(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 November 2023 (16.11.2023)

WIPO | PCT

(10) International Publication Number
WO 2023/217809 A1

(51) International Patent Classification:
A23L 33/185 (2016.01) *A23L 2/66* (2006.01)
A23C 11/10 (2021.01) *A23L 11/60* (2021.01)
A23L 2/52 (2006.01) *A23L 33/21* (2016.01)

(21) International Application Number:
PCT/EP2023/062333

(22) International Filing Date:
10 May 2023 (10.05.2023)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
22172658.1 10 May 2022 (10.05.2022) EP

(71) Applicant: **SOCIÉTÉ DES PRODUITS NESTLÉ S.A.** [CH/CH]; Avenue Nestlé 55, 1800 Vevey (CH).

(72) Inventors: **CHAVEZ MONTES, Bruno Edgar**; 81, Chemin de la Fauvette, 1012 Lausanne (CH). **CALDEO, Veronica**; Effingerstrasse 41B, 3008 Bern (CH). **VALLE COSTA SILVA, Juliana**; Avenue du Midi 27, 1700 Fribourg (CH).

(74) Agent: **ELLEBY, Gudrun**; Av. Nestlé 55, 1800 VEVEY (CH).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:
— *with international search report (Art. 21(3))*

(54) Title: INSTANT FOOD POWDER COMPRISING PEA PROTEIN AND NO DAIRY PROTEIN

(57) Abstract: The present invention relates to a spray dried beverage or food powder comprising 12 – 45 wt. %, preferably 20 – 30 wt. % of plant protein, 3 – 40 wt. %, preferably 20 - 30 wt. % fibers, 0 – 30 wt. %, preferably 12 to 18 wt. % vegetable oil or fat, optionally a source of fortification, optionally stabilizing salts, optionally sugar, and wherein the plant protein is pea protein. The invention also relates to a method for making the beverage or food powder.

WO 2023/217809 A1

INSTANT FOOD POWDER COMPRISING PEA PROTEIN AND NO DAIRY PROTEIN

Field of the invention

The present invention relates to instant beverage or food powder. In particular, the present invention relates to a beverage or food powder with a high plant protein content with good reconstitution properties. The food or dairy product may be devoid of dairy products.

Dairy alternatives usually do not comprise dairy proteins but comprise alternative protein sources.

Background

Certain consumers wish to consume less milk or do not want to consume milk at all, for example, because of its animal origin, due to lactose intolerance or due to dairy allergies. They may also see potential environmental sustainability issues.

As a consequence, consumers seek alternatives to milk. Alternatives to milk do exist and the dairy alternatives market is growing by 11% each year and finding an alternative with good nutrition and taste will be a major advantage in this competitive field.

WO 2013078510 discloses a nut-based milk analogue composition that has a substantially similar nutritional profile as cow milk.

CA2982280 discloses a method of producing a milk alternative, without necessarily adding a gum or emulsifier or starch, using chickpeas and/or other whole legumes or lentils (regular, sprouted or fermented), using pea protein, chickpea protein and/or a combination of plant-based protein (regular, sprouted or fermented), using flax seed oil and/or other vegetable oil, through high rotation mixing, heat and pressure, producing a very smooth mouthfeel.

Pea protein containing milk alternatives are commercially available. However, consumers increasingly search for food compositions that can be used as dairy alternatives that have an excellent nutritional value and a pleasant taste profile. In particular, there is a need for such food compositions that are high in protein and fibers.

Prior art plant-based powders are either low in protein content or, when protein content is higher, are in a dry-mix format which is not easy to reconstitute.

In particular, the inclusion of fiber while maintaining a pleasant taste and texture profile appears to be difficult. In accordance with this, US20130196028A1 discloses a method of making a chickpea soluble fraction, but which includes the removal of dietary fiber by filtration.

Also, if milk protein is replaced by plant protein sources, this often results in unpleasant taste, and the composition can be perceived as bitter and/or astringent.

It would therefore be desirable to provide a powder beverage that can be used as milk alternative, contains fiber and that has a good nutritional profile and taste profile.

Any reference to prior art documents in this specification is not to be considered an admission that such prior art is widely known or forms part of the common general knowledge in the field.

Object of the invention

The objective of the present invention is to improve the state of the art and in particular to provide a beverage or food powder that can be used in the preparation of dairy alternative and that is high in protein and fiber and that provides a good nutritional profile, and a good taste profile. More particularly, the objective of the

invention is to provide a high protein powder that can be dissolved without sediment, with improved stability in coffee and hard water, and that has a good dissolution time both in hot and ambient water.

Summary of the invention

The present invention provides the improvement by the subject matter of the independent claims. The dependent claims further develop the idea of the present invention.

In a first aspect, the invention relates to a spray dried beverage or food powder comprising

12 - 45 wt. %, preferably 20 – 30 wt. % of plant protein,
3 – 40 wt. %, preferably 20 - 30 wt. % fibers,
0 – 30 wt. %, preferably 12 to 18 wt. % vegetable oil or fat,
optionally a source of fortification,
optionally stabilizing salts,
optionally sugar and
wherein the plant protein is pea protein.

High protein content in powders is desirable when the nutritional target in final reconstituted powder is about 2 grams of protein or higher in 100 ml reconstituted beverage. While spraying of low protein systems is relatively easy, spray drying high protein powder (e.g. above 20 wt. %) presents problem due to blocking or pumping issues. On the other hand, it has been found that dry mixed or steam agglomerated plant-based powders have poor reconstitution in ambient or cold liquid. Stability of beverage or food powders is required if the powder is to be reconstituted in acid liquid such as coffee. This means that no flocculation of the protein in the final beverage or food product should take place. Finally, high caloric or non-clean label product is for many purposes not desirable.

The present invention provides an improved beverage or food powder that

provides solution to technical challenges:

- dispersion of high protein mixture with low viscosity to allow spray drying
- a drying process that is delivering instant reconstitution performance of the powder
- formulation delivering high nutrition, good taste and texture of a reconstituted beverage
- composition offering the versatility of milk for preparing a drink alone or combination with coffee, also as topping or cooking aid (e.g. for pancakes etc).

It has been found that the present invention may provide high protein content in powder >12 wt. %, high fibre content in powder >20 wt. %, instant properties in ambient or hot water, and stability in beverage such as coffee that is acid and in hard water. This provides a versatility in that it can be drunk alone or with coffee.

It has further been found that a total protein content below 12 wt. % provides too little protein / nutritional value in the final reconstituted product, while above 40 wt. % protein in the powder, and with total solids in the plant protein mix above 48 wt. % spray drying is not possible.

It has further been found that a total protein content below 12 wt. % provides too little protein / nutritional value in the final reconstituted product, while above 40 wt. % protein in the powder, while total solids in the plant protein mix above 48 wt. % does not allow spray drying.

In a second aspect, the invention relates to a method of making a beverage powder comprising the steps of

- proving a plant protein mixture comprising plant protein, fibers, vegetable fat and oil, optionally a source of fortification, optionally stabilization salt, according to the claims and liquid,
- heat treating and homogenizing the plant protein mixture, and

- spray drying the plant protein mixture to obtain a beverage or food powder.

In another aspect, the invention relates to a method of making a beverage or food powder comprising the steps of

- proving a plant protein mixture comprising 12 – 45 wt. % pea protein, 3 – 40 wt. %, fibers, optionally sugar, and optionally vegetable oil or fat, and liquid,
  the plant protein mixture having 30 - 48 % total solids, and a pH of between 6.0 and 8.5,
- heat treating and homogenizing the plant protein mixture, and
- spray drying the plant protein mixture to obtain a beverage or food powder.

Examples of cereals are oat, rice, wheat, barley, corn, millet, or a combination thereof. Examples of pseudo cereals are quinoa, buckwheat, amaranth or a combination thereof.

As used in this specification, the words “comprises”, “comprising”, and similar words, are not to be interpreted in exclusive or exhaustive sense. In other words, they are intended to mean “including, but not limited to”.

In the present context the fibers may be from oat, rice, quinoa, millet, wheat, or amaranth. Alternatively, the fibers may be from faba bean, chickpea, lentils, kidney beans, navy beans, pinto beans, haricot beans, lima beans, butter beans, azuki beans, mung beans, golden gram, green gram, black gram, urad, scarlet runner beans, rice beans, garbanzo beans, cranberry beans, lima beans, green peas, snow peas, snap peas, split peas and black-eyed peas. According to the invention it is preferred that not more than 20% of powder composition originates from the plant sources.

In one embodiment the powder contains 3-20% of fibers from the group above.

It has been found that the composition of the present invention achieves the objective of the present invention.

The beverage powder of the present invention was found to have instant properties, smooth texture, good taste, physical stability after reconstitution and with high protein content. A beverage made based on the beverage powder according to the invention was further found to be stable in coffee and in hard water.

Furthermore, it has been found that a wet mix can be prepared based on the beverage composition at a concentration that allows a cost-effective spray-drying with a viscosity within the operational limits.

The total solids of the plant-based mixture should preferably be >35% while the viscosity should remain within limits throughout the plant-based mixture preparation steps (mixing, heat treatment, homogenization). This will allow the mixture to be pumped and sprayed properly in a drying tower.

Brief Description of the Drawings

Figure 1 illustrates schematically an embodiment of the method for making a beverage or food powder according to the invention.

Figure 2 shows stability of a beverage powder according to the invention when mixed with coffee.

Figure 3 is a chart showing the stability of the powder when reconstituted in hard water.

Figure 4 is a chart showing instant reconstitution properties of the beverage or food powder according to the invention.

Detailed description of the invention

Consequently, the present invention relates to a spray dried beverage or food powder comprising 12 – 45 wt. %, preferably 20 – 30 wt. % of plant protein, 3 – 40 wt. %, preferably 20 - 30 wt. % fibers, 0 – 30 wt. %, preferably 12 to 18 wt. % vegetable oil or fat, optionally a source of fortification, optionally stabilizing salts, optionally added sugars or soluble carbohydrates and wherein the plant protein is pea protein.

The present invention provides a high protein plant-based beverage or food powder that is sprayed dried and which has excellent reconstitution properties even with the high protein content. Furthermore, the powder is stable both in acid liquid such as coffee with no flocculation of the proteins in the beverage and no sedimentation the first 20 min after preparation of the beverage or food product. The powder according to the invention has the additional benefit of providing a fiber content e.g, above 1.25 g per serving of 25 g and may be formulated as a low caloric product and clean-label product.

In a preferred embodiment of the invention, oil is added to the recipe and a creamy smooth mouthfeel can be achieved in the beverage obtained after reconstitution of the spray dried powder. It has been found that oil contributes to bulking and mouthfeel because small droplets of oil are present in the reconstituted product. While adding e.g. more than 5 wt. % oil to dry powder, it may result in the powder adhering together and provide poor reconstitution properties.

High protein quality is desirable for beverage and food products. The protein quality is indicated with its PDCAAS. Plant-based powders are often poor in protein quality. The present invention provides a powder that has a good PDCAAS.

The method according to the invention provides the additional benefit that high protein and high fiber ingredient mixes can be spray dried.

In a preferred embodiment of the method according to the invention the protein is not hydrolyzed as this may provide an off taste.

The powder and method according to the invention in an embodiment without added sugar or below 5 wt. % added sugar may provide the additional benefit of a long shelf-life (physically stable) due to low amounts of mono and di-saccharides, high physical stability (high Tg = glass transition temperature).

The liquid food composition prepared with a powder according to the present invention does not comprise dairy protein or hydrocolloid, e.g. gellan gum.

The term “food” shall be understood in accordance with Codex Alimentarius as any substance, whether processed, semi-processed or raw, which is intended for human consumption, and includes drink, chewing gum and any substance which has been used in the manufacture, preparation or treatment of "food" but does not include cosmetics or tobacco or substances used only as drugs.

A food may be considered high in fiber if the product contains at least 1.25 g of fiber per 100 g.

For the purpose of the present invention, a food may be considered high in protein, if at least 20% of the energy value of the food is provided by protein.

For the purpose of the present invention, a food may be considered high in calcium, if the product contains at least twice the value of ‘source of calcium’. A food may be considered a ‘source of calcium’ if the product contains at least a significant amount as defined in the Annex to Directive 90/496/EEC or an amount provided for by derogations granted according to Article 6 of Regulation (EC) No 1925/2006 of the European Parliament and of the Council of 20 December 2006 on the addition of vitamins and minerals and of certain other substances to foods. 15 % of the recommended allowance supplied by 100 g or 100 ml or per package

if the package contains only a single portion should be taken into consideration in deciding what constitutes a significant amount.

Pea protein isolate is commercially available from many sources, for example from suppliers such as Cosucra or Roquette.

Dairy proteins are milk proteins synthesized in the mammary gland and comprise caseins and whey proteins. For example, dairy proteins may comprise caseins, ß-lactoglobulin, α-lactalbumin, blood serum albumin, immunoglobulins, lactoferrin, and transferrin.

Preferably, the plant protein is in the form of isolate or concentrate or a combination thereof, the isolate preferably comprising 75 – 90 wt. % protein, the concentrate preferably comprising 50 – 70 wt. % protein.

In a preferred embodiment of the invention, the beverage or food powder comprises 15 – 28 wt. % pea isolate, 20 – 35 wt. % fibers, 10 – 20 wt. % vegetable oil or fat, and 0 – 25 wt. % added sugar, and the plant protein in the powder consist only of pea protein.

Cereal flours can be used in limited amounts (max. 10%) as bulking agents, and this would improve the PDCAAS.

In a preferred embodiment of the beverage or food powder of the invention, the powder is devoid of animal products.

Preferably, a source of fibers selected is from the group consisting of chicory root, sugar beetroot, sugar cane, Jerusalem artichoke or combination thereof, and wherein the fibers are preferably inulin from chicory root, soluble corn fibers, resistant dextrin, polydextrose or a combination thereof. Additionally, the source of fibers may be selected from the group consisting of pea, oat, rice, corn fibers, wherein the fibers are mostly insoluble fibers, selected from the group consisting

of pea, oat, rice, corn fibers, wheat, quinoa, buckwheat, and amaranth. For example the fibers may be in the form of fibers from rich fractions thereon.

The composition of the beverage powder in accordance with the present invention may be adjusted so that the final composition has a good taste profile, a good nutritional profile and resembles the appearance and texture of milk. An example of a powder with these properties and its stability in coffee is shown in Figure 2.

To improve stability against flocculation, stabilizing salts may be used. In a preferred embodiment, the stabilizing salts are selected from the group consisting of monopotassium phosphate, dipotassium phosphate, sodium bicarbonate, magnesium carbonate, citrates, or a combination thereof. If phosphates is added to a composition comprising inulin fibers it may result in a composition with a particularly pleasant mouthfeel and very little bitterness, astringency or other off notes normally associated with pea protein.

It is preferred that the source for fortification is selected from the group consisting of tri-calcium phosphate, calcium carbonate, calcium lactate, calcium chloride, calcium lactogluconate, di-calcium phosphate, tri-calcium citrate, iron, any fortification minerals, or a combination thereof.

If the composition made from the beverage powder of the present invention is used as milk alternative, many consumers may wish to add the composition to coffee, both of which are acidic beverages and – hence – often lead to unwanted protein flocculation. It was found that with the composition of the present invention such unwanted protein flocculation could be avoided. It was furthermore found that if dipotassium phosphate is added to the composition of the present invention, the stability of the liquid food composition of the present invention in hot coffee can even further be increased. Particularly advantageous results were obtained, if the composition of the present invention contained an amount of about 0.3 – 0.8 g phosphate per 100 ml. Preferably, the powder according to the invention comprises 5 – 7 wt. % of dipotassium phosphate,

monopotassium phosphate and sodium citrate, citric acid, and sodium bi-carbonate, or a combination thereof. More preferably, the powder comprising buffer systems of dipotassium phosphate and sodium citrate, or citric acid and sodium bi-carbonate.

If desired flavor profile of the composition of the present invention may be improved. For this, flavoring agents may be used. Hence, the liquid food composition in accordance with the present invention may further comprise a flavoring agent or a combination of flavoring agents. For example, the flavoring agent may be selected from the group consisting of milk mouthfeel flavor, vanilla flavor, coconut flavor, almond flavor, or combinations thereof. A good taste was achieved when the composition contained milk mouthfeel flavor as only flavoring agent. Furthermore, a good taste was achieved when the composition comprised combination of milk mouthfeel flavor and vanilla flavor, a combination of milk mouthfeel flavor and coconut flavor, or a combination of milk mouthfeel flavor and almond flavor were used.

It is preferred that the vegetable oil is high oleic vegetable oil, more preferably high oleic sunflower oil or rapeseed oil. As sunflower oil, any sunflower oil may be used. High quality sunflower oils are however preferred. Sunflower oil can be considered a healthy oil with a high stability. Sunflower oil has a rich content of vitamin E. It also has a good fatty acid profile containing with linoleic acid a polyunsaturated fatty acid and with oleic acid a monounsaturated fatty acid. It is well-known that, for example through a specific cultivation of the sunflowers and through adjusted manufacturing processes, oils with different fatty acid proportions can be manufactured. Oleic acid has been associated with several health benefits such as decreased low-density lipoprotein (LDL) cholesterol, and reduced blood pressure, for example. Hence, some consumers may prefer an oil with a high oleic acid content. High oleic sunflower oil is known and commercially available. High oleic sunflower oil is very high in oleic acid. High oleic sunflower oil is usually defined as having a minimum of 80 percent oleic acid. Consequently, in one embodiment of the liquid food composition of the

present invention the sunflower oil may be high oleic sunflower oil.

Sugar may be used in the powder of the present invention to adjust the sweetness of the composition naturally to the sweetness of milk. However, some embodiment of the powder according to the invention may also have no added sugar. In this embodiment of the invention sweetness is preferably provided by maltodextrin, malt extract or hydrolyzed cereal such as hydrolyzed oat.

If sugar is used, many sugars can be used for this purpose. Preferably the sugar is from sugar cane or beet. For example, the sugar used in the framework of the present invention may be cane sugar. Cane sugar, in particular unprocessed cane sugar may contain small amounts of essential minerals and/or a certain amount of antioxidants.

Milk is a rich source of nutrition for the need of a person. As such it provides good amounts of many of the nutrients necessary for the growth and maintenance of the human body. Many consumers would hence prefer a milk alternative to also have a good nutritional profile.

In view of this, the composition of the present invention may be high in protein and/or high in fiber and/or high in calcium.

For example, the food composition of the present invention may comprise per 100 ml about 2.0 - 2.8 g protein, about 1.3 – 2.0 g fat, about 2.2 - 2.8 g carbohydrates, and about 3.0 - 4.0 g fiber.

The composition of the present invention may further be enriched with vitamins, for example vitamins A, D, B2, and/or B12.

For example, the liquid reconstituted food composition in accordance with the present invention may comprise vitamins selected from the group consisting of vitamin A, vitamin D, vitamin B2 and vitamin B12. In one embodiment of the

present invention, the liquid food composition of the present invention may comprise per 100 ml 120-170 mg calcium, 120-170 µg vitamin A, 0.75-1.2 µg vitamin D, 0.21-0.30 mg vitamin B2 and/or 0.38-0.6 µg vitamin B12.

Oats are an excellent source of dietary fiber and are associated with many health benefits, such as – for example – a reduction of serum cholesterol levels in the body. Oats contain more soluble fiber than most other grains and are high in protein and healthy fats, and lower in carbohydrates than most other whole grains. Consequently, many breakfasts, such as porridge, for example are based on oats and several breakfast cereals are also based on oats.

To further improve the nutritional profile of the composition of the present invention, oat flour may be added to the composition of the present invention. It was surprisingly found that this was possible without any substantial negative impact on the flavor profile and texture of the composition of the present invention.

Hence, the liquid reconstituted food composition in accordance with the present invention may further comprise oat flour wholemeal. For example, the composition of the present invention may further comprise per 100 ml 0.5-1.25 g oat flour wholemeal.

For example, the liquid reconstituted food composition in accordance with the present invention may comprise per 100 ml 2.2 - .3.5 g pea protein isolate, about 1.4 – 2.0 g sunflower oil, 2.0 - 2.8 g sugar, 0.5-1.25 g oat flour wholemeal, 0.3 - 0.5 g tribasic calcium phosphate, about 0.5 - 0.9 g potassium phosphates, 120 - 170 mg calcium, 120-170 µg vitamin A, 0.75 - 1.20 µg vitamin D, 0.21 - 0.30 mg vitamin B2 and/or 0.38-0.60 µg vitamin B12.

The liquid food composition prepared based on the beverage powder in accordance with the present invention may be consumed warm, at ambient or cold temperature. It may be stable at ambient temperatures, allowing distribution and

storage without additional cooling facilities.

It may be used as a drink. For example, the liquid food composition obtained by reconstitution of the powder in accordance with the present invention may be used as a plant-based milk alternative. One advantage of the composition of the present invention is that it is stable in some acidic environments. Coffee, for example, may have a pH about 5. The reconstituted liquid food composition obtained with the powder in accordance with the present invention may be stable in acidic food compositions, such as coffee. “Stable” is to be understood in this case as showing no visible protein flocculation during at least 10 minutes. Hence, the liquid food composition in accordance with the present invention may be used as coffee whitener.

In this embodiment of the invention where coffee or hard water stability is desired advantageously stabilizing salts are used.

In a preferred embodiment, the reconstituted wherein the beverage powder has a pH in the range of 6.6 to 8.5 when reconstituted in 180 ml of water per 20 – 30 grams of powder. This provides a good stability of the final product, in particular when it is added to a liquid food composition having a pH in the range of 5.0 to 7.0.

The invention also relates to a method of making a beverage powder comprising the steps of

- proving a plant protein mixture comprising plant protein, fibers, vegetable fat or oil, optionally a source of fortification, optionally stabilization salt, according to the previous claims and liquid,
- heat treating and homogenizing the plant protein mixture, and
- spray drying the plant protein mixture to obtain a beverage or food powder.

Alternatively, the invention relates to a method of making a beverage powder comprising the steps of

- proving a plant protein mixture comprising 12 – 45 wt. % pea protein, 3 – 40 wt. %, fibers, and optionally sugar, and optionally vegetable oil or fat, and liquid,
  the plant protein mixture having 30 - 48 % total solids, and a pH of between 6.0 and 8.5,
- heat treating and homogenizing the plant protein mixture, and
- spray drying the plant protein mixture to obtain a beverage or food powder.

Figure 1 illustrates schematically an embodiment of the method according to the invention.

In Figure 1 the pea proteins, the stabilizing salts and other powder ingredients are hydrated in a hydrolysis tank. Vegetable oil or fat is then added during intense mixing. A heat treatment and homogenization then take place followed by spray drying. To reduce particle size, a milling step may be part of the process according to the invention. Optionally adding sugar, polyol, or one or more polysaccharides or mixtures thereof to the plant protein mixture.

When vegetable oil or fat is added in the method according to the invention the ingredient mix is homogenized. It has been found that a dry mix of ingredients comprising a substantial amount of protein will not dissolve in liquid. At high total solids the mix cannot be pumped and sprayed. The pH of the ingredient mix must be above the isoelectric point of pea proteins, which is between 4 and 6. Otherwise, pea proteins will flocculate and tend to sediment.

In one embodiment of the beverage powder according to the invention dried ingredients are added to the final spray dried powder.

In one embodiment of the method according to the invention the method comprises a step of optionally adding sugar, polyol, or one or more polysaccharides or mixtures thereof to the plant protein mixture.

The protein acts as an emulsifier and there is no need to add emulsifiers to the mixture

Those skilled in the art will understand that they can freely combine all features of the present invention disclosed herein. In particular, features described for the product of the present invention may be combined with the use of the present invention and vice versa. Furthermore, features described for different embodiments of the present invention may be combined.

Although the invention has been described by way of example, it should be appreciated that variations and modifications may be made without departing from the scope of the invention as defined in the claims.

Furthermore, where known equivalents exist to specific features, such equivalents are incorporated as if specifically referred in this specification. Further advantages and features of the present invention are apparent from the figures and non-limiting examples.

Examples

The beverage powder according to the invention is made with a method as shown in Figure 1. In the following examples such a method is applied to the recipe:

Pea beverage powder	% wt. (dry basis)
Pea Protein Isolates	26.00
Sugar	23.93
Soluble Corn Fiber	24.00
Sunflower oil	15.00
Di Potassium Phosphate	7.02
Tri Calcium Phosphate	3.25
Mono Potassium Phosphate	0.80

Reconstitution:

To prepare a glass of milk alternative 25g of powder are mixed with 180 mL of water (ambient 20°C or warm temperature 40°C).

The composition was tested by experts, and it was found that the powder dissolves easily and rapidly, resulting in a beverage with a pleasant taste and texture, no lumps and no sedimentation.

To prepare a white coffee cup: 1g pure soluble coffee + 3g beverage powder according to the invention (as shown in Table 1) + 2.5g sugar in 100mL water at 80°C: the powder dissolves easily and rapidly, resulting in a beverage with a pleasant taste and texture, no lumps, no sedimentation, no flocculation. The beverage is shown in the photo in Fig. 2.

Figure 3 is a chart showing the stability of the powder when reconstituted in hard water. The chart shows stability at >1000 ppm water hardness by light backscattering (PVM probe) characterized by a straight line (no change in slope) and no visible floc formation from parallel image analysis through the PVM probe.

Figure 4 shows instant reconstitution properties of the beverage powder according to the invention. The dissolution kinetics shows fast reconstitution, 90% of the powder is dissolved in 12s under 500rpm stirring at 40°C.

Claims

1. Beverage or food powder comprising
   12 – 45 wt. %, preferably 20 – 30 wt. % of plant protein,
   3 – 40 wt. %, preferably 20 - 30 wt. % fibers,
   0 – 30 wt. %, preferably 12 to 18 wt. % vegetable oil or fat,
   optionally a source of fortification,
   optionally stabilizing salts,
   optionally sugar, and
   wherein the plant protein is pea protein.

2. Beverage or food powder according to claim 1, wherein the powder comprises
   15 - 28 wt. % plant protein
   20 – 35 wt. % fibers,
   10 – 20 wt. % vegetable oil or fat, and
   0 – 25 wt. % added sugar.

3. Beverage or food powder according to any of the preceding claims, wherein the plant protein is in the form of isolate or concentrate or a combination thereof, the isolate preferably comprising 75 – 90 wt. % protein, the concentrate preferably comprising 50 - 70 wt. % protein.

4. Beverage or powder according to any of the preceding claims, wherein the composition comprises 15 - 35 wt. % pea protein isolate.

5. Beverage or food powder according to any of the preceding claims, comprising up to 10 wt. % cereal flour, preferably 1 - 5 wt. % cereal flour.

6. In one embodiment of the invention the powder comprises up to 10 wt. % cereal flour, preferably 1 - 5 wt. % cereal flour. The cereal flour is preferably oat flour, rice flour, or a combination thereof.

7. Beverage powder or food according to any of the preceding claims, having no added sugar.

8. Beverage or food powder according to any of the preceding claims, devoid of animal products.

9. Beverage or food powder according to any of the preceding claims, wherein source for fortification is selected from the group consisting of tri-calcium phosphate, calcium carbonate, calcium lactate, calcium chloride, calcium lactogluconate, di-calcium phosphate, tri-calcium citrate, iron, any fortification minerals, or a combination thereof.

10. Beverage or food powder according to any of the preceding claims, wherein the fibers are from a source of fibers selected from the group consisting of chicory root, sugar beetroot, sugar cane, Jerusalem artichoke, soluble corn fibers, resistant dextrin, polydextrose**.** or combination thereof.

11. Beverage or food powder according to any of the preceding claims wherein the fibers are fibers, selected from the group consisting of pea, oat, rice, corn fibers, wheat, quinoa, buckwheat, and amaranth, or a combination thereof.

12. Beverage or food powder according to any of the preceding claims, wherein the stabilizing salts are selected from the group consisting of monopotassium phosphate, dipotassium phosphate, sodium bicarbonate, magnesium carbonate, citrates, or a combination thereof.

13. Beverage or food powder according to any of the preceding claims, wherein the vegetable oil is high oleic vegetable oil, preferably high oleic sunflower oil or rapeseed oil.

14. Beverage or food powder according to any of the preceding claims, further comprising vitamins selected from the group consisting of vitamin A, vitamin D, vitamin B2 and vitamin B12.

15. Beverage or food powder according to any of the preceding claims, wherein the beverage powder when reconstituted in liquid is a plant-based milk alternative.

16. Beverage or food powder according to any of the preceding claims, wherein the beverage powder has a pH in the range of 6.6 to 8.5 when reconstituted in 180 ml of water per 20 – 30 grams of powder.

17. A method of making a beverage or food powder comprising the steps of
- proving a plant protein mixture comprising plant protein, fibers, vegetable fat or oil, optionally a source of fortification, optionally stabilization salt, according to the previous claims and liquid,
- heat treating and homogenizing the plant protein mixture, and
- spray drying the plant protein mixture to obtain a beverage or food powder.

18. A method of making a beverage or food powder comprising the steps of
- proving a plant protein mixture comprising 12 – 45 wt. % pea protein, 3 – 40 wt. %, fibers, and optionally sugar, and optionally vegetable oil or fat, and liquid, the plant protein mixture having 30 - 48 % total solids, and a pH of between 6.0 and 8.5,
- heat treating and homogenizing the plant protein mixture, and
- spray drying the plant protein mixture to obtain a beverage or food powder.

Fig. 1

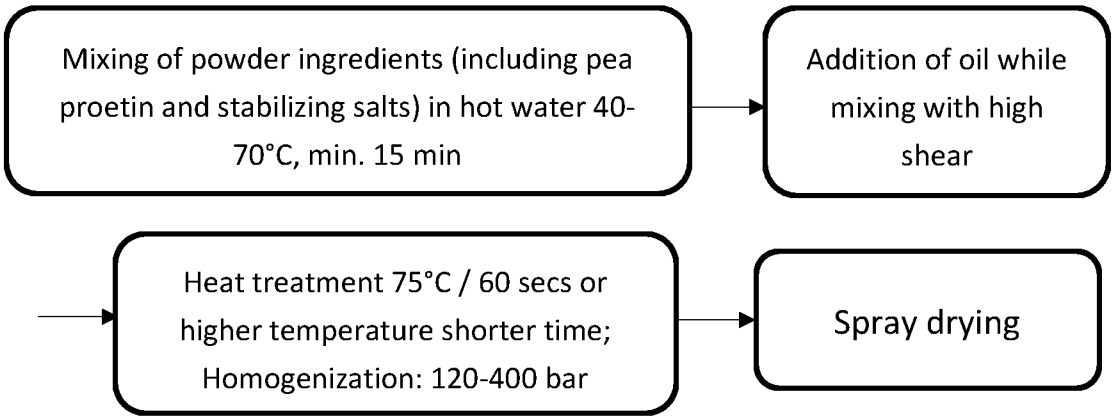

Mixing of powder ingredients (including pea proetin and stabilizing salts) in hot water 40-70°C, min. 15 min
Addition of oil while mixing with high shear
Heat treatment 75°C / 60 secs or higher temperature shorter time; Homogenization: 120-400 bar
Spray drying

Fig. 2

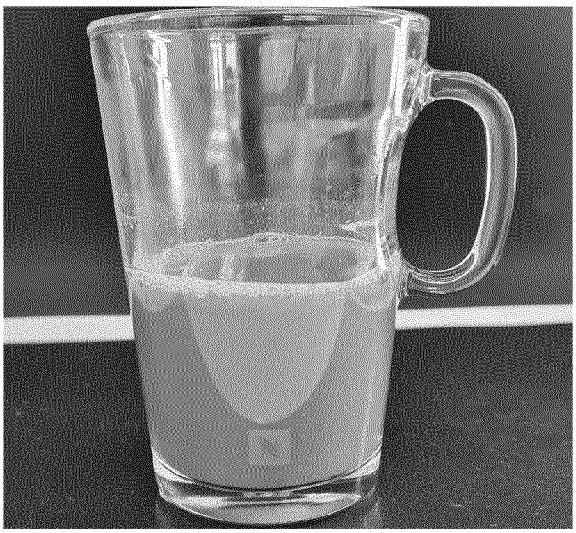


Fig. 3

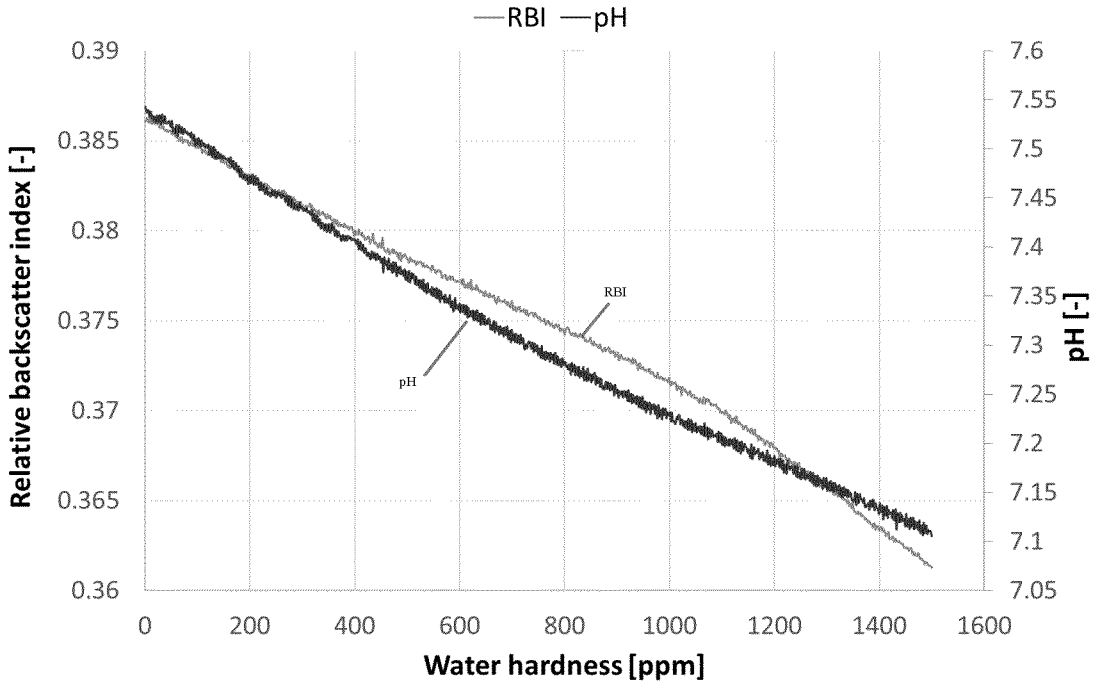
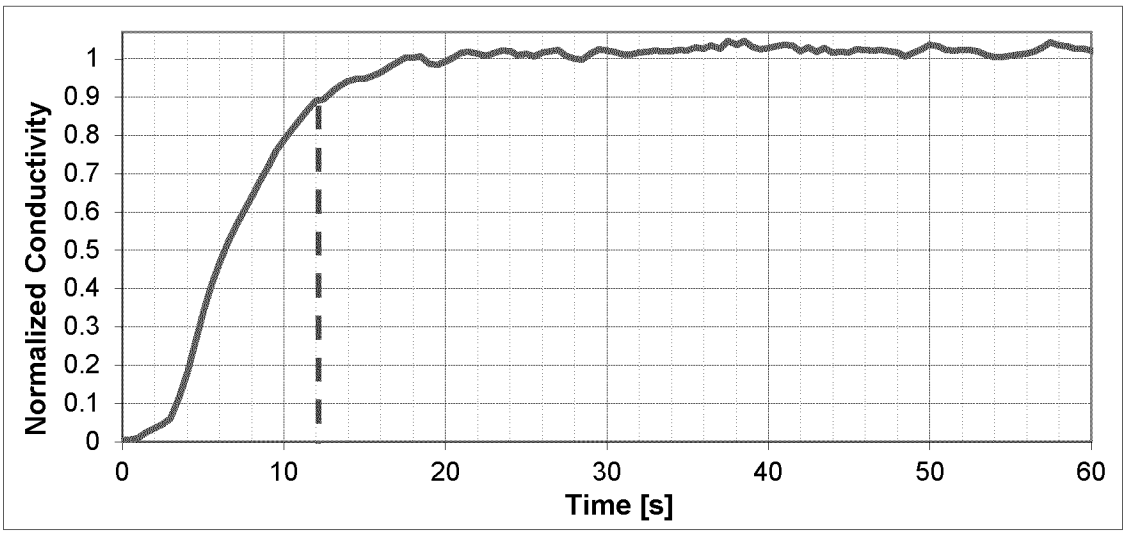

RBI
pH
0.39
0.385
0.38
0.375
0.37
0.365
0.36
Relative backscatter index [-]
7.6
7.55
7.5
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
7.05
pH [-]
0
200
400
600
800
1000
1200
1400
1600
Water hardness [ppm]

Fig. 4


Normalized Conductivity
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
40
50
60
Time [s]

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2023/062333

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23L33/185 A23C11/10 A23L2/52 A23L2/66 A23L11/60
A23L33/21
ADD.
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)
A23L A23C

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, BIOSIS, FSTA, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Anonymous: "Peasemeal - Wikipedia", www.wikipedia.org, 13 February 2018 (2018-02-13), pages 1-2, XP055878836, Retrieved from the Internet: URL:https://en.wikipedia.org/w/index.php?title=Peasemeal&oldid=825534993 [retrieved on 2022-01-13] table 1	1,3-9, 11,14,15
X	US 2012/015078 A1 (BOURSIER BERNARD [FR] ET AL) 19 January 2012 (2012-01-19)	1-18
Y	claims 29-35 paragraphs [0026] - [0027], [0032] - [0033], [0072], [0092] - [0093], [0104] - [0116], [0133] - [0159]	10,11

-/--

[x] Further documents are listed in the continuation of Box C.
[x] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"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)
"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

"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
"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
"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 July 2023	25/07/2023

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Heirbaut, Marc

2

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2023/062333

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2021/160656 A1 (NESTLE SA [CH]) 19 August 2021 (2021-08-19)	1-18
Y	claims 1-3,9-15 example 1	10,11

Y	WEI YUE ET AL: "Comparative studies on the stabilization of pea protein dispersions by using various polysaccharides", FOOD HYDROCOLLOIDS, ELSEVIER BV, NL, vol. 98, 22 July 2019 (2019-07-22), XP085803851, ISSN: 0268-005X, DOI: 10.1016/J.FOODHYD.2019.105233 [retrieved on 2019-07-22] abstract page 12, column 2, paragraph 2 - page 13, column 2, paragraph 1	10,11

A	SETHI SWATI ET AL: "Plant-based milk alternatives an emerging segment of functional beverages: a review", JOURNAL OF FOOD SCIENCE AND TECHNOLOGY, SPRINGER (INDIA) PRIVATE LTD, INDIA, vol. 53, no. 9, 2 September 2016 (2016-09-02), pages 3408-3423, XP036079557, ISSN: 0022-1155, DOI: 10.1007/S13197-016-2328-3 [retrieved on 2016-09-02] the whole document	1-18

A	MäKINEN OUTI ELINA ET AL: "Foods for Special Dietary Needs: Non-dairy Plant-based Milk Substitutes and Fermented Dairy-type Products", CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION, vol. 56, no. 3, 17 February 2016 (2016-02-17), pages 339-349, XP055782423, USA ISSN: 1040-8398, DOI: 10.1080/10408398.2012.761950 the whole document	1-18

2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2023/062333

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012015078 A1	19-01-2012	CA 2753134 A1	10-09-2010
		CN 102340994 A	01-02-2012
		EP 2403351 A1	11-01-2012
		ES 2458817 T3	07-05-2014
		JP 5710506 B2	30-04-2015
		JP 2012519013 A	23-08-2012
		KR 20110130408 A	05-12-2011
		US 2012015078 A1	19-01-2012
		WO 2010100370 A1	10-09-2010
WO 2021160656 A1	19-08-2021	BR 212022015839 U2	25-10-2022
		CN 115151136 A	04-10-2022
		EP 4102992 A1	21-12-2022
		ES 1300746 U	20-06-2023
		US 2023082031 A1	16-03-2023
		WO 2021160656 A1	19-08-2021