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RICE PORRIDGE PRODUCT AND METHOD OF PREPARING SAME

The present invention relates to rice porridge. The invention is especially concerned with the use of a mixture of milled rice and pre-cooked milled rice in the preparation of aseptic rice
5 porridge and a method of preparing same.

Rice porridge, also referred to as congee or gruel, is generally prepared by heating a mixture of rice and water so as to soften the grains of the rice. Nutrients, seasoning, flavourings and or other ingredients may also be added to the mixture.

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Freshly prepared rice porridge has an agreeable taste and consistency when the rice is softened to become sticky but only to the extent that much of the starch is maintained within the rice grains. If the porridge is cooked for too long or at too high a temperature, the surface tissue of the rice will be damaged allowing the release of excess starch. The resulting
15 porridge will be gluey, look starchy and have an undesirable texture and taste.

Rice porridge can be cooked and sterilised by instantaneous ultra-high temperature heating and then packaged aseptically. Cooked rice porridge may also be packed in heat-resistant containers and sterilised at high temperature and pressures. These methods generally lead to
20 the porridge having a steamed odour, loss of taste and flavour and poor physical properties due to high starch levels. Furthermore, when porridge in heat-resistant containers undergoes retort sterilization the high temperature processing can impart an undesirable odour or taste to the porridge unique to the container.

25 Pre-cooked aseptically packaged rice porridge having good odour, taste and physical properties is virtually non-existent and accordingly a method for preparing the same would have great commercial significance. Maintaining rice integrity and obtaining an acceptable texture in the preparation of the rice porridge are two of the most difficult problems to overcome.

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In an attempt to prepare aseptic rice porridge suitable for long-term storage, gelatin agents have been added during the preparation of rice porridge, and other methods have been proposed such as controlling the pH or temperature of the porridge during cooking, however, these methods have not successfully resulted in an aseptic rice porridge product suitable for
5 long-term storage and which maintains an agreeable taste and consistency at low temperatures. Rice porridge produced by these methods often still does not have a desired texture or good rice grain integrity.

It is an object of the present invention to overcome or at least alleviate one or more of the
10 above-mentioned disadvantages of the prior art.

Accordingly the present invention provides a method for the preparation of aseptic rice porridge including the step of heating a mixture of milled rice, pre-cooked milled rice and water.

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The invention also provides an aseptic rice porridge prepared according to the above method.

The rice porridge prepared according to the process of the present invention has superior properties when compared to rice porridge prepared using milled rice alone.

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The rice porridge of the present invention is particularly suited for packaging aseptically in a container. The mixture of milled rice and pre-cooked milled rice provides a finished product with cooked, open rice grains which are well preserved, giving a desired taste and texture to the finished product. The cooked, open rice grains are well preserved with good
25 integrity. The aseptic porridge is ready-to-eat and is also suitable for long term storage.

The term "milled rice" refers to regular-milled white rice in which the hull, bran layers and germ have all been removed. Preferably the milled rice is from Thailand.

The term "pre-cooked milled rice" refers to regular-milled white rice which has been soaked, cooked and dehydrated.

The rice porridge of the present invention may also contain other ingredients, such as, for example, vegetables, meat, seafood, fats, oils, spices, flavouring, sweeteners, nutrients and other conventional processed food additives, such as thickeners, preservatives, antioxidants and stabilisers, which may also be added in certain circumstances. Preferably any other ingredients are added to the original mixture of milled rice, pre-cooked milled rice and water, before the heating step.

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The ratio of milled rice versus pre-cooked milled rice is important to obtain rice porridge of good quality. If the ratio of milled rice to pre-cooked milled rice is too low, the porridge will become too mashy. On the other hand, if the ratio is too high, the porridge will become too watery. Preferably the ratio of milled rice to pre-cooked milled rice is from 1:3 to 3:1 w/w, more preferably about 5:4 w/w.

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During preparation of the rice porridge, preferably the mixture of rice, water and optionally other ingredients is heated at from 120-150°C for 2 to 5 minutes, more preferably from 130-140°C for 3 to 4 minutes, most preferably from 135-138°C for 3.5 minutes. This ultra high temperature step assists in the final cooking and the sterilization of the porridge.

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The production of rice porridge may be conducted in batch lots, however it is preferably suited to continuous production. It is preferred that the process of the present invention is conducted in a completely continuous process in which blending, pumping, heating, cooling and cleaning take place in an entirely closed system. This process results in consistently high product quality because the continuous production enables the same process conditions and parameters to be maintained day after day. Other valuable and commercial advantages are minimisation of product losses at start-up and shut-down, meticulous hygiene and aseptic processing.

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The mixture of milled rice, pre-cooked milled rice, water and any other ingredients are preferably heated with a Contherm™ scraped surface heat exchanger, although other similar heating units could be equally suitable. Scraped surface heat exchangers are exceptionally reliable and are designed for highly viscous products and products containing large particles.

- 5 High agitation of the product results in consistently efficient heat exchange. The scraping action of the blades keeps the surface of the heat exchanger clean even when extremely sticky products are processed.

It is desirable that the rice porridge prepared according to the present invention is cooled
10 aseptically prior to packaging. In a preferred embodiment, the rice porridge is cooled in stages whereby the rice porridge is precooled to from 80 to 50°C, more preferably to about 60°C and subjected to a final cooling to from 40 to 20°C, more preferably room temperature or about 25°C. Preferably the rice porridge is cooled and packaged aseptically so as to circumvent the need for an additional sterilization step for the porridge. The aseptic cooling
15 and packaging of the rice porridge will also help to maintain the integrity of the rice grains to provide a ready-to-eat rice porridge suitable for long-term storage. The porridge is preferably cooled with a Spiraflo™ cooling unit in order to minimise the damage to the cooked rice grain, although other similar cooling units could be equally suitable.

- 20 It is preferable that the rice porridge contains from 5 to 20% w/w rice in the product formulation. More preferably the rice porridge of the present invention contains from 8 to 9% w/w rice in the product formulation.

In order to facilitate an understanding of the invention, reference will be made to the
25 following examples which describe preferred embodiments of the invention. However, it is to be understood that the particularity of these examples is not too supersede the generality of the preceding description of the invention.

EXAMPLE 1 - PLAIN RICE PORRIDGE

Ingredients	QTY (kg)	% (w/w)
Water (80°C)	182.0	91.0
5 Thai Milled Rice	10.0	5.0
Pre-Cooked Milled Rice	8.0	4.0
Total:	200	100

The milled rice (10 kg) and pre-cooked milled rice (8 kg) were well mixed and added at a rate of 33 kg/h to a centrifugal pump together with water (182 kg) at 80°C at a rate of 332 L/h. The resultant mixture of milled rice, pre-cooked milled rice and water was pumped at 365 kg/h into a heating Contherm at 135°C and held for 3.5 min. The rice porridge so produced was cooled in stages by a Tetra Spiraflo, firstly to 60°C and then to 25°C. The cooled rice porridge was aseptically packaged.

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	pH	°Brix	Sensory
Before Packaging	5.77	2.3	Rice grains fully opened with good integrity, quite viscous
20 After packaging	5.83	2.3	Rice grains fully opened with good integrity, quite viscous
Aseptic package - next day	5.93	2.8	Rice grains fully opened with good integrity, viscosity increased slightly

25 The aseptic rice porridge was of excellent texture and overall the rice grain integrity was good with only a small amount of smashing of the grains. The viscosity of the porridge was about 600 cps at ambient temperature. The ready-to-eat aseptic rice porridge product was able to be stored at ambient temperature for weeks whilst maintaining the taste, texture and integrity.

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EXAMPLE 2 - CHICKEN RICE PORRIDGE

	Ingredients	QTY (kg)	% (w/w)
	Water (80°C)	692.00	86.2
5	Thai Rice (Milled rice: Pre-Cooked Milled Rice = 55:44)	64.00	8.0 (W:4.4) (T:3.6)
	Chicken Powder	13.60	1.7
	Seasoning Sauce	0.80	0.1
10	Fresh Spring Onion Mince (3mm)	3.84	0.48 (wet form)
	Fresh Ginger Mince (2mm)	2.64	0.33 (wet form)
	Cooked Chicken Mince (twice 10mm)	24.30	3.0 (wet form)
	Pepper Powder	0.80	0.1
	Cane Sugar	0.80	0.1
15	Total:	802.8	100

Chicken mince and broth were prepared by passing chicken fillets (27.5 kg) through a 10 mm screen, twice. Water was added to the minced chicken and the mixture heated at greater than 75°C for 10 minutes. The mixture was then filtered through a sieve to yield 20 cooked chicken mince (24.3 kg) and chicken broth (54.9 kg). The chicken broth was finefiltered to afford clear chicken broth which was used with the water in the preparation of the chicken rice porridge below.

A mixture of Thai milled rice and pre-cooked milled rice (55:44 kg) was added at a rate of 25 29.2 kg/h to a centrifugal pump together with water at 80°C at a rate of 298.8 kg/h, chicken broth, seasonings and powder at a rate of 32 kg/h, and the remaining solid ingredients at a rate of 140 kg/h. The resultant mixture was pumped at 365 kg/h into a heating Contherm at 138°C and held for 3.5 min. The chicken rice porridge so produced was cooled in stages by a Tetra Spiraflo, firstly to 60°C and then to 25°C. The cooled 30 chicken rice porridge was aseptically packaged.

	pH	°Brix	Sensory
Before Packaging	5.89	6.2	Quite viscous, good biting effect, good integrity of rice grains, chicken meat small, spring onions not visible.
5 After packaging	5.88	7.0	Slightly less viscous, good biting effect, good integrity of rice grains, chicken meat small, spring onions not visible.

The prepared aseptic chicken rice porridge was excellent in terms of product texture and rice grain integrity. After packaging some smashing of rice grains was noticed. The porridge had good biting effect and small pieces of chicken meat.

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OVERALL ACCEPTABILITY TEST OF PORRIDGE

		Plain rice porridge	Chicken rice porridge
15	Like Extremely	-	-
	Like Very Much	-	12 (60%)
	Like Moderately	6 (30%)	5 (25%)
	Like Slightly	2 (10%)	3 (15%)
	Neither Like nor Dislike	4 (20%)	-
	Dislike Slightly	4 (20%)	-
20	Dislike Moderately	1 (5%)	-
	Dislike Very Much	1 (5%)	-
	Dislike Extremely	2 (10%)	-

The plain rice porridge and chicken rice porridge prepared in Examples 1 and 2 were well liked by taste-test panellists. Panellists considered flavour, texture and taste of the rice porridge samples and the test showed that all panellists like the chicken rice porridge.

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Some panellists (40%) did not like the plain rice porridge and this was attributed to the plain porridge simply being virtually without taste compared to the chicken rice porridge.

The plain rice porridge and the chicken rice porridge were aseptically packaged and
5 subjected to incubation tests. The incubation tests for both types of porridge were
satisfactory after heating the samples either at 35° or 55°C for 7 days. However after
incubation and upon storage of these packs at 27°C for 15 days, a few of the packs were
found to be blown. Microbiological analyses and leakage tests were therefore conducted.
The conclusion was that the spoilage of the few packs was due to leakage and not due to
10 poor or incomplete sterilization of the porridge.

Those skilled in the art will appreciate that the invention described herein is susceptible to
variations and modifications other than those specifically described. It is to be understood
that the invention includes all such variations and modifications. The invention also
15 includes all of the steps, features, compositions and compounds referred to or indicated in
this specification, individually or collectively, and any and all combinations of any two or
more of said steps or features.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for the preparation of aseptic rice porridge including the step of heating a mixture of milled rice, pre-cooked milled rice and water to produce a rice porridge.
2. A method of claim 1, wherein the ratio of milled rice to pre-cooked milled rice is from 1:3 to 3:1 w/w.
3. A method of claim 1, wherein the ratio of milled rice to pre-cooked milled rice is about 5:4 w/w.
4. A method of any one of claims 1 to 3 wherein the mixture further contains vegetables, meat, seafood, spices, flavouring, nutrients or other ingredients.
5. A method of any one of claims 1 to 4, wherein the temperature of the water is about 80°C upon being admixed with the rice.
6. A method of any one of claims 1 to 5, wherein the mixture of milled rice, pre-cooked milled rice, water and any other ingredients are heated at from 120-150°C for 2 to 5 minutes.
7. A method of claim 6, wherein the mixture is heated at from 130-140°C for 3 to 4 minutes.
8. A method of claim 7, wherein the mixture is heated at from 135-138°C for about 3.5 minutes.
9. A method of any one of claims 1 to 8, wherein the heated mixture is aseptically cooled in at least one stage.



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10. A method of claim 9, wherein the heated mixture is cooled to about 60°C and then further cooled to about 25°C.
11. A method of claim 9 or claim 10, wherein the cooled mixture is aseptically packaged.
12. A method of any one of claims 9 to 11, wherein the rice porridge is prepared in a continuous process.
13. An aseptic rice porridge prepared by a method of any one of claims 1 to 12.

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ABSTRACT

The invention provides an aseptic rice porridge prepared from a mixture of milled rice, pre-cooked milled rice and water.