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(54) **Title:** NATURAL OAT DRINK COMPRISING DRINKABLE PORRIDGE

(57) **Abstract:** According to an example aspect of the present invention, there is provided a method of producing a natural oat drink comprising drinkable oat porridge, which serves consumers as an easily digestible bio booster for everyday life. Also, such oat drink, packed in a manner to guarantee at least 12 months shelf life, belongs to the scope of the present invention.



WO 2017/005987 A1

NATURAL OAT DRINK COMPRISING DRINKABLE PORRIDGE

FIELD

[0001] The present invention relates to a non-fermented drink, which contains mainly oat flour and water, and optionally berries. The invention provides at least the benefits of natural whole grain oats as in oat porridge in combination with good storage ability.

BACKGROUND

[0002] Bilberry, lingonberry and cranberry are good sources of fiber, most of which is insoluble. The berries contain protective nutrients like vitamins and minerals and a small level of energy. They contain a small amounts protein and fat. The levels of alpha linoleic acid, fiber and vitamins C and E related to the level of the energy are high, when the ratio is compared to recommendations. The berries are a good source of these protective nutrients (Sitra, 2008).

[0003] Bilberry, lingonberry and cranberry contain also phenolic compounds like flavonoids, phenolic acids and tannins, which have effect on health. The flavonoids of bilberry, lingonberry and cranberry are anthocyanin, flavonoils and catechins. Phenolic acids are hydroxy cinnamon acids and hydroxy benzo acids. Tannins contain oligo- and polymeric proanthocyanin (Sitra, 2008).

[0004] The polyphenolic group of bilberry has highest level of anthocyanines (over 500 mg/100g). According to USDA data the level of anthocyanin of blueberry is clearly lower (less than 200 mg/100g). Bilberry is the best source of anthocyanin in the Finnish foods. The polyphenolic group of lingonberry and cranberry has highest level of proanthocyanin (Sitra, 2008).

[0005] Bilberry, lingonberry and cranberry contain also resveratrol. According to USDA the level of resveratrol in lingonberry is comparable to grapes (6500 ng/g dry weight) (Sitra, 2008).

[0006] These anthocyanins components give bilberry its blue/black color and high antioxidant content, and they are believed to be the key bioactive compounds responsible for the many reported health benefits of bilberry and other berry fruits. Although bilberry is promoted most commonly for improving vision, it has been reported to lower blood glucose, to have anti-inflammatory and lipid-lowering effects, and to promote antioxidant defense and lower oxidative stress. Therefore, bilberry is of potential value in the treatment or prevention of conditions associated with inflammation, dyslipidemia, hyperglycemia or increased oxidative stress, cardiovascular disease (CVD), cancer, diabetes, and dementia and other age-related diseases. There are also reports that bilberry has antimicrobial activity (Benzie and Wachtel-Galor, 2011).

[0007] Oats contain high level of fiber and also soluble fiber as beta glucan. Oats contain the best quality of protein of the cereals. In addition oats contain high level of good quality of fat. Oat starch grains are similar in size (approximately 8 microns) to rice and smaller than other cereal starches. These properties make oat flour an ideal component for drink products. Oats has also neutral pleasant taste. The beta glucan fraction of oats has got EU-health claim. Oat beta glucan can manage cholesterol and level of glucose in blood, when the conditions are controlled.

[0008] Most of the oat drinks in the markets contain starch, which is hydrolyzed with enzymes in order to control the viscosity and to bring the sweetness. An example is oat drink called Oatly. Another option is to use maltodextrin or oligosaccharides, the length of which is controlled, as a carbohydrate source. Many sport drinks are built based on maltodextrin or oligosaccharides. Modified starch is used in very many moist products and drinks in order give sustainable viscosity.

[0009] Patent application WO 2009/071737 describes a method for improving the stability of an oat-based non-dairy drink, and also such healthy drink with a soft taste. The objective of the patent application is to produce a stabilized oat drink using berries with high antioxidant activities. These berries have normally extensive flavour such as sea buckthorn, which is taken into control in the patent application by using oat base ingredient. Although the invention is directed to oat based berry drinks, it does not describe for example the utilization of self-occurring sedimentation phenomenon and cooking of porridge simultaneously during a heat-treatment in producing drinkable oat porridge.

SUMMARY OF THE INVENTION

[0010] The invention is defined by the features of the independent claims. Some specific embodiments are defined in the dependent claims.

[0011] According to a first aspect of the present invention, there is provided a method of producing natural oat drink.

[0012] According to a second aspect of the present invention, there is provided a method of producing a bio booster, having the benefits of e.g. natural berries but at least natural fine milled whole grain oats, wherein the method utilizes heat-treatment in producing drinkable oat porridge.

[0013] These and other aspects, together with the advantages thereof over known solutions are achieved by the present invention, as hereinafter described and claimed.

[0014] The method of producing an oat drink according to an embodiment of the present invention is mainly characterized by what is stated in the characterizing part of claim 1.

[0015] The oat drink according to an embodiment of the present invention is mainly characterized in claim 8.

[0016] Considerable advantages are obtained by means of the invention. For example, the oat drink is healthy, easy to produce and does not require separate homogenization. In addition, the oat drink can be stored at least for 12 months. Another further advantage is the low glycemic response of the oat drink.

[0017] Next, the present technology will be described more closely with reference to certain embodiments.

EMBODIMENTS

[0018] It is described herein a method for producing a natural bio booster, i.e. an oat drink, which provides the benefits of oat porridge in a drinkable form. Also some of the essential features of such produced oat drink are described.

[0019] Term “natural” in the present context of an oat drink means a drink, which contains mainly water and cooked oat flour, and optionally a berry ingredient. Oat flour is not hydrolysed to sugars or maltodextrins.

[0020] FIGURE 1 is a chart showing the results from glycaemic response measurements of the oat drink and reference oat porridge according to example 7. The chart discloses postprandial glucose response of the measured substances from which the advantageous low glycemic response of the oat drink can be calculated (tables 6 and 7).

[0021] One aspect of the present invention is a method of producing an oat drink comprising oat flour, which can be pre-cooked, mixed at least with water, which method is characterized by utilizing self-occurring sedimentation phenomenon, whereby the oat flour is simultaneously cooked during pasteurization or ultra-high temperature (UHT) heat-treatment to form a natural easily drinkable oat porridge. “Easily drinkable” means for example that the drink has such viscosity that it can be poured into mouth or sucked by a straw from the beverage package.

[0022] One aspect of the present invention is to provide cooked shelf stable oat porridge drink.

[0023] According to another aspect of the present invention, the oat drink of the present invention contains:

- berry juice,
- sweetener(s),
- whole grain oat flour, and
- optionally salt

[0024] According to one embodiment of the present invention, it is preferred that the used oat flour is colloidal whole grain oat flour, which contains beta-glucan.

[0025] The oat drink of the present invention may also contain ingredients selected from the following:

- a source of protein,
- a source of fiber,
- a source of oil,
- glucomannan (konjac) to which EU has given health claim,
- healthy ingredients,
- added vitamin(s), and
- antioxidant(s) for example from green tea

[0026] In addition oat drink of the present invention may contain:

- colorizing agent
- flavoring agent
- stabilizer

[0027] According to one embodiment the oat drink of the present invention may further contain rice and soy.

[0028] According to one embodiment, the berry juice ingredient of this present innovation is preferably produced from bilberries, lingonberries, strawberries or cranberries, or any combination thereof. However, berry juice may also be produced from any other berries, for example blueberries, raspberries, gooseberries, chokeberries, goji berries, cloudbberries or arctic raspberries, or any combination thereof. The material of berry juices can also be described similarly as in WO 2009/071737.

[0029] The term “berry juice” herein means a material that can be obtained from berries for example by pressing, steam extraction or by other means used in the juice production. Berries are small fruits with multiple seed that are called berries in the common language and that are suitable for human consumption. The pressing cake including seeds and peels/skins is conventionally removed from the berry juices. The berry juices can be concentrated by removing water from it and if required, the concentrates can be diluted again. In the present invention berry juice is meant to mean the 100% juice from bilberries, lingonberries or cranberries or juices presented in the previous paragraph.

[0030] According to another embodiment, juices from fruits, such as citrus fruits, apples, bananas, pineapples, cherries and others that are in common language understood as fruits, may be used as the juice ingredient instead of berry juice.

[0031] According to one embodiment, the sweeteners are natural, such as honey, and plant syrups, such as agave, acacia, grape, maple, date, pineapple, mango, palm honey and oat syrup. Optionally sugar and sweeteners like stevia may be used.

[0032] According to another embodiment, the preferred oat ingredient is colloidal oat flour, which is whole grain oat flour, and is produced by patented method described in FI 124441. It is pre-cooked in order to produce better behaving oat porridge fraction into the oat berry drink. Optionally, fine milled whole grain oat flour or fine milled oat flakes can be used. The oat ingredient is kept in natural form during the process, where it is cooked and oat porridge is formed in order to bring the benefits of oat porridge into the oat berry drink. Salt is used, when required, in the same way as it is used, when oat porridge is cooked.

[0033] The protein source is preferably vegetative basis. It can be produced from oats, pea, cow pea, fava bean, rice, soy or other drink applicable vegetative protein.

[0034] The fiber source must be applicable to drinks and it needs to be mostly soluble into water. Suitable examples are fibers, which are based on resistant starches, polydextrose, fructo-oligosaccharides and hydrolyzed beta glucan.

[0035] According to one embodiment, the oil source may replace the oil, which is separated with the pressing cake. Suitable oil sources are for example rape seed, sunflower, maize, soy, olive palm, sesame, camelina almond, avocado, pumpkin, hemp or grape seed. Some of the oils provide healthy compounds like omega 3 oils, to which EU has given health claim, vitamins and/or plant sterols. Into the oil fraction vitamins, such as vitamin E, plant sterols, plant stanols or their derivatives, may be added.

[0036] The oat drink of the present invention may also comprise natural colorizing agent(s) in order to sustain the original color during the shelf life oat berry drink. Chokeberry (aronia) juice is one natural option. Natural colorizing agents, which are produced from the bilberries/blueberries, lingonberries or cranberries or similar berries are preferred in order to increase the colorizing substance in the drink. Other option can be got from black carrot fractions. Natural colorizing agents can be purchased.

[0037] Additionally, the oat drink of the present invention may comprise natural flavoring agent in order to sustain the flavor during the shelf life oat berry drink. Natural flavoring agents can be purchased.

[0038] According to one embodiment, the use of stabilizing agent in the oat drink is not preferred, because one aim is to sustain the natural behavior of whole grain oats and give the benefits of oat porridge in the oat drink. However, if stabilizing agent is used, beta glucan base ingredients are preferred. An example is PromOat (beta glucan concentrate product of Tate & Lyle) or any comparable product.

[0039] The ingredients are mixed, pasteurized or UHT treated and packed. Homogenization is not necessary and enzymes are not used, which means that starch and beta glucan is kept in the same form as in oat porridge.

[0040] According to one embodiment, the berry juice is produced from bilberries, lingonberries, strawberries or cranberries. The juice is produced for example by pressing, steam extraction or by other means used in the juice production. Pressing cake is separated away. Optionally the juice is evaporated to syrup. In the present invention berry juice meant to mean the 100% juice from bilberries, lingonberries or cranberries or berry juice presented before.

[0041] When a beta glucan containing de-hulled grain, such as oats is ground and pre-cooked, for example by extrusion (FI 124441) and the product obtained is finely ground, a natural colloidal meal used by the cosmetics industry is obtained, which, when required, fulfills the requirements of the USP monograph for colloidal meal (USP 32-NF27)). Beta glucan and other soluble bioactive substances are easily dissolved from this kind of meal.

[0042] According to one embodiment, more than 50%, preferably more than 70% and most preferably more than 90% of the beta-glucan is in a dissolved or emulsion-like form at the addition stage, which improves the viscosity properties of the formed ingredient mix i.e. operates as a stabilizing agent.

[0043] Beta glucan -containing pre-cooked oat flour does not contain any other ingredients than whole grain oats and moisture. As fine flour it is a very applicable natural ingredient in producing oat porridge fraction into oat berry drink.

[0044] In the Finnish patent FI 124441, the flour containing starch and beta glucan is pre-cooked by extrusion and finely ground. A flour containing starch and beta glucan can also be pre-cooked by drying the flour suspension on a roll dryer and grinding it, jet-cooking the flour suspension and grinding it after drying, and by subjecting the flour to

heat treatment in the presence of moisture e.g. in a preconditioner or expander and fine milling it after drying. The goal of pre-cooking is to make the starch portion of the flour either partially or fully water-soluble. Fine milling is used in order to produce particle, which cannot be noted in mouth and to accelerate the dissolution of beta glucan and starch. When a beta glucan -containing pre-cooked flour is dried and fine milled, a preferred raw material according to the present invention is obtained.

[0045] According to one embodiment, one optional raw material is fine milled oat flour, which can be reached by milling for example heat treated oat groats or oat flakes. The particle size ought to be the similar as is in the colloidal oat flour (FI124441): 97% smaller than 150 μm and 80% smaller than 75 μm . The small particle size is required for appropriate mouth feel and in order to accelerate the gelatinization in the short cooking time (UHT, pasteurization).

[0046] One of the embodiments is that an oat drink is composed of ingredients, which are mixed with water. The oat drink comprises preferably berry juice, sweetener(s), pretreated oat flour and salt. Optionally other ingredients are used such as protein, fiber, oil, glucomannan, and minor agents and nutrients. However, we must note that glucomannan requires higher amount of serving, because of the high viscosity and defined level of glucomannan in order to reach the health claim.

[0047] According to one embodiment, the oat drink comprises 1 to 5 wt-% of pre-treated whole grain oat flour and 15 to 50 wt-% of berry juice, or other juice ingredient, of the total weight of the oat berry drink.

[0048] Oat drink may additionally contain natural sweeteners like honey and plant syrups such as agave, acacia, grape, maple, date, pineapple, mango, palm honey and oat syrup. Optionally sugar can be used, but natural sugar or sweetener sources are preferred like demerara sugar, or stevia.

[0049] Protein, fiber and oil may also be added together with other ingredients at the same time or each of them can be added separately. All of the ingredient must be appropriate in drink production. One suitable example of protein ingredient is special pea protein produced by Roquette. Fiber source may for example be resistant starch, polydextrose, inulin, fructo-oligosaccharides and hydrolyzed beta glucan. Oils, which are used in the food industry may be used as the oil, for example rapeseed, canola, sunflower,

corn, soybean, olive, palm, sesame, camelina, linseed, almond, wheat germ, avocado, peanut, pumpkin seed, hemp, grape ja argano oil. Some oils, e.g. sesame, olive or peanut oils, may introduce new flavors. Some oils, e.g. green pumpkin seed oil may have effect on color. Some oils introduce functional components, e.g. omega-3 oil, vitamins and/or plant sterols. The oils can also be supplemented with oil-soluble functional components such as vitamins, plant sterols and plant stanols or their derivatives.

[0050] Furthermore, glucomannan (e.g. from konjac) may be used instead of fiber if EU-health claim for satiety is wanted. "The claim may be used only for food which contains 1 g of glucomannan per quantified portion. In order to bear the claim information shall be given to the consumer that the beneficial effect is obtained with a daily intake of 3 g of glucomannan in three doses of 1 g each, together with 1-2 glasses of water, before meals and in the context of an energy-restricted diet. Warning of choking to be given for people with swallowing difficulties or when ingesting with inadequate fluid intake - advice on taking with plenty of water to ensure substance reaches stomach." Thus we must note that glucomannan requires higher amount of serving, because of the high viscosity and high defined level of glucomannan in order to reach the health claim.

[0051] According to one embodiment, the oat drink comprises natural vitamins from its ingredients like oat flour, berry juice, honey and other natural sweeteners. However, part of them is destroyed during the heat treatment and shelf life. If additional vitamins are needed, they may be added and should preferably be water soluble like C and B vitamins and/or fat soluble D and E vitamins with the oil ingredient. Applicable vitamin premixes can be purchased.

[0052] Additionally, the oat drink of the present invention may comprise natural colorizing agent. Chokeberry (aronia) juice is a natural option. Natural colorizing agents, which are produced from the bilberries/blueberries, lingonberries or cranberries or similar berries are preferred in order to increase in the drink the polyphenol group, which provide the natural color. Another suitable option is obtained from black carrot fractions. Natural colorizing agents can be purchased.

[0053] The oat drink of the present invention may also comprise natural flavoring agent in order to sustain the flavor during the shelf life the oat drink. Natural flavoring agents produced from bilberries/blueberries and cranberries can be purchased.

[0054] Oat drink is produced in order to avoid typical stabilizing agents, because the aim is to keep the oat porridge fraction as natural as possible. Therefore natural beta glucan products are preferred, which provide adequate stabilizing effect.

[0055] The ingredients and water are mixed together according to the recipes presented in the examples below. Optionally with oil is added some vitamins and some minor agents. The suspension is optionally homogenized, pasteurized or UHT-treated and packed.

[0056] One aspect of the present method is to use whole grain oat flour, which has the same nutritional values as oat flakes. Whole grain oat flour brings the benefits of oat porridge into the oat berry drink. The whole grain oat flour is preferably pre-cooked as in FI 124441 in order to make it easier to produce the final oat porridge in pasteurization or UHT. Thus, natural and drinkable oat porridge with healthy berry juice is provided, with an option to add sweeteners and bit of salt in the production phase. Also other ingredients, such as oil, may be added, to obtain the same taste as in normal edible porridge. Also a natural stabilizer like a beta glucan is included and may be further added.

[0057] The present method is also characterized by the natural sedimentation, which is regarded to be a positive phenomenon. When fruit nectars are produced it is normal to add the processed (homogenized) pulp back to the juice at the late stage of the production. Instead of recycling the peels and skins and seeds of pressing cake, we add oat flour, which will cook in pasteurization or UHT and produce similar product fraction like oat porridge.

[0058] When EU nutrition claims are required, protein and/or fiber can be added. When EU health claims is required, glugomannan from konjac can be added. The oat porridge will be still there in the oat drink.

[0059] One goal of the present concept is to provide an oat drink having low glycemic response, which can be measured also with glycemic index (GI), which is a calculated value indicating the food's or drink's effect on a person's blood glucose level and representing the rise in a person's blood sugar level following consumption of the food or drink compared to a blood glucose level following consumption of reference food.

[0060] Glycemic index (GI) values are given by a method, where glycemic responses of different foods are compared independently. The comparison is possible, because the blood glucose measurement and the reference food are standardized. GI is

typically defined as the incremental area under the two-hour blood glucose response curve (AUC) following a 10- to 12-hour fast and ingestion of a food or drink with certain quantity of available carbohydrate. A low-GI product releases glucose more slowly and steadily leading to more suitable after meal blood glucose readings. The glycemic responses of different products can also be compared to each other, when the measurements are standardized. The low glycemic response oat drink of the present invention has the advantage of keeping away the hunger and maintaining the body energetic level longer time than corresponding healthy food, such as oatmeal (oat porridge). Thus, the oat drink of the present invention may also have positive effect in preventing obesity and diabetes and could therefore be recommended as substitute energy consumption for dietary and weight control programs.

[0061] Thus, in one important embodiment of the present invention the glycemic response of the oat drink is at least 40 %, more preferably at least 50 % and most suitably at least 60 % lower than average edible oatmeal (oat porridge) with same available carbohydrate amount. Available carbohydrate amount is intended to mean the calculative amount of digestible carbohydrates.

[0062] A further embodiment of the present invention is an oat drink, wherein the glycemic response is between 50 and 60, more preferably 56 or less per 250 g of the oat drink.

[0063] One further aspect of the present invention is a labelled beverage package, containing pasteurized or ultra-high temperature (UHT) heat-treated oat drink as described herein above, having shelf life of at least 12 months.

[0064] It is to be understood that the embodiments of the invention disclosed are not limited to the particular structures, process steps, or materials disclosed herein, but are extended to equivalents thereof as would be recognized by those ordinarily skilled in the relevant arts. It should also be understood that terminology employed herein is used for the purpose of describing particular embodiments only and is not intended to be limiting.

[0065] Reference throughout this specification to one embodiment or an embodiment means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases “in one embodiment” or “in an embodiment”

in various places throughout this specification are not necessarily all referring to the same embodiment. Where reference is made to a numerical value using a term such as, for example, about or substantially, the exact numerical value is also disclosed.

[0066] As used herein, a plurality of items, structural elements, compositional elements, and/or materials may be presented in a common list for convenience. However, these lists should be construed as though each member of the list is individually identified as a separate and unique member. Thus, no individual member of such list should be construed as a de facto equivalent of any other member of the same list solely based on their presentation in a common group without indications to the contrary. In addition, various embodiments and example of the present invention may be referred to herein along with alternatives for the various components thereof. It is understood that such embodiments, examples, and alternatives are not to be construed as de facto equivalents of one another, but are to be considered as separate and autonomous representations of the present invention.

[0067] Furthermore, the described features, structures, or characteristics may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of lengths, widths, shapes, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention can be practiced without one or more of the specific details, or with other methods, components, materials, etc. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

[0068] While the forgoing examples are illustrative of the principles of the present invention in one or more particular applications, it will be apparent to those of ordinary skill in the art that numerous modifications in form, usage and details of implementation can be made without the exercise of inventive faculty, and without departing from the principles and concepts of the invention. Accordingly, it is not intended that the invention be limited, except as by the claims set forth below.

[0069] The verbs “to comprise” and “to include” are used in this document as open limitations that neither exclude nor require the existence of also un-recited features. The features recited in depending claims are mutually freely combinable unless otherwise explicitly stated. Furthermore, it is to be understood that the use of “a” or “an”, that is, a

singular form, throughout this document does not exclude a plurality.

INDUSTRIAL APPLICABILITY

[0070] At least some embodiments of the present invention find industrial application in food industry, in the production of a natural bio booster, which is based on the healthy benefits of e.g. natural berries in the form of a berry juice, and at least natural whole grain oats in the form of a drinkable porridge.

EXAMPLE 1 – Colloidal Oat flour as a raw material of oat porridge

Colloidal Oat Flour is produced from de-hulled oats, which are pre-milled, extruded and milled according to patent FI 124441. Colloidal Oat Flour has similar particle size as cacao. Thus Colloidal Oat Flour is precooked, dried and milled from the same material as oat flakes, which can easily be used in drinks. When Colloidal Oat Flour is heated during UHT/pasteurization unit operation of drink production, it creates oat porridge fraction, which is applicable to drinks. In Table 1 there is presented the nutritional content of Finnish oat flakes, Colloidal Oat Flour as is and also in the similar moisture level as the oat flakes.

Table 1.

	Oat Flakes Fineli, Finland 1.)	Oat Flakes Raisio	Oat Flakes Myllyn Paras	Oat Flakes Helsingin Mylly	Polar Glucan, 3.)	Colloidal Oat Flour as 12% moisture
Moisture 2.)	12,0	NA	NA	NA	4,0	12,0
Fat	7,3	8,0	7,5	6,9	7,4	6,8
Carbohydrates	57,0	55	54	56	59,6	54,6
Protein	14,5	14	14	14	15,7	14,4
Dietary fiber	10,0	11	11	11	11,8	10,8
Ash 2.)	2,0	NA	NA	NA	1,7	1,6
Energy kJ/100g	1566	1557	1522	1533	1648	1511
Energy kcal/100g	374	372	364	366	394	361

1.) Fineli is a Finnish food composition data base

values are from date 19.6.2015 <http://www.fineli.fi/index.php?lang=en>

2.) Moisture and ash levels are from Luke Feed tables

date 19.6.2015 https://portal.mtt.fi/portal/pls/portal/REHU_MTT_REHU_MTT_KAIKKITIEDOT_PACK.REPORT?p_kieli=3&p_feedcode=03004

3.) Values have been analysed in Luke from sample 15.2.2015

EXAMPLE 2 – The oat bilberry drink

Water, bilberry juice, honey, agave syrup, colloidal oat flour according patent FI 124441 and salt are mixed together, UHT treated and packed into autoclaved laboratory bottle. The nutritional information and the corresponding recipe are presented in Table 2.

Table 2.

NUTRITIONAL INFORMATION		RECIPE	
	g per 100 g		RECIPE g
Moisture	86,6	Bilberry juice	22,7
Protein	0,6	Honey	5,5
Starch and sugar	12,6	Agave syrup	3,7
Fat	0,0	Colloidal oat flour	3,4
Ash	0,1	Salt	0,1
Dietary fiber	0,0	Pea protein	0,0
SUM	99,8	Maize dextrin as fiber	0,0
Energy kJ/100 g	224	Water	64,6
Energy kcal/100 g	53	SUM	100,0

EXAMPLE 3 – The oat lingonberry drink or oat cranberry drink

Water, lingonberry juice or cranberry juice, honey, agave syrup, colloidal oat flour according patent FI 124441 and salt are mixed together, UHT treated and packed into autoclaved laboratory bottle. The nutritional information and the corresponding recipe are presented in Table 3 and Table 4.

Table 3.

NUTRITIONAL INFORMATION

	g per 100 g
Moisture	86,1
Protein	0,5
Starch and sugar	13,0
Fat	0,3
Ash	0,1
Dietary fiber	0,0
SUM	100,0
Energy kJ/100 g	241
Energy kcal/100 g	58

RECIPE

	RECIPE g
Lingonberry	20,0
Honey	5,8
Agave syrup	4,6
Colloidal oat flour	3,2
Salt	0,1
Pea protein	0,0
Maize dextrin as fiber	0,0
Water	66,4
SUM	100,0

Table 4.

NUTRITIONAL INFORMATION

	g per 100 g
Moisture	86,6
Protein	0,5
Starch and sugar	12,5
Fat	0,3
Ash	0,1
Dietary fiber	0,0
SUM	100,0
Energy kJ/100 g	232
Energy kcal/100 g	56

RECIPE

	RECIPE G
Ccranberry juice	20,0
Honey	5,8
Agave syrup	4,6
Colloidal oat flour	3,2
Salt	0,1
Pea protein	0,0
Maize dextrin as fiber	0,0
Water	66,4
SUM	100,0

EXAMPLE 4 – The amount of oat porridge fraction created into oat bilberry drink

Recipe of oat porridge:

3,5 dl of oat flakes, 1 litre of water and salt is mixed together and cooked

The weight of oat flakes and the oat porridge is the following:

3,5 dl oat flakes weight 140 g and thus the total weight of oat porridge is 1140 g.

Amount of oat porridge in a serving (250 g bottle) of oat bilberry drink:

250 g of oat bilberry drink contains 8,5 g whole grain oat flour (Table 2) in colloidal form, which is cooked during pasteurization/UHT-treatment. The dry matter of the whole grain

oat flour in colloidal form according to patent FI124441 is about 92%. When 8,5 g of whole grain oat flour in colloidal form is calculated to dry matter of oat flakes (88%), the weight of corresponding amount of oat flakes is 8,9g.

8,9 g oat flakes produces 72 g oat porridge according to the oat porridge recipe above. A spoonful of oat porridge weights about 10g. Thus we get about 7 spoons oat porridge, when we drink 250 g oat bilberry drink.

EXAMPLE 5 – Basic oat drink

Oat drink does not necessarily require berry or fruit juices. Basic oat drink can contain water, colloidal oat flour according patent FI 124441, maltodextrin, resistant starch, sugar, rape seed oil, tricalciumphosphate and salt that are mixed together, UHT/treated and packed into autoclaved laboratory bottles. The nutritional information and corresponding recipe are presented in Table 5.

Table 5.

NUTRITIONAL INFORMATION

	g per 100 g	g per 300 g
Moisture	91,0	273,0
Protein	0,4	1,2
Starch and sugar	6,1	18,2
Fat	1,0	2,9
Ash	0,4	1,3
Dietary fiber	1,1	3,4
SUM	100,0	300,0
Energy kJ/100 g	155	464
Energy kcal/100 g	37	111
Colloidal Oat Flour g	3,0	9,1

RECIPE OF OAT DRINK

	RECIPE g
Bilberry juice	0,0
Honey	0,0
Agave syrup	0,0
Colloidal oat flour	3,0
Salt	0,038
Pea protein	0,0
Resistant starch	0,9
Maltodextrin	2,9
Rape seed oil	0,8
Sugar	1,4
Tricalciumphosphate	0,4
Water	90,5
SUM	100,0

EXAMPLE 6 – The amount of oat porridge fraction created into a serving (300 g bottle) of basic oat drink

300 g of basic oat drink contains 9,0 g whole grain oat flour (Table 5) in colloidal form, which is cooked during pasteurization/UHT-treatment. The dry matter of the whole grain oat flour in colloidal form according to patent FI124441 is about 92%. When 9,0 g of

whole grain oat flour in colloidal form is calculated to dry matter of oat flakes (88%), the weight of corresponding amount of oat flakes is 9,4g.

9,4 g oat flakes produce 77 g oat porridge according to the oat porridge recipe of example 4. A spoonful of oat porridge weights about 10g. Thus we get about 8 spoons oat porridge, when we drink 300g basic oat drink.

EXAMPLE 7 – Glycemic response

Method

Glycemic response of an oat drink according to the present invention, i.e. Aberry Oat Bilberry Drink, and oat porridge (oatmeal) was tested.

Products tested

Aberry Oat Bilberry Drink contained the following ingredients: water, bilberry juice (22%), honey (5%), fine milled whole grain oat flour (3,5%), agave syrup, chokeberry juice and salt (0,1%). During the production the oat drink was UHT-treated, which simultaneously cooked also the whole grain oat flour of the oat drink. Aberry Oat Bilberry Drink was packed aseptically.

Oat porridge was prepared in the following way: 45,5 Quaker Quick Cooking White Oats oat flakes and 250 ml of boiling water was kept in a kettle for 10 minutes without mixing. The oatmeal was cooled to 30 °C before eating.

Test

Person fasted 10 hours before the measurements. The measurements were started in the morning about 8:00 o'clock. Before the measurements test person drank 100 ml of water. Both products were measured two times.

The blood glucose values were measured by capillary measurement method from the fingertip. The measurement times were 0; 15; 30; 45; 60; 90 and 120 minute. Every time two parallel samples were taken. If the values differed more than 0,5 mmol/l, an additional 3rd sample was taken. The result was an average. The measurements were started by measuring the blood sugar after fasting period (fasting value). The product (drink or oatmeal) was taken 5 minutes after the measurement of fasting value.

The results were calculated by a glycemic index program, which gives an area under the curve of the blood glucose values during the measurement period. The area gives a response of blood glucose during the measurement period. When the areas are compared, the relative glucose response of oat drink and oatmeal can be calculated. If there would be a standardized reference food, a GI-index value could be calculated.

The oat drink and oatmeal samples contained both 27 g available carbohydrates. The weight of Aberry oat bilberry drink was 250 g. The results are presented in table 6.

Table 6.

	min	0	15	30	45	60	90	120
Oat drink 1	mmol/l	4,8(0)	5,7(0,9)	6,4(1,6)	6,2(1,4)	5,4(0,6)	4,5(-0,5)	4,2 (-0,6)
Oat drink 2	mmol/l	4,7(0)	5,4(0,7)	6,1(1,4)	6,0(1,3)	5,0(0,39)	4,7(0)	4,6(-0,1)
Oatmeal 1	mmol/l	4,7(0)	5,3(0,6)	6,8(2,1)	7,1(2,4)	6,0(1,3)	5,1(0,4)	4,1(-0,6)
Oatmeal 2	mmol/l	4,7(0)	5,4(0,7)	7,4(2,7)	6,8(2,1)	6,6(1,9)	5,2(0,5)	4,6(-0,1)

The differences to fasting glucose values (mmol/l) are presented in parenthesis.

Calculated area of relative glucose responses (i.e. AUC = area under curve) are presented in table 7.

Table 7.

Oat drink 1	54
Oat drink 2	56
Oatmeal 1	109
Oatmeal 2	139

The oat drink gave a significantly more advantageous blood glucose response than the oatmeal (oat porridge), even if both of the foods contained the same amount of available carbohydrate. The shape of the oat drink curve is advantageous, because the curve locates at low level and does not go very much under the fasting value in 2-3 hours. In this example the glucose response of the oat drink was about 50% of the oat porridge (Fig. 1).

CITATION LIST

Patent literature:

WO 2009/071737

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Chu W.-K., Cheung S. C. M., Lau R. A. W. and Benzie I. F. F., Herbal Medicine: **2011**, Biomolecular and Clinical Aspects. 2nd edition.

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<http://www.sitra.fi/julkaisut/muut/marjat.pdf>

CLAIMS:

1. A method of producing an oat drink, comprising fine milled oat flour mixed at least with water, **characterized** in that the fine milled oat flour is cooked simultaneously during pasteurization or ultra-high temperature (UHT) heat-treatment of the drink, forming a natural and easily drinkable oat porridge drink.
2. The method according to claim 1, **characterized** in that the oat flour is whole grain oat flour.
3. The method according to claim 1 or 2, **characterized** in that the oat flour is colloidal whole grain oat flour containing beta-glucan, of which > 50%, preferably > 70% and most preferably > 90% is in a dissolved or emulsion-like form.
4. The method according to any of the preceding claims, **characterized** in that the drink further comprises juice, preferably made of berries.
5. The method according to claim 4, **characterized** in that the berries are selected from bilberry, lingonberry, strawberry or cranberry.
6. The method according to any of the preceding claims, **characterized** by adding further ingredients selected from the following: a source of oil, protein(s) and fiber(s), added vitamin(s) and antioxidant(s), a colourising agent and a flavouring agent.
7. The method according to any of the preceding claims, **characterized** in that the pasteurization or ultra-high temperature (UHT) heat-treatment provides at least 12 months shelf life for the oat drink.
8. An oat drink, **characterized** by comprising natural drinkable oat porridge containing at least water and cooked oat flour.
9. The oat drink according to claim 8, **characterized** by comprising fine milled whole grain oat flour.

10. The oat drink according to claim 8 or 9, **characterized** by comprising berry juice, preferably made of bilberry, lingonberry or cranberry.

11. The oat drink according to any of claims 8 to 10, **characterized** by comprising 1 to 5 wt-% of fine milled whole grain oat flour and 15 to 50 wt-% of berry juice of the total weight of the oat drink.

12. The oat drink according to any of claims 8 to 11, **characterized** by comprising natural stabilizing agents, such as beta glucan.

13. The oat drink according to any of claims 8 to 12, **characterized** in that the glycemic response of the oat drink is at least 40 %, more preferably at least 50 % and most suitably at least 60 % lower than average edible oatmeal with same available carbohydrate amount.

14. The oat drink according to any of claims 8 to 13, **characterized** in that the glycemic response is between 50 and 60, more preferably 56 or less per 250 g of the oat drink.

15. The oat drink according to any of claims 8 to 14, **characterized** in that it is produced by any method according to claims 1 to 7.

16. A labelled beverage package, **characterized** by containing pasteurized or ultra-high temperature (UHT) heat-treated oat drink according to any of claims 8 to 15, having shelf life of at least 12 months.

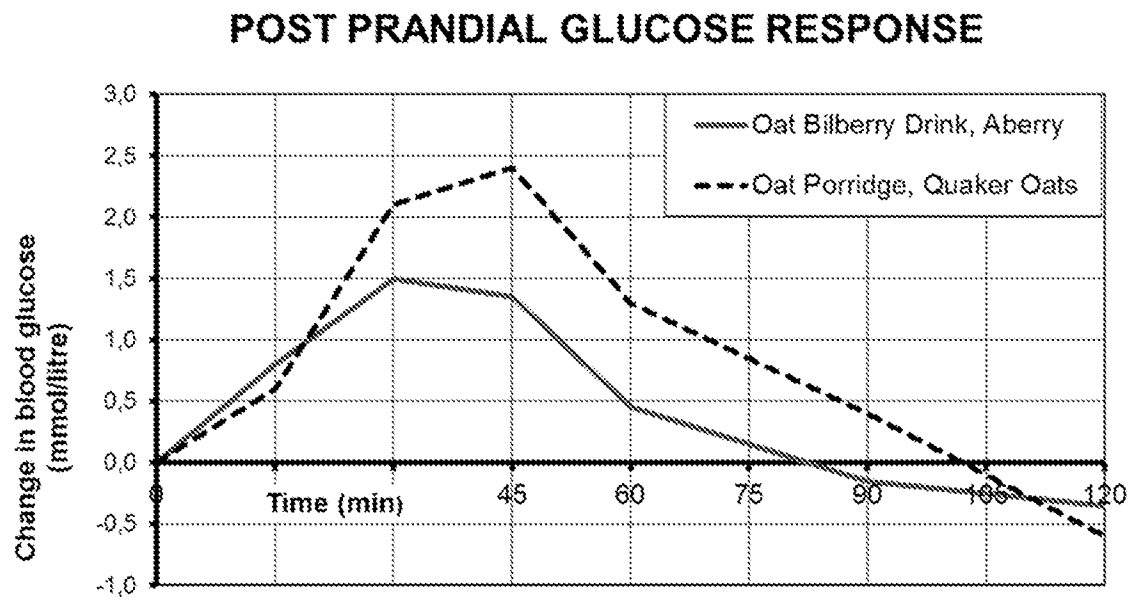


Fig. 1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI2016/050515

A. CLASSIFICATION OF SUBJECT MATTER

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

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
FI, SE, NO, DK

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

EPODOC, EPO-Internal full-text databases, Full-text translation databases from Asian languages, WPIAP, PRH-Internal, BIOSIS, COMPD, EMBASE, INSPEC, MEDLINE, CALPUS, CABA, FSTA, GNP

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		2, 3
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Y		2, 3, 6

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI2016/050515

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT
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International application No.
PCT/FI2016/050515

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INTERNATIONAL SEARCH REPORT

International application No.

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CLASSIFICATION OF SUBJECT MATTER

IPC

A23L 2/38 (2006.01)

A23L 2/02 (2006.01)

A23L 7/10 (2016.01)