

## POWDERED BEVERAGE OR FOOD COMPOSITION

### Field of the invention

The present invention relates to beverage powder compositions used to prepare beverages  
5 within a beverage preparation apparatus further to storing, dosing and dilution.

### Background of the invention

Various automated beverages or food dispensers for making hot or cold reconstituted  
products are known in the art. In a conventional beverage or food dispenser, a metered  
10 amount of water-soluble beverage-forming or food-forming powder supplied from a storage  
canister and a complementary metered amount of hot or cold water supplied from a water  
source are mixed to produce a final product, which is dispensed into a cup or glass.

Cohesive and hygroscopic powders, such as milk powders, coffee mixes, gravy and the like  
and containing fat and/or humectant ingredients, are difficult to dispense out of a beverage  
15 or food canister in a consistent manner and are difficult to fully evacuate from the canister. In  
particular, cohesive powders do not flow well due to compaction and/or decompaction of the  
powder, lumping, cliffing and bridging inside the canister.

There are mainly two identified issues with dispensing these powders with high caking  
properties in the traditional dispensers.

20 The first issue relates to the consistency of powder dosing that more particularly refers to the  
dose-to-dose variation. Typically, the gram-throw of powder dramatically decreases after a  
certain number of throws and the reconstituted beverage or food becomes more diluted. In  
terms of product quality, the consistency of the product is important for meeting the  
satisfaction of the consumer. If the dose-to-dose variation is too large, it affects the in-cup  
25 quality of the product in a way that becomes perceptible for the consumer.

The second issue relates to the powder evacuation out of the canister which may be  
incomplete or consistent within a predetermined tolerance. In short, the canister is unable to  
empty up to a certain point and a significant amount of powder remains. In traditional  
canisters, powder evacuation includes doses or gram-throws that are below the target throw  
30 as well as powder that remains in the canister after the dosing mechanism cannot further  
deliver powder. In terms of autonomy, low powder evacuation requires the canister to be  
more frequently filled by the operator, in order for the beverage not to become unacceptably  
weak when the powder level becomes low. Therefore, powders with high caking properties  
may impact final product quality and may require more attention from the operator in re-filling  
35 and maintenance of the device.

This problem directly related to high caking properties powders appears too in beverage or

food powder manufacturing plants where beverage or food powders are filled in packaging further to the powder manufacturing, that is when manufactured powder hold in a storing container is dosed and dispensed in packaging, e.g. single dose sticks. Again, it is essential that the dose of powder is accurate and that the dosing and filling steps are implemented rapidly. Yet the caking property of the beverage powder may not facilitate that step.

To solve the problem, it has been known to use free-flow agents, also known as anti-caking agents. These are additives placed in powdered or granulated materials to prevent the formation of lumps and for easing dosing, packaging, transport and are well known in the art to reduce agglomeration when powders are stored, potentially in hot and humid conditions. Free-flow agents and anti-caking agents include ingredients like silicon dioxide, tricalcium phosphate, powdered cellulose, magnesium stearate, sodium bicarbonate, sodium ferrocyanide, potassium ferrocyanide, calcium ferrocyanide, bone phosphate, sodium silicate, calcium silicate, magnesium trisilicate, talcum powder, sodium aluminosilicate, potassium aluminium silicate, calcium aluminosilicate, bentonite, aluminium silicate, stearic acid, polydimethylsiloxane.

Silicone dioxide is the more frequently used anti-caking agent but, for regulatory reasons, it is less and less recommended to use it and there is a need for the use of other anti-caking agents.

20

### **Summary of the invention**

An object of the present invention is to provide a new solution to the problem of beverage or food powders easily subject to the problem of caking.

25 It would be advantageous to provide a solution that answers current regulatory requirements.

The object of the invention is achieved by the subject matter of the independent claims. The dependant chains further develop the idea of the present invention.

30 Particularly, the object of the present invention is to provide powdered food or beverage compositions with a better flowability and low caking property comprising a combination of calcium carbonate and pea fibres.

Accordingly, the present invention provides in a first aspect a powdered beverage or food composition comprising :

- up to 5 % in weight of calcium carbonate, and
- up to 3 % in weight of pea fibres.

In a second aspect, there is provided the use of a mixture of calcium carbonate and pea fibres as an anti-caking agent for soluble beverage or food powder.

- 5 In a third aspect, there is provided a method for controlling powder caking in a soluble beverage or food powder, wherein calcium carbonate and pea fibres are mixed with the soluble beverage or food powder.

- 10 In a fourth aspect, there is provided a use of the powdered beverage or food composition according to the first aspect in a beverage preparation machine comprising a storing container and a dosing device.

- This composition is particularly adapted for use in such a machine due to its low caking property even in hot and humid conditions. Dosing remains accurate and the quality of the beverage prepared from a dose of powdered composition remains constant even after the  
15 composition has been stored several days or weeks inside the machine (open shelf time).

In a fifth aspect, there is provided packaging comprising a dose of composition according to the first aspect.

- 20 The anti-caking property of the composition enables an accurate dosing and filling of small size packaging from a tank storing an important amount of the powdered composition.

- It has been found that the specific combination of calcium carbonate and pea fibres introduced in powdered beverage or food compositions presenting high tendency to caking during storing highly improved the storing, flowability and dosing of these compositions.  
25 Advantageously, these additives do not impact the taste of beverages or foods prepared from the powders.

In addition, these additives present the advantage that they can be supplied as natural products.

### 30 **Detailed description of exemplary embodiments**

**In a first aspect** of the invention, there is provided a powdered beverage or food composition comprising :

- up to 5 % in weight of calcium carbonate, and
- up to 3 % in weight of plant fibres.

- 35 Preferably the composition comprises up to 4 % in weight of calcium carbonate, for example up to 3 % or up to 2,5 %, and up to 3 % in weight of plant fibres, for example up to 2 %.

The powdered beverage or food composition can comprise :

- at least 0,1 % by weight of calcium carbonate, and
- at least 0,05 % by weight of plant fibres.

Preferably the composition comprises at least 0,2 % in weight of calcium carbonate, for example at least 0,3 %, or at least 0,4 % or at least 0,5 % or at least 0,6 % or at least 0,7 % or at least 0,8 % or at least 0,9 %, and at least 0,05 % in weight of plant fibres, for example at least 0,1 %, or at least 0,2 % or at least 0,3 % or at least 0,4 %.

In a preferred embodiment the powdered beverage or food composition comprises :

- between 1 and 2,5 % by weight of calcium carbonate, and
- between 0,5 and 2 % by weight of plant fibres.

Generally, the percentage in weight of fibres is less than the percentage in weight of  $\text{CaCO}_3$  in particular for cost and/or taste reasons.

Usually the powdered beverage or food composition is substantially void of  $\text{SiO}_2$ . The powder of the invention does not comprise  $\text{SiO}_2$  and answers current food regulations.

Preferably, the powder is a water soluble powdered beverage or food composition for reconstitution in water or aqueous based liquid to form a beverage or food.

Preferably the plant fibres are used in such a proportion inside the powdered composition that they do not provide any dietary function to the final beverage prepared from the powder. Usually, the powdered composition is diluted with water or an aqueous fluid in a ratio of at least 1:7 , preferably 1:10, meaning a level of fibres in the final beverage of at most 0,4 % in weight (if the powdered composition comprises 3 % fibres), preferably at most 0,05 % in weight (if the powdered composition comprises 0,5 % fibres).

The beverage or food powder can be any powdered composition that is subject to caking during storage inside a beverage preparation machine, particularly during storage under hot and/or tropical conditions. This caking property is usually linked to the physicochemical properties of the powdered composition, such as, for example, the presence of free fat at the surface of the powder particles, the water activity of the powdered composition, the presence of hygroscopic ingredients like carbohydrates and salts.

The beverage powder is preferably selected from the group of :

- dairy creamer powder that is powder derived from cow milk (skim milk powder, half skimmed milk powder, full cream milk powder), possibly with some stabilising and buffer salts such as phosphates, citrates, bicarbonates,

- non-dairy creamer powder, that is powder derived from vegetable milks or a combination of milk protein (caseinate or micellar casein), vegetable fat and glucose syrup, possibly with some stabilising and buffer salts such as phosphates, citrates, bicarbonates and with low molecular emulsifiers,
  - 5 - fully plant based creamer powder, that is powder derived from vegetable fat, plant glucose syrup, plant elements such as flours, cream or proteins, possibly with some stabilising and buffer salts such as phosphates, citrates, bicarbonates and with low molecular emulsifiers,
  - filled dairy creamer powder, that is powder derived from skimmed milk, vegetable fat and glucose syrup,
  - 10 - coffee mixes powder, that is a mixture of at least milk powder or any of the above creamer powder and instant coffee powder, and optionally additives like sugar or flavour,
  - chocolate powder, that is a mixture of at least milk powder, cocoa powder and sugar,
  - soup powder comprising dehydrated fat based culinary products,
  - or a combination thereof.
  - 15
- The food powder can be selected from the group of :
- a smoothie powder,
  - fruit puree powder,
  - mashed vegetable powder
  - 20 or a combination thereof.

The difference between food and beverage lays essentially in the pouring consistency of the final preparation reconstituted from the powdered composition and water or an aqueous fluid. Generally, a beverage is more liquid than a puree or a smoothie.

25

Usually, the pea fibres and the calcium carbonate are not agglomerated with the other ingredients of the food or beverage powdered composition. The other ingredients themselves can be agglomerated as the result of their preparation or not.

30

Generally, plant fibres are selected from the list of fruit, fibres, vegetable fibres, cereal bran or a combination thereof.

Fruit and vegetable fibres can be selected from the group consisting of fibers from carrot, beetroot, pumpkin, citrus, apple, oat, bamboo, tomato, bell pepper, leek, ginger, onion, kale, parsnip, celery, cucumber, courgette, broccoli, kohlrabi, asparagus, pea.

35

Cereal bran can be selected from the group consisting of rice bran, wheat bran, soya bran, buckwheat bran, corn bran, oat bran, barley bran, rye bran and mixtures thereof.

The plant fibres include the edible parts of plants, resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. Fibers include both soluble and insoluble fibers, this classification depending on their biological and physicochemical properties (insoluble fibres are only very slightly fermented by the intestinal flora whereas soluble fibres are a very good fermentation substrate for the intestinal flora).

According to the preferred embodiment, the plant fibres of the powdered beverage or food composition comprise pea fibres.

It is preferred that these pea fibres are non-extracted natural pea fibres comprising soluble and insoluble pea fibres.

A suitable source of such pea fibres which may be utilized include, for example, those fibres commercially available as VITACEL® Pea Fiber EF 100-20 (from JRS).

Even more preferably, the plant fibres of the powdered beverage or food composition powder composition consist of pea fibres only.

Calcium carbonate part of the powdered beverage or food composition is food grade calcium carbonate.

Generally the powdered beverage or food composition is prepared by introducing plant fibres and calcium carbonate in a pre-existing beverage or food powder. Accordingly, a beverage or food powder is first manufactured without anti-caking agent and then plant fibres and calcium carbonate can be introduced in this pre-manufactured beverage or food powder devoid of anti-caking agents.

Plant fibres, calcium carbonate and the powdered beverage composition can be dry mixed. Optionally plant fibres and calcium carbonate can be pre-mixed before they are introduced inside the pre-existing beverage or food powder.

**In a second aspect**, there is provided the use of a mixture of calcium carbonate and plant fibres as an anti-caking agent for soluble beverage or food powder, wherein the components of said mixture are mixed with the soluble beverage powder in a proportion such that the resulting powdered beverage or food composition comprises :

- up to 5 % in weight of calcium carbonate, and
- up to 3 % in weight of plant fibres,
- preferably
- at least 0,1 % by weight of calcium carbonate, and
- at least 0,05 % by weight of plant fibres.

even more preferably :

- between 1 and 2,5 % by weight of calcium carbonate, and
- between 0,5 and 2 % by weight of plant fibres.

This use is particularly recommended for powders designed to be temporary stored in a  
5 container and then dosed on demand by a consumer.

According to the preferred embodiment, plant fibres are pea fibres.

There is also provided the use of a mixture of calcium carbonate and plant fibres for  
10 controlling powder caking in a soluble beverage or food powder, wherein the components of  
said mixture are mixed with the soluble beverage or food powder in a proportion such that  
the resulting powdered beverage or food composition comprises :

- up to 5 % in weight of calcium carbonate, and
- up to 3 % in weight of pea fibres.

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**In a third aspect**, there is provided a method for controlling powder caking in a soluble  
beverage or food powder, wherein a mixture of calcium carbonate and plant fibres are mixed  
with the soluble beverage or food powder in a proportion such that the resulting powdered  
beverage or food composition comprises :

- 20
- up to 5 % in weight of calcium carbonate, and
  - up to 3 % in weight of pea fibres.

**In a fourth aspect**, there is provided the use of a powdered beverage or food composition  
such as described above in a beverage preparation machine comprising a powder storing  
25 container and a powder dosing device.

The composition is particularly adapted for being used in beverage preparation machines  
comprising at least one container configured for holding a powdered beverage composition,  
usually configured for holding multiple doses of powdered beverage composition. This  
container is generally refillable. In a less preferred embodiment, it is disposable.

30 This container comprises a powder outlet for dispensing at least one dose of powder.

The machine can comprise several containers. When containers are filled with different  
natures of powders, different natures of beverages (coffee, decaf, tea or milk) can be  
prepared or multi-component beverages can be prepared (milk and coffee).

Generally, the machine comprises a dosing device designed to cooperate with the powder  
35 outlet of the at least one container. Usually the dosing device is attached to the powder  
outlet. The dosing device cooperates so that it is able to close the outlet of the container at  
rest and to dose the powder stored in the container and to dispense the dose downwards

when it is actuated.

Generally the dosing device can be a gravimetric dosing unit, wherein the powder outlet of the container is opened during a certain period to dispense the required dose, or the dosing device can be a volumetric dosing unit comprising a cavity of predefined volume through which a dose of powder is introduced and then dispensed downwards to another part of the machine. The dosing device can be a barrel, a sliding chamber, a rotary pierced disc or any similar device.

Generally the dosing device and the container are attached together and form an assembly that can be received in a receiving area for the container inside the machine. This receiving area is usually supported by the above mentioned container support of the machine.

The dosing device is designed to be movable by an actuator such as a motor enabling a rotating movement of the dosing device or a translation movement of the dosing device.

The powdered compositions of the present invention are particularly adapted for being stored, dosed and dispensed from the dosing canisters of a machine such as illustrated in WO 2013/014040 or WO 2011/080124, from an assembly of a container and a dosing device as illustrated in WO 2019/016149 or as illustrated in EP 3384815.

The powder does not cake or bridges inside the canister or container. It is accurately dosed and the risk powder remains in the canister or container without being dosed and dispensed is limited.

**In a fifth aspect**, there is provided a packaging comprising the powdered beverage or food composition such as described above.

After manufacturing, the powdered beverage or food composition can be stored in a bag, Big bag or tote or silo without risk of caking and then accurately conveyed and dosed to fill into packaging. Filling is efficient and rapid.

This packaging can be a stick pack, usually comprising a single dose of powder composition designed to prepare one beverage, or a container comprising multiple doses of powder composition like a jar or a pouch or a container designed to fit in a dispensing machine.

In the present application :

- by caking, it is meant the phenomenon where the particles of a powder form bridges and agglomerate during storage.
- by powder flowability, it is meant the ease with which a powder flows by gravity from a storing container. Flowability can be affected by the caking of the stored powder.

The above aspects of the invention may be combined in any suitable combination. Moreover, various features herein may be combined with one or more of the above aspects to provide

combinations other than those specifically illustrated and described. Further objects and advantageous features of the invention will be apparent from the claims, from the detailed description, and examples.

## 5 **EXAMPLES**

Existing powdered beverage compositions were tested without and with the addition of different additives and their flow properties were tested through different processes.

### 10 **1. Example 1**

#### **1.1 Powdered compositions**

Two following existing powdered creamer compositions were tested and improved with state of the art anti-caking agents ( $\text{SiO}_2$ ) and with the new anti-caking mixture according to the  
15 invention.

Table 1

|                                                                   | <b>Filled dairy Creamer 1</b> | <b>Non-dairy Creamer 2</b> |
|-------------------------------------------------------------------|-------------------------------|----------------------------|
| <b>Ingredients</b>                                                | <b>g</b>                      | <b>g</b>                   |
| Skimmed milk powder                                               | 25.02                         |                            |
| Vegetable fat                                                     | 21.59                         | 35.5                       |
| Whole milk powder                                                 | 18.56                         |                            |
| Sweetening agents                                                 | 25.5                          | 56.2                       |
| Whey powder                                                       | 1.04                          |                            |
| Lactose                                                           | 0.99                          |                            |
| Casein                                                            | 0.31                          | 1.3                        |
| Additives (salt, pH adjuster, emulsifiers, flavor, colorant, ...) | 3.72                          | 4.0                        |
| Moisture                                                          | 3.53                          | 3.0                        |

Anti-caking agents were added in these powdered creamer compositions as follows :

- $\text{SiO}_2$  was introduced in a quantity such that its amount represented 0.5 % in weight of the  
20 resulting composition,
- $\text{CaCO}_3$  and pea fibres were introduced in quantities such that the amount of  $\text{CaCO}_3$  represented 1.0 % in weight of the resulting composition and the amount of pea fibres represented 0.5 % in weight of the resulting composition.

SiO<sub>2</sub> was commercialised by Fuji Silysia Chemical LTD and referenced as Sylsilia,

CaCO<sub>3</sub> was commercialized by OMYA under reference Calcipur 110-KP.

Pea fibres were VITACEL® Pea Fiber EF 100-20 commercialised by JRS.

- 5 The different anti-caking agents were introduced inside existing powdered creamers and powders were dry mixed.

## 1.2. Flowability properties

Flowability of the different powder compositions were evaluated by measuring :

- 10 - Carr index,  
- flow and critical diameter in a Granuflow device.

### Carr's index

- The Carr index of a powder is calculated by the formula  $C = 100(1 - \rho_B/\rho_T)$ , where  $\rho_B$   
15 represents the bulk density of the powder and  $\rho_T$  represents the tapped density of the powder.

The Carr index is an indication of the compressibility of a powder. Powders with low Carr index present lower compressibility which ensures flowability and avoids risk of bridging.

### 20 Bulk density

Bulk density was measured by pouring powder from a storing container through a funnel inside a cylinder as follows :

- weighing the cylinder to the nearest 0.1 g,  
- pouring the powder from its container into the funnel, allowing it to flow freely into the  
25 cylinder until the latter overflows. The distance between the bottom of the funnel and the top of the cylinder is  $40,0 \pm 1.5$  mm .  
- removing the excess of product by levelling the top of the cylinder with the flat blade of a pharmaceutical spatula.  
- weighing the cylinder and its contents to the nearest 0.1 g.

30

### Tapped density

Tapped densities of powders were measured with a JEL jolting density meter STAV 2003.

### Flow and critical diameter in Granuflow

- 35 Flow properties of the powders were measured with the apparatus Granuflow commercialised by the company Aptis. This apparatus permits the flow of a powder through

holes of various diameters in order to find the minimum hole diameter, called critical diameter, through which powder is able to flow.

In addition, this apparatus was used also to measure the flow of powder through a 18 mm diameter hole.

5

Results are summarised in Table 2.

Table 2

|                                  | <b>Creamer 2</b> | <b>Creamer 2 +<br/>0.5 % SiO<sub>2</sub></b> | <b>Creamer 2 + 1% CaCO<sub>3</sub><br/>+ 0.5% Pea fibres</b> |
|----------------------------------|------------------|----------------------------------------------|--------------------------------------------------------------|
| <b><math>\rho_B</math> (g/l)</b> | 464              | 494                                          | 490                                                          |
| <b><math>\rho_T</math> (g/l)</b> | 556              | 540                                          | 554                                                          |
| <b>Carr index</b>                | 16.54            | 8.51                                         | 11.55                                                        |
| <b>Flow (ml/s)</b>               | 50.1             | 55.25                                        | 54.55                                                        |
| <b>Critical diameter (mm)</b>    | 10               | 4                                            | 4                                                            |

10 It can be observed that the use of calcium carbonate and pea fibres strongly decreases the Carr index of the creamer powdered composition 2 and enables the dispensing of said powdered composition through a critical diameter of 4 mm and at a flow similar to the current used anti-caking agent SiO<sub>2</sub>.

Table 3

|                                   | <b>Creamer 1</b> | <b>Creamer 1 +<br/>0.5 % SiO<sub>2</sub></b> | <b>Creamer 1 +<br/>1% CaCO<sub>3</sub></b> | <b>Creamer 1 + 1%<br/>CaCO<sub>3</sub> + 0.5%<br/>Pea fibres</b> |
|-----------------------------------|------------------|----------------------------------------------|--------------------------------------------|------------------------------------------------------------------|
| <b><math>\rho_B</math> (g/l)</b>  | 416              | 448                                          | 441                                        |                                                                  |
| <b><math>\rho_T</math> (g/l)</b>  | 561              | 494                                          | 549                                        |                                                                  |
| <b>Carr index</b>                 | 25.8             | 9.31                                         | 19.7                                       |                                                                  |
| <b>Flow (ml/s)</b>                |                  | 42.4                                         |                                            | 51.4                                                             |
| <b>Critical diameter<br/>(mm)</b> | 34               | 4                                            | 34                                         | 4                                                                |

15

It can be observed that the use of calcium carbonate and pea fibres enables the dispensing of the creamer powdered composition 1 through a critical diameter of 4 mm and at a flow similar to the current used anti-caking agent SiO<sub>2</sub> whereas such dispensing was not possible without anti-caking agent, even with CaCO<sub>3</sub> alone.

### 1.3. Use in dispensing machines

The impact of the use of the different above powdered compositions in a first type of beverage dispenser under different storing conditions was evaluated.

- 5 The first beverage dispenser comprises a container storing 250 g of powdered composition, the bottom of which cooperates with a powder dosing slider comprising a dosing cavity of about 3 g. This dispenser is similar to the dispenser described in WO 2019/016149.

The container was filled with different powdered compositions and completely emptied (if possible) and the weight of each dispensed dose of powder (per operation of filling the dosing cavity and dispensing this powder filled in the cavity through a forth and back movement of the slider) was measured so as to deduce the following properties for each composition :

- 15 - optimized average weight of dispensed powder. This is the average weight of the dispensed doses except the first dispensed dose.

- accuracy of the dosing weight in % at +/- 5 %. This measure corresponds to the percentage of weights that present a difference of weight comprised between +/- 5 % with the above optimized average weight.

- 20 This measure reflects the property of the powder to be dispensed in a consistent manner:

- accuracy of the dosing weight in % at +/- 10 %. This measure corresponds to the percentage of weights that present a difference of weight comprised between +/- 10 % with the above optimized average weight.

- 25 This measure reflects the property of the powder to be dispensed in a consistent manner:

- blockage of the dosing slider that is full blockage or no powder falling out of the slider even if the slider can be slid.

- 30 This measure reflects the facility of powder to cake and agglomerate inside the dosing slider across time.

Measures were made under lab conditions (Temperature = 22°C and relative Humidity = 40 %) and in tropical conditions during 14 days (Temperature = 30°C and Relative Humidity = 70 %). Under lab conditions, doses were dispensed and weighted one after the other until the container is empty, whereas in tropical conditions, only two doses were dispensed and weighted per day during two weeks.

Results for powdered compositions based on creamer powder 1 and 2 are summarised in below Tables 3 and 4.

Table 3

|                                              | <b>Creamer 2</b>                                 | <b>Creamer 2 + 0.5 %<br/>SiO<sub>2</sub></b> | <b>Creamer 2 + 1%<br/>CaCO<sub>3</sub> + 0.5% Pea<br/>fibres</b> |
|----------------------------------------------|--------------------------------------------------|----------------------------------------------|------------------------------------------------------------------|
| <b>Dosing under lab conditions</b>           |                                                  |                                              |                                                                  |
| optimized average weight (g) of powder dosed | not possible to get a value, inconsistent dosing | 3.26                                         | 3.03                                                             |
| dosing device blockage                       | yes, after two dosing operations                 | no                                           | no                                                               |
| accuracy (%) at +/- 5 %                      | not possible to get a value, inconsistent dosing | 91.9                                         | 88.5                                                             |
| accuracy (%) at +/- 10 %                     | not possible to get a value, inconsistent dosing | 95.1                                         | 98                                                               |
| <b>Dosing under tropical conditions</b>      |                                                  |                                              |                                                                  |
| optimized average weight (g) of powder dosed | not possible to get a value, inconsistent dosing | 3.28                                         | 2.96                                                             |
| dosing device blockage                       | yes, after two days in tropical conditions       | no after 2 weeks                             | no after 2 weeks                                                 |
| accuracy (%) at +/- 5 %                      | not possible to get a value, inconsistent dosing | 90.9                                         | 96                                                               |
| accuracy (%) at +/- 10 %                     | not possible to get a value, inconsistent dosing | 98.3                                         | 100                                                              |

Table 4

|                                              | <b>Creamer 1</b>                                            | <b>Creamer 1 + 0.5 %<br/>SiO<sub>2</sub></b> | <b>Creamer 1 + 1%<br/>CaCO<sub>3</sub> + 0.5% Pea<br/>fibres</b> |
|----------------------------------------------|-------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------|
| <b>Dosing under lab conditions</b>           |                                                             |                                              |                                                                  |
| optimized average weight (g) of powder dosed | not possible to get a value, inconsistent dosing            | 2.91                                         | 2.43                                                             |
| dosing device blockage                       | no                                                          | no                                           | no                                                               |
| accuracy (%) at +/- 5 %                      | not possible to get a value, inconsistent dosing            | 85.2                                         | 66.6                                                             |
| accuracy (%) at +/- 10 %                     | not possible to get a value, inconsistent dosing            | 91.1                                         | 96.8                                                             |
| <b>Dosing under tropical conditions</b>      |                                                             |                                              |                                                                  |
| optimized average weight (g) of powder dosed | Not done in tropical condition as not working in laboratory | 2.77                                         | 2.37                                                             |
| dosing device blockage                       |                                                             | no after 2 weeks                             | no after 2 weeks                                                 |
| accuracy (%) at +/- 5 %                      |                                                             | 91.9                                         | 95.7                                                             |
| accuracy (%) at +/- 10 %                     |                                                             | 100                                          | 100                                                              |

It can be observed that without the presence of an anti-caking agent, powdered creamers 1 and 2 present very poor properties in term of flowability and cannot be used at all inside the beverages dispenser under tropical conditions.

5

The presence of pea fibres and CaCO<sub>3</sub> in the powdered compositions greatly improves the flowability of these compositions that can be used for accurate dosing and dispensing inside the beverage dispenser even after two weeks under topical conditions, showing properties similar to current SiO<sub>2</sub> anti-caking agent.

10

## 2. Example 2

### 2.1 Powdered compositions

Following current powdered beverage compositions comprising usual SiO<sub>2</sub> anti-caking agent  
5 were tested and improved by replacing SiO<sub>2</sub> by other anti-caking agents.

These current compositions were :

- a first 3-in-1 coffee mix 1 comprising SiO<sub>2</sub> as an anti-caking agent,
- a second 3-in-1 flavored coffee mix 2 comprising SiO<sub>2</sub> as an anti-caking agent,
- 10 - a creamer 3 comprising SiO<sub>2</sub> as an anti-caking agent.

The composition of these powdered beverage compositions are listed in Table 5.

Table 5

|                  | Flavored coffee mix 2 | Coffee mix 1 | Creamer 3   |
|------------------|-----------------------|--------------|-------------|
| Ingredients      | % in weight           | % in weight  | % in weight |
| Instant coffee   | 10.00                 | 14           |             |
| Dairy creamer*   | 59.50                 | 74           | 99.00       |
| Sugar            | 28.00                 | 10.73        |             |
| SiO <sub>2</sub> | 0.80                  | 1.00         | 1.00        |
| Thickner powder  | 0.10                  | 0.27         |             |
| Flavor           | 1.40                  |              |             |
| Salt             | 0.20                  |              |             |

\* This dairy creamer comprises 92 % in weight powder milk and 8 % in weight glucose syrup.

15

For the following tests, SiO<sub>2</sub> used as anti-caking agent was replaced in these powdered compositions by either CaCO<sub>3</sub> only or by a mixture of CaCO<sub>3</sub> and pea fibres.

SiO<sub>2</sub>, CaCO<sub>3</sub> and pea fibres were of the same natures as mentioned in Example 1.

Powders of anti-caking agents were introduced inside existing powdered beverage  
20 compositions and powders were dry mixed.

Flowability properties of the powdered compositions are summarised in Tables 6, 7 and 8.

Table 6

|                | Coffee mix 1 | Coffee mix 1 with 2 % wt CaCO <sub>3</sub><br>+ 1 % wt pea fibres in place of SiO <sub>2</sub> |
|----------------|--------------|------------------------------------------------------------------------------------------------|
| $\rho_T$ (g/l) | 557.5        | 543.9                                                                                          |
| $\rho_B$ (g/l) | 513          | 452                                                                                            |
| Carr index     | 7.98         | 16.90                                                                                          |

Table 7

|                | Coffee mix 2 | Coffee mix 2 with 1,6 % wt CaCO <sub>3</sub> +<br>0,8 % wt pea fibres in place of SiO <sub>2</sub> |
|----------------|--------------|----------------------------------------------------------------------------------------------------|
| $\rho_T$ (g/l) | 613          | 604                                                                                                |
| $\rho_B$ (g/l) | 545          | 520                                                                                                |
| Carr index     | 11.09        | 13.92                                                                                              |

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Table 8

|                | Creamer 3 | Creamer 3 with 2 % wt CaCO <sub>3</sub> +<br>1 % wt pea fibres in place of SiO <sub>2</sub> |
|----------------|-----------|---------------------------------------------------------------------------------------------|
| $\rho_T$ (g/l) | 543.6     | 526.2                                                                                       |
| $\rho_B$ (g/l) | 475       | 453                                                                                         |
| Carr index     | 12.62     | 13.91                                                                                       |

All the creamers present a Carr index inferior to 18 which is good in terms of flowability.

## 2.2. Use in dispensing machines

- 10 The impact of the use of the different above powdered compositions in a second type of beverage dispenser was evaluated.

The second beverage dispenser comprises a powder canister able to store between 500 and 700 g of powder depending on the density of said powder, with a dosing auger positioned inside the canister and its bottom in order to guide powder to a canister outlet. Similar dosing

- 15 canisters are illustrated for example in WO 2013/014040 or WO 2011/080124.

For different powdered compositions, the canister was filled and emptied several times and the following properties were measured each time :

- accuracy of the dosing weight in % at +/- 15 %,
- accuracy of the dosing weight in % at +/- 25 %,

- % of weight not dispensed : that is the weight of powder filled inside the canister and that the auger cannot dispense. This value reflects the caking and bridging property of powder.
- refill point : that is the percentage of powder quantity that can be dispensed from the canister with a good average. From this point, doses start to be inconsistent and the canister should be refilled again to ensure correct dosing. A good refill point should be higher than 60 %.
- optimized average weight,
- % of doses presenting a too important difference, precisely below 6 %, with a predefined target dose.

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Tests were made under lab conditions (Temperature = 22°C and relative Humidity = 40 %).

Results for powdered compositions based on powders compositions of coffee mix 1 and, coffee mix 2 are summarised in below Tables 9 and 10.

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Table 9

|                                               | <b>Coffee mix 1 with 1 % CaCO<sub>3</sub><br/>in place of SiO<sub>2</sub></b> |       |       | <b>Coffee mix 1 with<br/>2 % CaCO<sub>3</sub> + 1 % pea fibres in<br/>place of SiO<sub>2</sub></b> |        |        |
|-----------------------------------------------|-------------------------------------------------------------------------------|-------|-------|----------------------------------------------------------------------------------------------------|--------|--------|
| Test                                          | 1                                                                             | 2     | 3     | 1                                                                                                  | 2      | 3      |
| accuracy (%) at +/- 15 %                      | 73.9%                                                                         | 73.0% | 71.0% | 77.8%                                                                                              | 82.5%  | 87.9%  |
| accuracy (%) at +/- 25 %                      | 84.2%                                                                         | 83.7% | 81.8% | 88.0%                                                                                              | 90.3%  | 90.4%  |
| % of weight not dispensed                     | 15.8%                                                                         | 16.3% | 18.2% | 12.0%                                                                                              | 9.7%   | 9.6%   |
| refill point                                  | 71 %                                                                          | 71 %  | 71 %  | 80.4 %                                                                                             | 80.4 % | 80.4 % |
| optimized average weight (g)                  | 19.8g                                                                         | 19.5g | 19.0g | 20.2g                                                                                              | 20.7g  | 20.7g  |
| off target dose (for a target dose of 20.3 g) | 6.4 %                                                                         | 6.4 % | 6.4 % | 2.2 %                                                                                              | 2.2 %  | 2.2 %  |

Table 10

|                                               | Coffee mix 2 with 1 % CaCO <sub>3</sub><br>in place of SiO <sub>2</sub> |       |       | Coffee mix 2 with<br>1,6 % CaCO <sub>3</sub> + 0,8 % pea<br>fibres in place of SiO <sub>2</sub> |       |       |
|-----------------------------------------------|-------------------------------------------------------------------------|-------|-------|-------------------------------------------------------------------------------------------------|-------|-------|
| Test                                          | 1                                                                       | 2     | 3     | 1                                                                                               | 2     | 3     |
| accuracy (%) at +/- 15 %                      | 77.0%                                                                   | 5.0%  | 37.2% | 79.0%                                                                                           | 77.4% | 87.1% |
| accuracy (%) at +/- 25 %                      | 88.6%                                                                   | 39.2% | 76.7% | 92.4%                                                                                           | 88.4% | 89.9% |
| % of weight not dispensed                     | 11.4%                                                                   | 60.8% | 23.3% | 7.6%                                                                                            | 11.6% | 10.1% |
| refill point                                  | 23.4%                                                                   | 23.4% | 23.4% | 77.4%                                                                                           | 77.4% | 77.4% |
| optimized average weight (g)                  | 21.5g                                                                   | 18.4g | 19.9g | 22.0g                                                                                           | 22.7g | 22.9g |
| off target dose (for a target dose of 22.7 g) | 18.9%                                                                   | 18.9% | 18.9% | 2.9%                                                                                            | 2.9%  | 2.9%  |

The tests demonstrate that the addition of CaCO<sub>3</sub> and pea fibres provides good dispensing of 1 and 2 from the powder canister : dosing is consistent and close to the target dose, few powder remains blocked in the canister and the refill point is high. By comparison, the use of CaCO<sub>3</sub> alone as anti-caking agent in these powdered coffee mixes does not provide comparable dispensing properties.

Although the invention has been described with reference to the above illustrated embodiments, it will be appreciated that the invention as claimed is not limited in any way by these illustrated embodiments.

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.

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

## CLAIMS

1. Powdered beverage or food composition comprising :  
- up to 5 % in weight of calcium carbonate, and  
5 - up to 3 % in weight of plant fibres.
2. Powdered beverage or food composition according to Claim 1 comprising :  
- at least 0,1 % by weight of calcium carbonate, and  
- at least 0,05 % by weight of plant fibres.
- 10 3. Powdered beverage or food composition according to Claim 1 or 2 comprising :  
- between 1 and 2,5 % by weight of calcium carbonate, and  
- between 0,5 and 2 % by weight of plant fibres.
- 15 4. Powdered beverage or food according to any one of the precedent claims, wherein said powder is substantially void of SiO<sub>2</sub>.
5. Powdered beverage or food composition according to any one of the precedent claims, wherein the powder is a water soluble beverage or food powder composition for  
20 reconstitution in water or aqueous based liquid to form a beverage or food.
6. Powdered beverage or food composition according to the precedent claim, wherein the beverage powder is selected from the group of :  
- dairy creamer powder,  
25 - non-dairy creamer powder,  
- filled dairy creamer powder,  
- fully plant based creamer powder,  
- coffee mixes powder,  
- chocolate powder,  
30 - soup powder,  
or a combination thereof.
7. Powdered beverage or food composition according to Claim 5, wherein the food powder is selected from the group of :  
35 - smoothie powder,  
- fruit puree powder,  
- mashed vegetable powder

or a combination thereof.

8. Powdered beverage or food composition according to any one of the precedent claims, wherein said plant fibres are selected from the list of vegetable fibres, cereal bran or a combination thereof.

9. Powdered beverage or food composition according to any one of the precedent claims, wherein said plant fibres are pea fibres.

10. Powdered beverage or food composition according to any one of the precedent claims, wherein said pea fibres are non-extracted natural pea fibres comprising soluble and insoluble pea fibres.

11. Use of a mixture of calcium carbonate and pea fibres as an anti-caking agent for soluble beverage or food powder, wherein the components of said mixture are mixed with the soluble beverage powder in a proportion such that the resulting powdered beverage or food composition comprises :

- up to 5 % in weight of calcium carbonate, and

- up to 3 % in weight of plant fibres,

preferably

- at least 0,1 % by weight of calcium carbonate, and

- at least 0,05 % by weight of plant fibres.

even more preferably :

- between 1 and 2,5 % by weight of calcium carbonate, and

- between 0.5 and 2 % by weight of plant fibres.

12. Use of a mixture of calcium carbonate and pea fibres for controlling powder caking in a soluble beverage or food powder, wherein the components of said mixture are mixed with the soluble beverage or food powder in a proportion such that the resulting powdered beverage or food composition comprises :

- up to 5 % in weight of calcium carbonate, and

- up to 3 % in weight of plant fibres,

13. A method for controlling powder caking in a soluble beverage or food powder, wherein calcium carbonate and plant fibres are mixed with the soluble beverage powder in a proportion such that the resulting powdered beverage or food composition comprises :

- up to 5 % in weight of calcium carbonate, and

- up to 3 % in weight of plant fibres.

14. Use of the powdered beverage or food composition according to any one of Claims 1 to 10 in a beverage preparation machine comprising a storing container and a dosing device.

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15. Packaging comprising the powdered food or beverage composition according to any one of Claims 1 to 10.