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(54) Title: CEREAL SUSPENSION

(57) Abstract: The invention relates to an improved cereal suspension that is manufactured by a novel method. Due to the novel method, the consistency as well as the taste and the sweetness of the.suspension - can- be controlled. The method of manufacture includes steps where amylases are used in specific combinations, resulting in the degradation of beta-glucans in the oat and in an increase in the sweetness of the suspension. After the enzymatic treatment, beta-glucans from another source are added, a measure which enables an efficient control of the consistency of the suspension. The invention also relates to a cereal suspension that contains beta-glucans.

CEREAL SUSPENSION

FIELD OF INVENTION

The invention relates to a method for the production of a β-glucane containing cereal suspension as well as the β-glucane containing cereal suspension and products comprising β-glucane containing cereal suspensions.

BACKGROUND OF THE INVENTION

For a number of years focus has been on beta glucanes due to the health enhancing values of the beta glucanes. The beta glucanes have been linked to health effects such as being good for the cardiovascular system, gastrointestinal tract, positive weight control through a sated feeling as well as reducing the GI-load by lowering the glucose and the insulin levels.

WO90/10748 discloses a process for the manufacturing of a cellulose-containing product, whereby the whole biomass is obtained from annual cellulose-producing plant, such as cereals are treated with alkali.

WO95/07628 relates to a homogenous and stable cereal suspension tasting and smelling like natural oats, wherein said suspension have been treated with specific α- and β- amylases in separate steps and whereby the process give rise to an cereal suspension having at least partly intact β-glucanes from oat.

WO00/24270 discloses a method for producing from an oat flour fraction, a water soluble beta-glucane composition having a high beta glucane/glucose weight ratio such as from 15:1, or more, wherein said method comprises the use of β-amylase in an amount sufficient to transform more than 50 % by weight of starch contained in the oats flour fraction to maltose. The enzyme pullulase and/or protease may be used in combination with α-amylase.

The development of different functional food products has increased during the years. However, there is still a need of developing new products having improved properties as well as new properties and it is often difficult to produce cereal based suspension products with specific properties such as the consistency as well as giving a product a fat taste without adding any fat.

SUMMARY OF THE INVENTION

The invention relates to a new improved cereal suspension being prepared by a new invented method. By the invented method it may at least be possible to control the consistency of the developed cereal suspension as well as the taste and sweetness of the suspension. Additionally, the invented cereal suspension, lower the glucose response in a mammal, such as a human being compared to conventional cereal suspensions. Conventional cereal suspension such as oat suspensions does

not have a defined size of the beta-glucanes present within the suspension. The method comprises steps in which amylases are used in a specific combination which gives rise to steps in which the beta glucanes present within the oats efficiently and fast are degraded into small pieces of beta-glucanes, are systemically degraded as well as a sweet taste is achieved. The process is also very cost effective. After the treatment of the cereal suspension β-glucanes are added from another cereal source and thereby it is possible to control the consistency efficiently.

In a first aspect the invention relates to a method for the production of a β-glucane containing cereal suspension comprising the steps of; providing dry-or wet-grinded rolled cereals, suspending said first cereals if the cereals has been dry-grinded in a liquid, treating said cereals with at least three different enzymes, wherein said enzymes are α- and β- amylase enzymes, wherein the enzymes degrades the fibres, adding whereby you thereafter may add β-glucanes from a second cereal source, in an amount of from 0.011 to 1,0 % and obtaining the β-glucane containing cereal suspension.

Such a suspension will have a number of improved properties such as reduction of the LDL (bad cholestrerol) cholesterol content, increased viscosity when the cereal suspension passes the small intestine which delays the adsorption of fats and sugars, lower the glucose response compared to conventional cereal suspension. Normally, conventional cereal suspensions does not contain substantially intact β-glucanes. The invented suspension gives a good feeling of satiation which aids in limiting the caloric intake as well as a number of other health enhancing effects.

In a second aspect the invention relates to a β-glucane cereal suspension product comprising a first cereal suspension to which β-glucanes from a second source of cereals has been added, wherein the amount of β-glucanes are from 0.01 to 1.0 %, wherein the cereal suspension and the β-glucanes are from different cereal sources. The β-glucan cereal suspension may be obtained by the above described method.

In a third aspect the invention relates to a product comprising a β-glucane cereal suspension.

BRIEF DESCRIPTION OF DRAWINGS

Fig 1 illustrates one way to produce the invented cereal suspension as explained in EXAMPLE 1.

DETAILED DESCRIPTION OF THE INVENTION

The invention relates to a β-glucane cereal suspension, wherein said suspension being based on a cereal suspension from a first cereal source, wherein the major part of the fibres such as the β-glucanes has been removed or degraded and to which β-glucanes from a second source has been added to an amount of 0.01 to 1.0 %, such as 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 or 1.0%. Examples are 0.2-1.0 % or 0.5-1.0 % The β-glucane cereal suspension has a Brix number from 9-11, such as to 9.5, 9.6, 9.7, 9. 8, 9.9, 10.0, 10.1, 10.1, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8 or 10.9. The brix number is an indication on, how much sucrose a product contain. The cereal source may be different kinds of wheat, such as durum, dinkel and bulgur, triticale, oat, rye, corn, grain sorghum, pearl millet or barley, such as the suspension may be produced from oat and the β-glucanes may be from barley, rye or another oat source. Other sources may be leguminous plants. One specific example being the combination of wheat to which β-glucanes will be added. The cereal source may be any kind of pure cereal source or any mixture of given cereal sources. The second source of cereals which will be added after the β-glucanes have been removed or degraded from the first source may contain β-glucanes having a size of at least 400 000 Dalton, such as 500 000, 600 000, 700 000, 800 000 or more or having a size range of from 400 000 to 1 500 000 or 500 000 to 1 500 000 or 700 000 to 1500 000 Dalton. However, the size may vary depending on the cereal source and there will always be traces or minor amounts have a size less than the sizes mentioned above.

The invention also relates to a method in which the product defined above may be produced. The method comprises the steps of providing dry-or wet-grinded rolled cereals. The cereals may then be added to a vacuum container to which a liquid such as water will be added and the cereals suspended into a suspension. The vacuum container secures that the cereal suspension will no be exposed to air and no or just minor oxidation may occur. The cereal suspension will be treated with a subset of enzymes, wherein the order of the enzymes may be as follows: α-amylase enzyme followed by a β-amylase enzyme followed by an α-amylase enzyme. By the use of different treatments with different enzymes different cereal suspensions will be created, wherein the brix value of the cereal suspensions will increase during the treatment and the cereal suspension will obtain a taste which is sweeter and sweeter. Example of an α-amylase is Fungamyl® obtainable from Novo Nordisk AS and Maltogenase® obtainable from Danisco AS and example of a β-amylase is DIAZYME®BB obtainable from Danisco AS. The β-glucanes of the cereal suspension will be partly or completely degraded during the enzymatic treatment, dependent on the purity of the enzymes. After a first treatment with at least an α-amylase the suspension may be passed into a colloid miller and milled into a homogenous suspension and the following treatment with at least a β-amylase for

an additional time period, wherein the Brix number increases. The enzymes may then be inactivated by for example an increase in temperature, such as above 100 °C. The fibre fraction may then be removed from the cereal suspension, wherein the fibre fraction comprises β-glucanes as well as other fibres by decanting. After treatment with at least a β-amylase the cereal suspension may be treated by at least an additional α-amylase, which will hydrolyse 1,4-alpha-glucosidic linkages in starch, partially hydrolysed starch and low-molecular weight oligosaccharides, including maltotriose. Maltose units are removed in a stepwise manner from the non-reducing chain ends. Example of an α-amylase suitable to be used in the final enzymatic treatment being Maltogenase™ obtainable from Novo Nordisk AS. All the steps used in the process are to achieve the goal of increasing the brix value to a value which gives a desired taste. The enzymatic steps will be followed by heat inactivating steps such as UHT treatment steps. Prior to that the product is finalised when β-glucans are added, wherein said β-glucans are from another source than the cereals that have been treated in the method. The β-glucans may be the Barley Bβ-Fibre obtainable from Culinar having a defined size of the beta-glucanes.

The β-glucane cereal suspension has a number of improved properties, such a well defined suspension will be more attractive to use as a health improving cereal suspension compared to other cereal suspensions. Such a suspension will have a number of improve properties such as it reduces the LDL (bad cholestrerol) cholesterol content, increased viscosity when the cereal suspension passes the small intestine which delays the adsorption of fats and sugars, lower the glucose response compared to conventional cereal suspension, gives a good feeling of satiation which aids in limiting the caloric intake as well as a number of other health enhancing effects.

The β-glucane cereal suspension may also comprise one or more added ingredients such as taste, colour, minerals, vitamins, vanilla, cacao, cinnamon, herbs, ginger, coffe, fruit, berries etc. Another example is inuline.

The β-glucan cereal suspension product may be ice-cream, gruel, yoghurt, milkshake, smoothie, a health drink or any other drink. The β-glucan cereal suspension product may be replacement product for an animal milk product such as a cow milk product.

EXAMPLES

EXAMPLE 1

Production of an oat suspension.

Fig 1 shows how the β-glucane containing oat suspension was prepared in the example. 480 kg of oat flakes (Frebaco AB, Linköping, Sweden) and the enzyme Fungamyl® obtainable from Novo Nordisk AS was added in an amount of 91 ml was added to the vacuum container as well as 450 ml of DIAZYME®BB obtainable from Danisco AS
and (2) into which 3281 kg water was pumped from container (3), wherein container 3 has a temperature of 57 °C. The oat suspension was treated for 8 minutes and then transferred to a colloid mill (4) were the suspension was milled for 20 minutes and transferred to container 5 to which 91 ml of Fungamyl (6) and the treatment contained for additional 22 minutes. The enzymes were then inactivated at 110 degree C (7) followed by a flashing step at 75 °C (8). The flashing was followed by a step of decanting (9) wherein the fibre fraction containing β-glucanes were removed from the oat suspension followed by e cooling step (10) performed at a temperature of about 58-60 °C. The oat suspension was transferred to a container (11) and 220 ml of Maltogenase (12) was added and the oat suspension was perheated (13) and incubated until preferred taste is obtained having a brix value of about 10 when an UHT treatment (14) at 140 °C were performed to inhibit the enzymes. Again a step of flashing were done (15) followed by homogenisation followed by a final step of cooling down the product. To the oat suspension was then intact β-glucanes added in step 11 after treatment with Maltogenase. Optionally other ingredients such as those mentioned above may be added at the same step as the β-glucanes or at a different step.

The result is shown below.

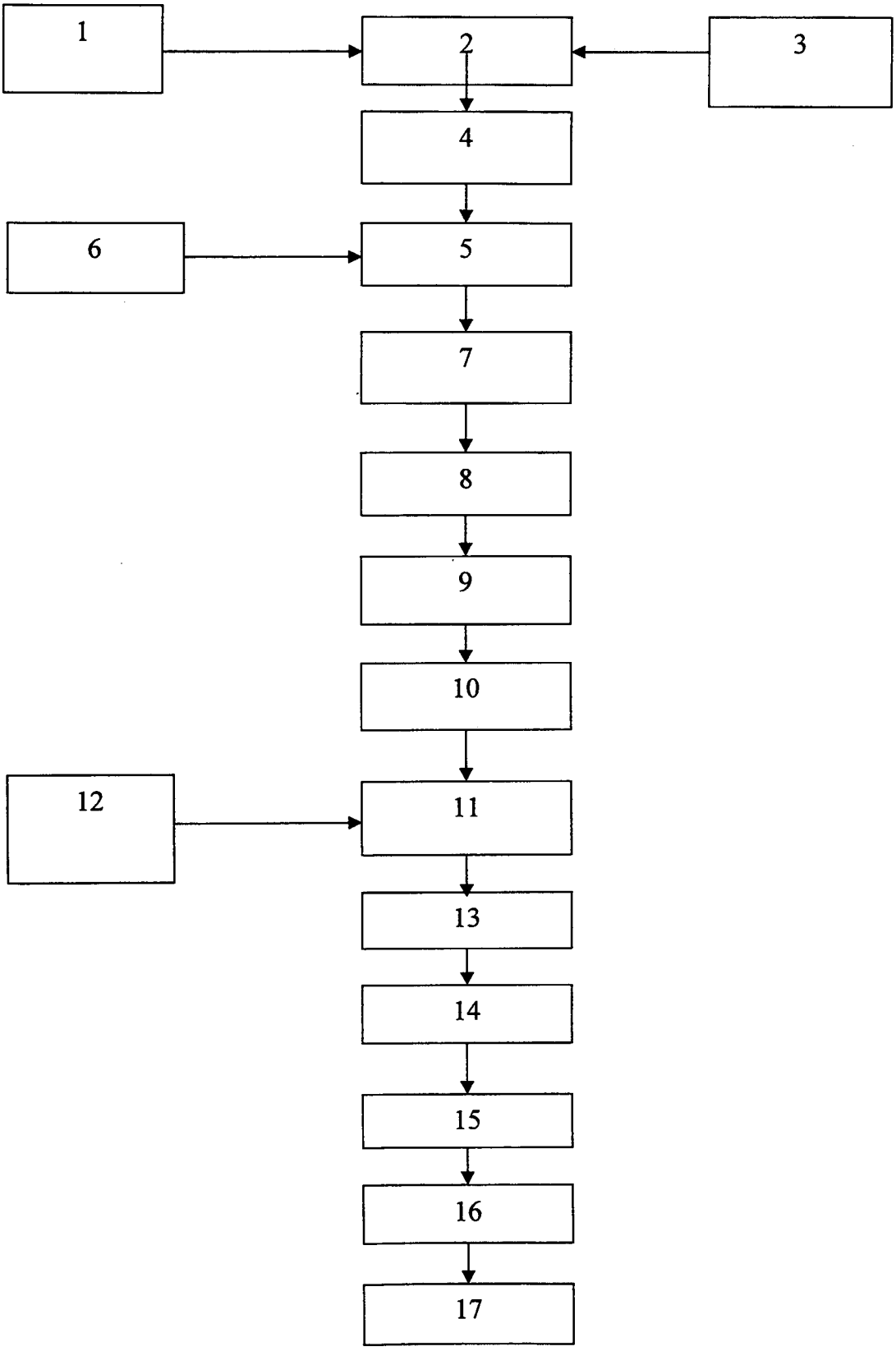
Material	Amount w/v	TS	Brix value	pH
Oat flakes and water prior to enzymatic step (2)	100 %	10.6	10.34	6.46
Oat suspension and β-glucanes final product	99.5 % 0.5 %	10.5	10.4	6.44
Product B-glucan oat suspension	98.25 %	11.6	11.04	6.33

Cacao B-glucanes salt	 1.10 % 0.5 % 0.15 %			

CLAIMS

1. A method for the production of a β-glucane containing cereal suspension comprising the steps of;
   a. Providing dry-or wet-grinded rolled cereals,
   b. Suspending said first cereals if the cereals has been dry-grinded in a liquid,
   c. Treating said cereals with an α-amylase,
   d. Treating said cereals with a β-amylase, , wherein step c always is prior to step d,
   e. Treating the cereals with an α-amylase after step d),
   f. Removing unsoluble fibres,
   g. Adding β-glucans from second cereal source, in an amount of from 0.011 to 1,0 % and
   h. Obtaining the β-glucane containing cereal suspension.
2. The method according to claim 1, wherein said process comprises an additional step of inactivating said enzymes after step d.
3. The method according to any of claims 1-2, herein said first cereals in step b is suspended in water.
4. The method according to any of preceding steps, wherein said β-glucans from said second cereal source have a size of at least 400 000 Dalton.
5. The method according to any of preceding claims, wherein said enzymes are different enzymes.
6. The method according to any of preceding claims, wherein said inactivating step is performed by UHT treatment (Ultra High Temperature).
7. The β-glucane cereal suspension product according to claim 6, wherein the Brix number of the product is from 9-11.
8. The method according to any of preceding claims, wherein said process comprises the steps of:
   a. Adding one or more ingredients to said cereal suspension in step g.
9. The method according to any of preceding claims, wherein the cereals are selected from the group consisting of wheat, triticale, oat, rye, corn, grain sorghum, pearl millet or barley.
10. A β-glucane cereal suspension product comprising a first cereal suspension to which β-glucanes has been added from a second source of cereals, wherein the amount of β-glucanes are from 0.01 to 1.0 %.
11. The β-glucane cereal suspension product according to claim 10, wherein said β-glucans from said second cereal source have a size of at least 400 000 Dalton.

12. A product comprising the β-glucane cereal suspension according to any of claims 1-11.
13. The product according to claim 12, wherein said product is selected from the group consisting of ice-cream, gruel, yoghurt, smoothie, milkshake, health drink.


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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2009/000409

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A23L, A23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	JP 2003274852 A, ASAHI DENKA KOGYO KK, 2003-09-30: (abstract) Retrieved from: WPI database, WEEK 200381, AN 2003-869417 --	9-13
Y	WO 02065855 A2 (CEREAL BASE CEBA AB), 29 August 2002 (29.08.2002), abstract --	9-13
Y	US 5686123 A (LINDAHL L. ET AL), 11 November 1997 (11.11.1997), abstract --	9-13

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Cited literature, if any, will be enclosed in paper form.

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