Thus, there remains a need for a liquid thickener delivery system that may be used, for example, to feed subjects suffering from a mastication and/or deglutition disorder, such as dysphagia, which overcomes one or more of the inherent limitations of commercially available gel and/or powdered thickener delivery systems.

SUMMARY

In a first aspect, the disclosure refers to a storage and delivery system for a stable liquid composition, comprising:

(a) a container containing the stable liquid composition, said composition for increasing the viscosity of an aqueous liquid or aqueous liquid solid mixture foodstuff, wherein the composition is stable for at least six months at room temperature and wherein the composition comprises a viscosity of less than 2000 cP and a water activity of greater than 95%, wherein the composition comprises: (i) one or a plurality of thickening agents selected from the group consisting of agar, alginic acid, carrageenan, guar gum, gum tragacanth, gum ghatti, microcrystalline cellulose, methyl cellulose, hydroxypropylmethylcellulose, hydroxypropylcellulose, methylethylcellulose, gum karaya, locust bean gum, tara gum, psyllium seed gum, quince seed gum, a pectin, furcellaran, gellan gum, konjac, sodium alginate, xanthan gum and any combination thereof, wherein the concentration of said thickening agents is about 3% to about 30% by weight; and (ii) one or a plurality of polysaccharides or extracts thereof selected from the group consisting of scleroglucan, dextran, elsinan, soy bean polysaccharide, levan, an arabinogalactan, alternan, inulin, , pullulan, an arabinoxylan, curdlan, low viscosity carboxymethylcellulose (CMC), an

Acacia gum, a Larix occidentalis polysaccharide extract, a Larix laricina polysaccharide extract, a Larix decidua polysaccharide extract, a Larix sibirica polysaccharide extract, and any combination thereof, wherein said polysaccharides or extracts thereof comprises 10 to over 100,000 saccharide units and the concentration of said polysaccharides or extracts thereof is about 3% to about 30% by weight; and (iii) water and/or a food grade aqueous solution; and

(b) a pump dispenser sealingly attached to the container, said dispenser comprising a valve for inhibiting or preventing drying of the composition in the container.

Suitably, the composition is configured to be delivered in one or more doses of a predetermined volume to the foodstuff. Preferably, one, two and three doses of the predetermined volume of the composition increase the viscosity of said foodstuff to first, second and third viscosity levels respectively and wherein a nonlinear relationship exists between the first, second and third viscosity levels.

In a second aspect, the disclosure refers to a method of delivering a stable liquid composition to an aqueous liquid or aqueous liquid solid mixture foodstuff comprising the steps of:

(a) providing a container containing the stable liquid composition, said composition for increasing the viscosity of said foodstuff and having a viscosity of less than 2000 cP and a water activity of greater than 95%, wherein the composition is stable for at least six months at room temperature and wherein the composition comprises: (i) one or a plurality of thickening agents selected from the group consisting of agar, alginic acid, carrageenan, guar gum, gum tragacanth, gum ghatti, microcrystalline cellulose, methyl cellulose, hydroxypropylmethylcellulose, hydroxypropylcellulose, methylethylcellulose, gum karaya, locust bean gum, tara gum, psyllium seed gum, quince seed gum, a pectin,

furcellaran, gellan gum, konjac, sodium alginate, xanthan gum and any combination thereof, wherein the concentration of said thickening agents is about 3% to about 30% by weight; (ii) one or a plurality of polysaccharides or extracts thereof selected from the group consisting of scleroglucan, dextran, elsinan, soy bean polysaccharide, levan, an arabinogalactan, alternan, inulin, pullulan, an arabinoxylan, curdlan, low viscosity carboxymethylcellulose (CMC), an Acacia gum, a Larix occidentalis polysaccharide extract, a Larix laricina polysaccharide extract, a Larix decidua polysaccharide extract, a Larix sibirica polysaccharide extract and any combination thereof, wherein said polysaccharide or extracts thereof comprises 10 to over 100,000 saccharide units and the concentration of said polysaccharide or extracts thereof is about 3% to about 30% by weight; and (iii) water and/or a food grade aqueous solution, wherein the container is further sealingly attached to a pump dispenser, said dispenser comprising a valve for inhibiting or preventing drying of the composition in the container; and

(b) applying a force to the pump dispenser to thereby deliver one or more doses of a predetermined volume of the composition to the foodstuff.

In one example, one, two and three doses of the predetermined volume of the composition increase the viscosity of said foodstuff to first, second and third viscosity levels respectively and wherein a nonlinear relationship exists between the first, second and third viscosity levels.

In particular examples, the method of the present example further comprises the step of applying low-shear mixing to the foodstuff and the composition so as to promote increasing the viscosity of said foodstuff by the composition.

In referring to the disclosure of the first and second examples, the dispenser suitably comprises a dispenser tip, the dispenser tip including

the valve disposed therein.

Suitably, the aforementioned valve is or comprises a self-sealing valve. In particular examples, the aforementioned valve is selected from the group consisting of a cross-slit valve, a ball valve, a flapper valve, an umbrella valve, a duck bill valve, a reed valve and any combination thereof.

In particular examples of the first and second examples, the valve is biased to a closed position and is actuated to an open position upon application of a force to the pump dispenser forcing said composition to flow through the valve.

In a third aspect, the disclosure refers to a method for increasing the viscosity of an aqueous liquid or aqueous liquid solid mixture foodstuff, the method including the steps of:

(a) adding to the foodstuff a stable liquid composition having a viscosity of less than 2000 cP and a water activity of greater than 95%, wherein the composition is stable for at least six months at room temperature and the composition comprising: (i) one or a plurality of thickening agents selected from the group consisting of agar, alginic acid, carrageenan, guar gum, gum tragacanth, gum ghatti, microcrystalline cellulose, methyl cellulose, hydroxypropylmethylcellulose, hydroxypropylcellulose, methylethylcellulose, gum karaya, locust bean gum, tara gum, psyllium seed gum, quince seed gum, a pectin, furcellaran, gellan gum, konjac, sodium alginate, xanthan gum and any combination thereof, wherein the concentration of said thickening agents is about 3% to about 30% by weight; (ii) one or a plurality of polysaccharides or extracts thereof selected from the group consisting of scleroglucan, dextran, elsinan, soy bean polysaccharide, levan, an

arabinogalactan, alternan, inulin, pullulan, an arabinoxylan, curdlan, low viscosity carboxymethylcellulose (CMC), an Acacia gum, a Larix occidentalis polysaccharide extract, a Larix laricina polysaccharide extract, a Larix decidua polysaccharide extract, a Larix sibirica polysaccharide extract and any combination thereof, wherein said polysaccharide or extracts thereof comprises 10 to over 100,000 saccharide units and the concentration of said polysaccharide or extracts thereof is about 3% to about 30% by weight; and (iii) water and/or a food grade aqueous solution; and

(b) applying low-shear mixing to the foodstuff and the composition so as to promote increasing the viscosity of said foodstuff by the composition.

Suitably, for the method of the two aforementioned examples, the low-shear mixing is applied for about 30 seconds or less to achieve a maximal viscosity of the foodstuff. Preferably, the low-shear mixing is applied for about 10 to about 30 seconds to achieve a maximal viscosity of the foodstuff.

In particular examples of the method of the second and third examples, low-shear mixing comprises stirring at a speed of from about 10 rpm to about 40 rpm.

Also disclosed is a stable liquid composition having a viscosity of less than 2000 cP and a water activity of greater than 95%, the composition comprising: (i) one or a plurality of thickening agents selected from the group consisting of agar, alginic acid, carrageenan, guar gum, gum tragacanth, gum ghatti, microcrystalline cellulose, methyl cellulose, hydroxypropylmethylcellulose, hydroxyproylcellulose, methylethylcellulose, gum karaya, locust bean gum, tara gum, psyllium seed gum, quince seed gum, a pectin,

CLAIMS

1. A storage and delivery system for a stable liquid composition, comprising:

(a) a container containing the stable liquid composition, said composition for increasing the viscosity of an aqueous liquid or aqueous liquid solid mixture foodstuff, wherein the composition is stable for at least six months at room temperature and wherein the composition comprises a viscosity of less than 2000 cP and a water activity of greater than 95%, wherein the composition comprises: (i) one or a plurality of thickening agents selected from the group consisting of agar, alginic acid, carrageenan, guar gum, gum tragacanth, gum ghatti, microcrystalline cellulose, methyl cellulose, hydroxypropylmethylcellulose, hydroxypropylcellulose, methylethylcellulose, gum karaya, locust bean gum, tara gum, psyllium seed gum, quince seed gum, a pectin, furcellaran, gellan gum, konjac, sodium alginate, xanthan gum and any combination thereof, wherein the concentration of said thickening agents is about 3% to about 30% by weight; (ii) one or a plurality of polysaccharides or extracts thereof selected from the group consisting of scleroglucan, dextran, elsinan, soy bean polysaccharide, levan, an arabinogalactan, alternan, inulin, pullulan, an arabinoxylan, curdlan, low viscosity carboxymethylcellulose (CMC), an *Acacia* gum, a *Larix occidentalis* polysaccharide extract, a *Larix laricina* polysaccharide extract, a *Larix decidua* polysaccharide extract, a *Larix sibirica* polysaccharide extract and any combination thereof, wherein said polysaccharides or extracts thereof comprises 10 to over 100,000 saccharide units and the concentration of said polysaccharides or extracts thereof is about 3% to about 30% by weight; and (iii) water and/or a food grade aqueous solution; and

(b) a pump dispenser sealingly attached to the container, said dispenser comprising a valve for inhibiting or preventing drying of the composition in the container.

2. The system of Claim 1, wherein the composition is configured to be delivered in one or more doses of a predetermined volume to the foodstuff.

3. The system of Claim 2, wherein one, two and three doses of the predetermined volume of the composition increase the viscosity of said foodstuff to first, second and third viscosity levels respectively, wherein the first viscosity level is about 120 to about 180 mPa.s, the second viscosity level is about 350 to about 450 mPa.s, and the third viscosity level is about 850 to about 950 mPa.s.

4. A method of delivering a stable liquid composition to an aqueous liquid or aqueous liquid solid mixture foodstuff comprising the steps of:

(a) providing a container containing the stable liquid composition, said composition for increasing the viscosity of said foodstuff and having a viscosity of less than 2000 cP and a water activity of greater than 95%, wherein the composition is stable for at least six months at room temperature and wherein the composition comprises: (i) one or a plurality of thickening agents selected from the group consisting of agar, alginic acid, carrageenan, guar gum, gum tragacanth, gum ghatti, microcrystalline cellulose, methyl cellulose, hydroxypropylmethylcellulose, hydroxypropylcellulose methylethylcellulose, gum karaya, locust bean gum, tara gum, psyllium seed gum, quince seed gum, a pectin, furcellaran, gellan gum, konjac, sodium alginate, xanthan gum and any combination thereof, wherein the concentration of said

thickening agents is about 3% to about 30% by weight; and (ii) one or a plurality of polysaccharides or extracts thereof selected from the group consisting of scleroglucan, dextran, elsinan, soy bean polysaccharide, levan, an arabinogalactan, alternan, inulin, pullulan, an arabinoxylan, curdlan, low viscosity carboxymethylcellulose (CMC), an *Acacia* gum, a *Larix occidentalis* polysaccharide extract, a *Larix laricina* polysaccharide extract, a *Larix decidua* polysaccharide extract, a *Larix sibirica* polysaccharide extract and any combination thereof, wherein said polysaccharide or extracts thereof comprises 10 to over 100,000 saccharide units and the concentration of said polysaccharide or extracts thereof is about 3% to about 30% by weight; and (iii) water and/or a food grade aqueous solution, wherein the container is further sealingly attached to a pump dispenser, said dispenser comprising a valve for inhibiting or preventing drying of the composition in the container; and

(b) applying a force to the pump dispenser to thereby deliver one or more doses of a predetermined volume of the composition to the foodstuff.

5. The method of Claim 4, wherein one, two and three doses of the predetermined volume of the composition increase the viscosity of said foodstuff to first, second and third viscosity levels respectively and wherein a nonlinear relationship exists between the first, second and third viscosity levels.

6. The method of Claim 4 or Claim 5, further comprising a step of applying low-shear mixing to the foodstuff and the composition so as to promote increasing the viscosity of said foodstuff by the composition.

7. The system or method of any one of the preceding claims, wherein the valve is or comprises a self-sealing valve.

8. The system or method of any one of the preceding claims, wherein the dispenser comprises a dispenser tip, the dispenser tip including the valve disposed therein.

9. The system or method of any one of the preceding claims, wherein the valve is selected from the group consisting of a cross-slit valve, a ball valve, a flapper valve, an umbrella valve, a duck bill valve, a reed valve and any combination thereof.

10. The system or method of any one of the preceding claims, wherein said valve is biased to a closed position and is actuated to an open position upon application of a force to the pump dispenser forcing said composition to flow through the valve.

11. A method for increasing the viscosity of an aqueous liquid or aqueous liquid solid mixture foodstuff, the method including the steps of:

(a) adding to the foodstuff a stable liquid composition having a viscosity of less than 2000 cP and a water activity of greater than 95%, wherein the composition is stable for at least six months at room temperature and the composition comprising: (i) one or a plurality of thickening agents selected from the group consisting of agar, alginic acid, carrageenan, guar gum, gum tragacanth, gum ghatti, microcrystalline cellulose, methyl cellulose, hydroxypropylmethylcellulose, hydroxypropylcellulose, methylethylcellulose, gum karaya, locust bean gum, tara gum, psyllium seed gum, quince seed gum, a pectin, furcellaran, gellan gum, konjac, sodium alginate, xanthan

gum and any combination thereof, wherein the concentration of said thickening agents is about 3% to about 30% by weight; (ii) one or a plurality of polysaccharides or extracts thereof selected from the group consisting of scleroglucan, dextran, elsinan, soy bean polysaccharide, levan, an arabinogalactan, alternan, inulin, pullulan, an arabinoxylan, curdlan, low viscosity carboxymethylcellulose (CMC), an *Acacia* gum, a *Larix occidentalis* polysaccharide extract, a *Larix laricina* polysaccharide extract, a *Larix decidua* polysaccharide extract, a *Larix sibirica* polysaccharide extract and any combination thereof, wherein said polysaccharide or extracts thereof comprises 10 to over 100,000 saccharide units and the concentration of said polysaccharide or extracts thereof is about 3% to about 30% by weight; and (iii) water and/or a food grade aqueous solution; and

(b) applying low-shear mixing to the foodstuff and the composition so as to promote increasing the viscosity of said foodstuff by the composition.

12. The method of any one of Claims 6 to 11, wherein the low-shear mixing is applied for about 30 seconds or less to achieve a maximal viscosity of the foodstuff.

13. The method of Claim 12, wherein the low-shear mixing is applied for 10 to 30 seconds to achieve a maximal viscosity of the foodstuff.

14. The method of any one of Claims 6 to 13, wherein the low-shear mixing comprises stirring said composition at a speed of from 10 rpm to 40 rpm.

15. The method of any one of Claims 5 to 14, wherein the viscosity of said foodstuff is increased to greater than 95 cP.

16. The system or method of any one of the preceding claims, wherein the composition is stable for at least six months at room temperature.

17. The system or method of any one of the preceding claims, wherein the foodstuff of increased viscosity is for feeding a subject suffering from a mastication and/or deglutition disease, disorder or condition.

18. The system or method of Claim 17, wherein the mastication and/or deglutition disease, disorder or condition is or comprises dysphagia.