds. The phosphates were predissolved in 0.5 parts hot water and added with agitation using a lightning mixer.

The mix was transferred to a batch tank and the coffee powder was added first with high speed agitation during coffee powder dissolution and then with low speed agitation to avoid foaming.

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The mix was then processed in a plate heat exchanger with a preheat treatment at 80°C for 60 seconds followed by steam injection at 141°C and held for 14 seconds. After flashing at 80°C, the mix was homogenised in double stages at $250 \times 10^5 / 50 \times 10^5$ Pa (250/50 bars) at 63°C and cooled before being aseptically filled into plastic cartons (Tetrapak - Tetrapak is a Registered Trade Mark).

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The shelf life at room temperature was at least 6 to 12 months.

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Claims

1. A ready-to-serve heat treated beverage comprising a beverage vehicle containing milk protein, a beverage base containing
5 coffee or tea, a buffering agent, kappa carrageenan in an amount up to 0.010% and a chelating agent for cations in an amount up to 0.25% containing at least 0.005% of sodium alginate and/or propylene glycol alginate, the said amounts being by weight based on the total weight of the beverage.
- 10 2. A beverage according to claim 1 wherein the beverage vehicle is milk or a mixture of milk and water.
3. A beverage according to claim 1 or 2 wherein the beverage
15 vehicle has a pH above 6.63.
4. A beverage according to any of claims 1 to 3 wherein sugar or an artificial sweetener is present.
- 20 5. A beverage according to any of claims 1 to 4 wherein the amount of kappa carrageenan is from 0.001% to 0.008% by weight based on the total weight of the beverage.
6. A beverage according to any of claims 1 to 5 wherein the
25 chelating agent is present in an amount of from 0.08% to 0.22% by weight based on the total weight of the beverage.
7. A beverage according to any of claims 1 to 6 wherein the amount of propylene glycol alginate or sodium alginate is from
30 0.01% to 0.04% by weight based on the total weight of the beverage.
8. A beverage according to any of claims 1 to 7 wherein the buffering agent is disodium phosphate.



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9. A beverage according to any of claims 1 to 8 wherein the amount of buffering agent is from 0.10% to 0.25% by weight based on the total weight of the beverage.
- 5 10. A beverage according to any of claims 1 to 9 wherein lecithin is present in an amount up to 0.2% by weight based on the total weight of the beverage.
- 10 11. A process for the preparation of a ready-to-serve heat treated beverage which comprises mixing a beverage vehicle containing milk protein, a beverage base containing coffee or tea, a buffering agent, kappa carrageenan in an amount up to 0.010%, and a chelating agent for cations in an amount up to 0.25% containing at least 0.005% of sodium alginate and/or 15 propylene glycol alginate, the said amounts being by weight based on the total weight of the beverage and then heat-treating and homogenising the mixture.
- 20 12. A process according to claim 11 wherein the heat treatment is an ultra high temperature processing treatment.
- 25 13. A process according to claim 12 wherein the ultra high temperature processing treatment is carried out at 135°C to 150°C for a period of from 2 to 30 seconds.
14. A process according to claim 11 or 12 wherein the beverage is homogenised before or after the heat treatment.
- 30 15. A process according to any of claims 11 to 14 wherein the homogenisation is carried out at a pressure in the range of from 250×10^5 to 320×10^5 Pa (250 to 320 bars) at a temperature from 60° to 70°C.
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