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(54) Title: PECTIN POWDER BLENDS COMPRISING DRIED SALTS OF AN EDIBLE ACID

(57) Abstract: The present invention relates to a powder blend comprising high methoxyl pectin and at least one dried salt of an edible acid selected from tartrate, citrate, phosphate, polyphosphates and lactate, the salt having a water content of less than 12% by weight, a method for preparing the same, and the use thereof in food products, in particular confectionery products. The present invention also relates to said dried salt of an edible acid and the use thereof in food products, in particular confectionery products.



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Pectin powder blends comprising dried salts of an edible acid

5 The present invention relates to a powder blend comprising high methoxyl pectin and at least one dried salt of an edible acid selected from tartrate, citrate, phosphate, polyphosphates and lactate, the salt having a water content of less than 12% by weight, a method for preparing the same, and the use thereof in food products, in particular confectionery products. The present invention also relates to said dried salt
10 of an edible acid and the use thereof in food products, in particular confectionery products.

Pectins are widely used in the food industry as texturizing gelling agents and thickeners. A particularly important class of commercial pectins are the so-called high
15 methoxyl pectins (HM pectins), in which 50% or more of the carboxyl groups are methyl-esterified. These HM pectins find widespread application in the food industry, in particular in the bakery industry for making fillings and in the confectionery industry for making fruit fillings, candies and so-called gum and jelly products, such as fruit jellies, jelly centers, fruit gums and jams.

20 From a technological perspective, it is highly important that the used pectins allow sufficient time for processing, but at the same time the products set relatively quickly so that the set products can be immediately processed. In this regard, the setting temperature and the setting time of HM pectins is of key importance for the user. A
25 low setting temperature, i.e. a long setting time, indicates that there is relatively much time available for processing without gel formation, whereas a high setting temperature, i.e. a short setting time, indicates that the products will set relatively quickly.

30 The setting temperature and setting time depend on various factors. For example, pectins having a degree of esterification (which is the number of methoxylated galacturonic acids to total galacturonic acids) of about 60% have the lowest setting temperature, i.e. the longest setting time. With higher degrees of esterification the setting temperature increases and the setting time decreases. Further key factors are
35 the soluble solids content and the pH of the product. The addition of increased amounts of soluble solids, typically provided in the form of glucose syrups and neutral sugars like sucrose, reduces the water activity and thus promotes aggregation of pectin. Therefore, the setting temperature increases, or the setting

time decreases, resulting in an increased risk of gelation and/or too short processing times. These undesirable effects of high soluble solids contents, as typically used in the production of confectionery products, may be compensated to a certain extent by increasing the pH, which decreases the tendency of the pectin chains to aggregate and, thus, allows preventing too fast gelation and achieving sufficiently long processing times. In many confectionery applications, however, a relatively low pH is desirable for taste reasons, but at the same time sufficiently long processing times and relatively short setting times of the products are required. In this case the use of buffer salts that act as setting temperature reducers or retarders (gel retarding agents) become necessary.

These setting temperature reducers are typically salts of edible acids, such as citric acid, phosphoric acid, tartaric acid or polyphosphates. They are believed to sterically interfere with the aggregation of pectin chains. As a result, the higher the concentration of the setting temperature reducers, the lower the setting temperature and the longer the setting time of the products. Thus, the setting temperature reducers enable, for example, the production of food products, in particular confectionery products, at lower pH without the risk of too fast gelation and with sufficiently long processing times.

There are different HM pectin blends for food applications available on the market, which are specifically tailored to the intended gelling behaviour, the desired texture and constant production conditions. These known HM pectin blends include blends that are pre-formulated with setting temperature reducers and/or sugars. All these blends of HM pectin, however, suffer from the disadvantage that they undergo caking during the blending process or in their bags upon storage. As a result, the blending process is difficult or the bags turn into "stones" and are very difficult to handle, which poses a significant problem to the users of such products.

It is therefore an object of the present invention to provide a powder blend, comprising high methoxyl (HM) pectin and a setting temperature reducer, suited for use in food products, in particular confectionery products, which does not undergo caking upon storage and is easier to produce and handle.

This object is achieved by the provision of a salt of an edible acid selected from tartrate, citrate, phosphates, polyphosphates and lactate (hereinafter sometimes referred to as "edible acid salt") having a water content of less than 12%, and blending this salt with high methoxyl pectin (hereinafter sometimes referred to as

"HM pectin") and, optionally, other components like carbohydrates to prepare a pectin powder blend, which is suitable for use in various food products, in particular in confectionery products.

5 The present invention is based on the unexpected finding that a powder blend, comprising pectin and a tartrate, citrate, phosphate, polyphosphate or lactate salt with a water content of less than 12% by weight of the salt, does not undergo caking and remains stable without any increase in water content on storage and caking
10 tendencies. Thus, the powder blend of the present invention is advantageous in terms of handling, ease of blending, increased stability and improved shelf life.

Heretofore, it was commonly believed in the art that the encountered caking problems arise from the salt itself, which tends to cake in the blend. However, in contrast to what was believed in the art, the inventors of the present invention have
15 surprisingly found that the caking problem does not arise from the salt itself or its hygroscopic behaviour, but rather is due to the water originating from the admixed edible acid salt that is captured by the HM pectin and then causes caking of the pectin powder blend.

20 Another advantage associated with the present invention is the possibility to include high amounts of edible acid salts that act as pH-buffer substances and setting temperature reducers. A high content of such edible acid salts is desirable to prevent too fast gelation and to achieve long processing times, which is an important aspect in many food products, in particular in food products having high soluble solid
25 contents and/or a relatively low pH, such as confectionery products. Heretofore, the ongoing need in the art for pectin powder blends comprising edible acid salts in high amounts of, for example, more than 30% by weight could not be met, because the water content of the conventionally used edible acid salts is typically in the range of about 16 to 30% by weight of the salt. Thus, conventional edible acid salts contain a
30 significant amount of water, which causes the pectin powder blend to undergo caking. Indeed, at water contents of more than 30% by weight immediate caking is observed. In contrast thereto, the pectin powder blends of the present invention allow producing blends with edible acid salt contents as high as, for example, 60% by weight, without observing any caking problems, which is of great interest to the
35 food industry.

According to a first aspect of the present invention, there is provided a powder blend comprising high methoxyl pectin and at least one salt of an edible acid selected from

tartrate, citrate, phosphate, polyphosphates and lactate, the salt having a water content of less than 12% by weight, preferably less than 10% by weight, and more preferably less than 8%, 7% or 6% by weight.

5 The edible acid salt having a water (moisture) content of less than 12% by weight according to the present invention (sometimes referred to as "dried salts" herein) may be prepared by a heat drying method, which involves the steps of (a) providing a salt of the edible acid with a given initial water content and (b) subjecting the salt to a heat drying treatment at a temperature of 60 to 85°C, in particular 75 to 85 °C,
10 under reduced pressure (0 to (-1) bar) for a sufficient period of time to reduce the initial water content of said salt to less than 12% by weight.

This heat drying method is a result of several trials using various direct and indirect drying techniques at different heating temperatures and heating times. It was found
15 that the drying must be slow in order to allow the water to evaporate without caking of the salt in the drier. The optimal temperature for drying was identified to be within a relatively low and narrow temperature range of 60 to 85°C, in particular 75 to 85 °C. In order to carry out the heat drying treatment, any suitable heat drying apparatus, such as a vacuum paddle dryer, may be used.

20 If the initial water content of the salt is in the range of 16 to 30% by weight, a heating time of typically 4 to 8 h, more typically 4 to 6 h, is generally sufficient to reduce the initial water content to less than 12% by weight. Preferably, a starting edible acid salt having a water content of 16 to 22% by weight is used, and the heat
25 drying conditions involve a temperature of between 78 and 82 °C under reduced pressure for a period of time of between 4.3 and 4.7 h, resulting in a reduction of the initial water content to a water content of less than 12% by weight, preferably less than 10% by weight, more preferably less than 8% or 7% by weight, and most preferred less than 6% by weight. The above-described heat drying treatment may
30 be carried out by means of any suitable heat drying apparatus.

A preferred salt of an edible acid for use herein is a salt of tartrate, citrate or lactate, more preferably a salt of tartrate and citrate, and particularly preferred a salt of tartrate. The counterion of the salt is preferably selected from alkali metals or
35 alkaline earth metals. Particularly suited for use herein are sodium and/or potassium salts of the edible acid and most preferred for use herein is potassium sodium tartrate, in particular Seignette's salt (also called "Rochelle salt").

Suitable pectins for use herein have a degree of esterification of more than 50%. Preferred for use herein are HM pectins having a degree of esterification of more than 55% or 60% and less than 70% or 65%. Especially suited for use herein are HM pectins having a degree of esterification of 53% to 67%. The HM pectins may be derived from any natural source. Typically, HP pectins suited for use herein are derived from the peel of citrus fruits (e.g. lemon, lime and orange) or from apple pomace. Suitable HM pectins also include chemically-modified HM pectins, such as amidated HM pectins.

In a preferred embodiment, the salt of the edible acid constitutes at least 10%, preferably more than 20%, and more preferably more than 30%, 35% or 40% by weight, yet more preferably 25 to 60% by weight, still more preferably 35 to 60% by weight, and most preferably 40 to 60% by weight of the total weight of the powder blend of the present invention. The HM pectin preferably represents 20 to 70%, more preferably 30 to 65%, yet more preferably 40 to 65%, and most preferably 50 to 60% by weight of the total weight of the powder blend.

The powder blend of the present invention may consist exclusively of HM pectin and the dried salt of an edible acid described herein, but preferably further comprises at least one carbohydrate. The carbohydrate may be selected from the group consisting of sucrose, dextrose, dextrans, fructose, maltose, maltotriose, polyols, gelatine, starch, agar-agar and mixtures thereof. Some residual quantity of powder gum can also be added as a carbohydrate, either alone or in combination with one or more of the above mentioned carbohydrates, for example locust bean gum, carrageenan, alginate, xanthan, and mixtures thereof. A preferred carbohydrate for use herein is dextrose. Conveniently, the carbohydrate may be added in the form of glucose, fructose or maltose syrups, as known in the art. The content of the at least one carbohydrate in the powder blend of the present invention may range from 0 to 30%, preferably 5 to 25%, more preferably from 10 to 20% by weight of the total weight of the powder blend. Said gum will generally not be present in an amount of more than 2% by weight of the total weight of the powder blend.

Further ingredients, although not preferred, may additionally be included in the powder blend of the present invention in a total amount of no more than 10%, preferably 0 to 5%, more preferably 0 to 2% by weight of the total weight of the powder blend. For example, small quantities of another salt can be used, said salt acting as a calcium sequestrant, and is preferably hexametaphosphate or

pyrophosphate and in amounts of from 0 to 5%, preferably 0 to 2% by weight of the total weight of the powder blend.

5 According to a further aspect of the present invention, there is provided a salt of an edible acid selected from tartrate, citrate, phosphate, polyphosphate and lactate, the salt having a water content of less than 12% by weight, preferably less than 10% by weight, and more preferably less than 8%, 7% or 6% by weight. Preferably, the salt is obtainable by a method as defined hereinabove.

10 According to another aspect of the present invention, there is provided a method for preparing the powder blend as defined hereinabove. This method comprises the steps of (a) providing (i) at least one salt of an edible acid selected from tartrate, citrate, phosphate, polyphosphate and lactate having a water content of less than 12% by weight, preferably less than 8%, 7% or 6% by weight, (ii) high methoxyl
15 pectin and (iii), optionally, at least one carbohydrate, and (b) blending the at least one salt of the edible acid together with the high methoxyl pectin and, optionally, the at least one carbohydrate. In a preferred embodiment, the salt of said edible acid is selected from salts of tartrate, citrate and lactate.

20 According to a last aspect, the present invention relates to the use of the powder blend or the salt of an edible acid as defined herein in food products. Preferably, the food products are bakery products with fillings or confectionery products, such as products with fruit fillings, candies and gum and jelly products, such as fruit jellies, jelly centers, fruit gums, and aerated fruit flavoured products. It is further preferred
25 that suitable food products for use herein have a brix value of higher than 60° and a pH of below 4.0 with or without fruit, such as confectionery and bakery products, in particular fillings, glazes, decorations and the like.

30 The present invention will now be described in more detail by reference to the following Example and the accompanying drawings, in which:

Fig. 1 is a schematic view of the vessel and blade of a rheometer, the arrow schematically depicting the helical movement of the blade through the vessel contents;

35

Fig. 2 is a graph showing an exemplary rheometric curve of axial force (g) *versus* axial distance (mm) for a powder blend of the present invention consisting of 59 wt.% HM pectin, 12 wt.% dextrose and 29 wt.% Seignette's salt having a water

(humidity) content of 6 wt.% (lower curve), and for a comparative powder blend, comprising 59 wt.% HM pectin, 12 wt.% dextrose and 29 wt.% Seignette's salt having a water (humidity) content of 20 wt.% (upper curve); and

Fig. 3 is a plot showing the degree of caking for a powder blend of the present invention consisting of 59 wt.% HM pectin, 12 wt.% dextrose and 29 wt.% Seignette's salt having a water (humidity) content of 6 wt.% (grey bars), and for a comparative powder blend, comprising 59 wt.% HM pectin, 12 wt.% dextrose and 29 wt.% Seignette's salt having a water (humidity) content of 20 wt.% (black bar) at 35 °C over time.

EXAMPLE

In the following it is demonstrated that blending of a HM pectin powder with an edible acid salt, which has been dried beforehand to a water content of less than 12% by weight, preferably less than 10% by weight, results in a powder blend that exhibits a drastically increased stability to caking upon storage. In fact, no caking at all was observed using the dried salt of the present invention having a water content of 6% by weight over prolonged storage times, whereas the use of a conventional salt having a water content of 20% by weight caused the blend to undergo caking within a relatively short period of time. This enhanced stability of the pectin blends to caking does not only facilitate the handling and blending, but also offers the option of using significantly increased amounts of edible acid salts acting as setting temperature reducers in the blends without encountering caking problems.

1. Experimental procedures

1.1 Materials

The following powder blends were used:

Pectin powder blend of the present invention (inventive powder blend)

59 wt.% citrus pectin (lot 0703059R)
29 wt.% Seignette's salt dry (water content of 6% by weight)
12 wt.% dextrose

Comparative pectin powder blend (comparative powder blend)

59 wt.% citrus pectin (lot 0703059R)

29 wt.% Seignette's salt wet (water content of 20% by weight)

5 12 wt.% dextrose

1.2 Method for assessing the degree of caking

10 A quantity of 160 ml of a pectin powder blend was put into graduated (200 ml) beakers and masses of 560 g were placed on the powder blends to accelerate the caking process. The beakers were then stored at 35°C in an oven. After storage for given time periods the beakers were cooled to 25°C in a desiccator without reuptake of humidity.

15 After having withdrawn the weights, the degree of caking was rheometrically assessed using a (texturometer) adapted for powders (TAXT+) equipped with the Stable Micro Systems, Ltd. powder data analysis software package "Powder Flow Analyser" (version no. 3.0.5.0). The rotor was axially moved downwardly through the
20 sample with the blade, rotated at a given speed, traversing the beaker contents in a helical manner as schematically depicted in Fig. 1. More specifically, the rotor was programmed to slice through the compacted powder column at a tip speed of 20 mm/s and an angle of 170 degrees to reach the height of 4 mm. The axial force exerted as a result of the resistance of the substance in the beaker to the blade as a
25 function of the axial distance travelled was measured and plotted on the Y axis *versus* the axial distance on the X axis. An exemplary curve of axial force *versus* axial distance for an inventive powder blend (lower curve) and a comparative powder blend (upper curve) recorded in this manner is shown in Fig. 2.

30 The degree of caking was calculated by integrating the area under the recorded curve of axial force *versus* axial distance travelled from the upper surface of the substance in the beaker to the bottom of the beaker (indicated by the broken line in Fig. 2).

35 The method was found to be very reliable and reproducible with a standard deviation of no more than about 7% or less for HM pectin samples with low caking abilities (results not shown) and, thus, allows to accurately distinguish different pectin samples with respect to their caking behaviour.

1.2 Method for measuring the water content

5 The water content of the used edible acid salts was measured by placing a given amount of powder in an oven at 105 °C and evaluating the loss of weight after 4 h of drying.

2. Results

10 The degree of caking of the inventive powder blend and the comparative powder blend upon storage at 35°C was assessed after storage times of 24 hours, 3 days, 3 weeks and 6 weeks by recording curves of axial force (g) vs. the axial distance travelled (mm) and determining the area (g·mm) under the recorded curve, as described above. The results are shown in Fig. 3, where the black bar represents the
15 comparative powder blend and the grey bars represent the inventive powder blend.

As can be seen, in contrast to the inventive powder blend, the comparative powder blend shows strong caking tendencies upon storage at 35 °C for 24 h. After a storage time of 3 days or longer the comparative powder blend was completely solidified and
20 thus no rheometric measurements could be carried out. In contrast, the powder blend according to the present invention is stable over prolonged storage times without showing any caking tendencies.

Claims

- 5 1. A powder blend comprising high methoxyl pectin and at least one salt of an edible acid selected from tartrate, citrate, phosphate, polyphosphates and lactate, the salt having a water content of less than 12% by weight.
2. The powder blend of claim 1, wherein the water content of the salt of said
10 edible acid is less than 10% by weight.
3. The powder blend of claim 1 or 2, wherein the salt of said edible acid is an alkali metal or alkaline earth metal salt of said edible acid.
- 15 4. The powder blend of claim 3, wherein the salt of said edible acid is a sodium and/or potassium salt of said edible acid.
5. The powder blend of claim 4, wherein the salt of said edible acid is potassium sodium tartrate.
- 20 6. The powder blend of claim 4, wherein the salt of said edible acid is Seignette's salt.
7. The powder blend of any one of claims 1 to 6, wherein the salt of said edible
25 acid constitutes at least 10% by weight of the powder blend.
8. The powder blend of claim 7, wherein the salt of said edible acid constitutes at least 30% by weight of the powder blend.
- 30 9. The powder blend of any one of claims 1 to 8, further comprising at least one carbohydrate.
10. The powder blend of claim 9, wherein the carbohydrate is selected from sucrose, dextrose or dextrans, fructose, maltose, maltotriose, polyols, gelatine,
35 starch, agar-agar and mixtures thereof.

11. A salt of an edible acid selected from tartrate, citrate, phosphate, polyphosphates and lactate, the salt having a water content of less than 12% by weight.

5 12. The salt of claim 11, wherein the water content is less than 10% by weight.

13. A method for preparing a powder blend according to any one of claims 1 to 10, comprising the steps of:

10 providing at least one salt of an edible acid selected from tartrate, citrate, phosphate, polyphosphate and lactate, the salt of said edible acid having a water content of less than 12% by weight;

providing high methoxyl pectin; and

15

optionally, providing at least one carbohydrate; and

blending the at least one salt of said edible acid together with high methoxyl pectin and, optionally, the at least one carbohydrate.

20

14. Use of a powder blend according to any one of claims 1 to 10 or a salt of an edible acid according to claim 11 or 12 in food products.

15. The use of claim 14, wherein the food products are confectionery products.

25

16. Confectionery product comprising the powder blend according to any one of claims 1 to 10.

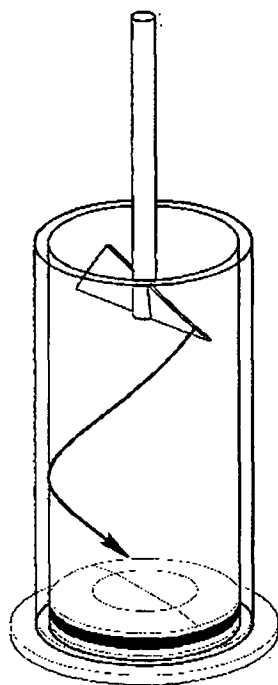
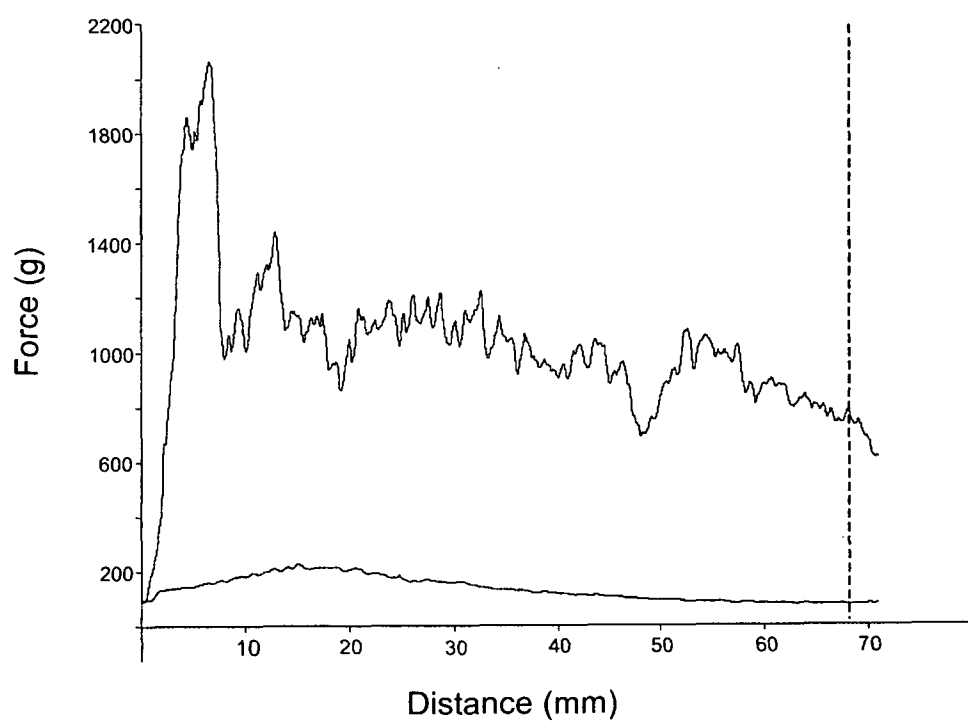
FIG. 1**FIG. 2**

FIG. 3