

Pourable Salad Dressing

The present invention is concerned with pourable products, in particular with pourable acidic food products of the dressing type, and especially pourable salad dressings of low viscosity which nevertheless possess particles suspending properties.

BACKGROUND OF THE INVENTION

Many attempts have been made to formulate good quality salad dressings. In particular there is a need for pourable products with good appearance and physical characteristics at all fat levels from 50 wt% down to zero fat products. Two-phase pourable dressings (up to 50 wt% of fat) have aqueous phases which normally do not suspend pieces of herbs, vegetables and spices. Current storage-stable low/zero fat dressings commonly employ xanthan to keep pieces of herbs, vegetables and spices suspended. But the xanthan presence results in a viscosity which is undesirably increased over home-made non storage-stable products or full fat products. Storage-stable means that the pieces of vegetables, herbs and/or spices remain suspended for at least four weeks. Use of xanthan results moreover in poor surface coating properties and in a slimy mouthfeel. Therefore the drastic reduction, and most preferably the removal of xanthan from pourable salad dressings is much desired.

EP 558 113 contains a description of a general process for water continuous compositions including salad dressings which contain polysaccharides present as microgels obtained by applying shear during gel formation.

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STATEMENT OF INVENTION

Pourable storage-stable salad dressings have been found which, surprisingly, in the absence of effective amounts of xanthan, have the ability to keep pieces of herbs, vegetables and/or spices suspended for a prolonged period of time. This suspension effect is attained at a viscosity which is even lower than the minimum viscosity necessary for imparting pieces suspending properties to the current xanthan based oil and vinegar dressings.

According to a first aspect of the invention a pourable acidic dressing is provided comprising

- a. 0-50 wt% of fat,
 - 20 b. 46-99 wt% of water,
 - c. pieces of vegetables, herbs and/or spices of a visible size,
 - d. an acidulant, enough for a titratable acidity of 0.5-2.5%,
 - 25 e. 0.1-4 wt% of one or more non-starch polysaccharides present in a sheared gel form,
- which polysaccharides used either singly or in combination, if applied under quiescent gelling conditions, at the concentration used in the dressing composition, and at the appropriate pH, titratable acidity and salt content, are capable to form in water either
- (A) a rigid thermoreversible gel; or
 - (B) a rigid chemically set gel; or
 - (C) a rigid synergistic gel.

35 The final dressing has a Brookfield viscosity of 100-4,500 cps. (centipoise) and a yield stress ($\tan \delta = 1$) of 0.1-10 Pa.

"Quiescent gelling conditions" means that the gel is allowed to form in the absence of shear.

It has been found further that such dressings can be
5 obtained if the dressing composition contains specific polysaccharide gels and the dressing be prepared under shear conditions which cause disruption of the normal polysaccharide network formation.

10 Therefore, according to a second aspect of the invention a process is provided for preparing a pourable salad dressing having the above-mentioned composition and rheology which process comprises the steps of

- 15 a. dispersing the polysaccharides in water to obtain a pre-mix, optionally adding one or more other ingredients, including the pieces of herbs, vegetables and spices to the dressing composition;
- b. applying shear during the formation of the gel;
- 20 c. adding the remaining ingredients of the dressing to the sheared gel dispersion;

such that the final dressing has
a Brookfield viscosity of 100-4,500 cps. and
a yield stress ($\tan \delta = 1$) of 0.1-10 Pa.

25 The dressings of the invention have improved rheology, stability, surface coating properties and mouthfeel when compared with the traditional oil and vinegar dressings and the dressings of the prior art containing effective amounts
30 of xanthan gum.

DETAILS OF THE INVENTION

35 The dressing contains pieces of vegetables, herbs and/or spices of a visible size. Visibility has to be understood

in that the pieces as such can be distinguished by the naked eye. This means that at least 80 wt.% of the particles has a size in the range of 0.5-5 mm. Such pieces when initially dispersed in a dressing normally settle at the bottom of the container after some hours. Visibility does not mean that pieces are visible under all circumstances. E.g. in an opaque dressing only the particles at the surface of the dressing are visible. Dressings of the invention preferably have a Brookfield viscosity in the range 200 to 2000 cps., more preferably 200 to 1000 cps.. These are proper low viscosities for a pourable dressing.

Brookfield viscosity is a common viscosity parameter and is determined by taking the viscosity after shearing for 1 minute at 10 rpm using a Brookfield DV-I+™ viscometer fitted with the RV spindle set.

Dressings of the invention preferably have a yield stress ($\tan \delta = 1$) in the range 0.2-5 Pa, more preferably 0.2-2 Pa. This yield stress ensures good particle suspending ability. It is determined by performing an oscillatory stress ramp using a Carrired CSL™ 500 rheometer and standard geometries, and determining the stress value at which the tangent of the delta function becomes unity ($\tan \delta = 1$). This method enables comparison of different materials at the same deformation state.

The determination of viscosity and yield stress is made at a temperature of normal product usage, generally being 5-35°C but typically 18-25°C.

In preparing the dressings of the invention shear is applied during gel formation resulting into microgel particles. For obtaining the desired rheology the proper shear conditions can be found by common variations known to the man skilled in the art. Generally a relatively high shear is used.

Shear can be applied by various means employing e.g. a homogeniser, high shear mixer, votator or scraped surface heat exchanger. There must be sufficient clearance to allow substantial passage of particulates, having a size up to about 5 mm. This sufficient clearance is gained by using a scraped surface heat exchanger, with properly sized rotors, to allow for a 5 mm minimum annular spacing for the product. Larger spacing may allow larger particulate integrity. Smaller spacing will not allow homogeneous distribution of of particulates, and destroys particulate integrity. Suitably a ConthermTM model 6x3a scraped surface heat exchanger is operated at a product temperature of 5°C, at a throughput of 1.5 to 4.0 kg/minute and having a tip speed of 1.5 to 10 m/s., preferably 2.0 m/s. When using other shear devices, in order to obtain a product with the desired rheology and surface coating properties the skilled person is able to determine appropriate shear conditions which are at least equivalent to the shear conditions of the ConthermTM.

All dressing ingredients may be added in the pre-mix before shearing starts ("all-in-one-process"). But in order to prevent possible particle disruption, the herb, vegetable and spice pieces are preferably added after formation of the gel dispersion.

According to a preferred embodiment the dressing premix is subjected to a pasteurisation treatment before shearing.

The gels which may be employed for the invention are selected from the group consisting of thermoreversible gels, chemically set gels and synergistic gels.

For the purpose of the invention the term thermoreversible gels refers to polysaccharide gels which melt upon heating and which re-take their gel structure upon cooling.

Examples of thermoreversible gels of polysaccharides are disclosed in EP 355 908.

Non-starch polysaccharides preferred for this purpose are agar, iota-carrageenan, kappa-carrageenan and furcellaran.

- 5 The preferred concentration is 0.5-2.0 wt% and more preferably 0.7-1.5 wt%, except for agar where the level is preferably 0.2-2.0 wt% and more preferably 0.4-1.1 wt%.
The gelation temperature of thermoreversible gels preferably is 0-85°C, more preferably 20-50°C.

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- For the purpose of the present invention the term chemically set gels refers to polysaccharide gels which do not reversibly melt upon increasing the temperature. They derive their gel structure from a chemical interaction of
15 the polysaccharide with appropriate ions, e.g. Ca^{2+} ions.
Examples of chemically set gels of polysaccharides are disclosed in EP 432 835.

- A suitable non-starch polysaccharide preferred for this
20 purpose is sodium/calcium alginate, where the degree of alginate conversion to calcium alginate preferably is >10%, more preferably 20-100%, most preferably 70-90%. For the calcium dependency of the alginate gel strength, see Food Gels, pp. 53-78, (Ed. P. Harris), 1990, Elsevier ISBN 1-
25 85166-441-9.

- Another chemically set gel is low-methoxy (DE 5-50) pectin with a R value in the range 0.3-1.0 (where R is defined as twice the calcium concentration divided by the
30 concentration of free pectinate groups). The desired R-value is attained by adding an appropriate amount of $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ -solution to the pectin solution.

- These chemically set gels are preferably used at a level of
35 0.3-2.0 wt%, more preferably 0.6-1.5 wt%, most preferably 0.7-1.1 wt%.

Preferred cations for effecting the gelation are Ca^{2+} and K^+ , which are used in such amount that the above conversion degree or R value is attained. Normally, suitable concentrations are found in the range 0.01-1.0 wt%.

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Synergistic gels are described in, for example, Edwin R. Morris, Mixed Polymer Gels, Food Gels, Elsevier Applied Science (1990), 291-352. For the purpose of the invention
10 synergistic gels are understood to comprise all mixtures of two or more polymers, at least one of these being a non-starch polysaccharide, that may individually be non-gelling, but which will form gels (or gels of higher modulus) on mixing.

15 Examples of combinations of polysaccharides which are capable of forming synergistic gels are

sodium alginate / pectin,
agar / konjac mannan,
carrageenan / konjac mannan,
20 propylene glycol alginate (PGA) / pectin,
agar / locust bean gum and
kappa-carrageenan / locust bean gum.

A gel chosen from the group consisting of agar, calcium
25 pectin, calcium alginate, sodium alginate / pectin, kappa-carrageenan and iota-carrageenan is preferred for use in the dressings of the present invention.

More preferred is the synergistic alginate / pectin gel
30 with a weight % preferably being 0.2 - 0.9, more preferably 0.3 - 0.8, most preferably 0.4 - 0.7.

Especially preferred is the synergistic sodium alginate / high-methoxy pectin gel. The sodium alginate preferably has high guluronic acid content. The hydroxyl groups of the
35 high methoxy pectin have been methylated preferably at a level of more than 50%, more preferably greater than 55%, most preferably 60-80%.

The alginate : pectin ratios preferably are 30:70 to 90:10, more preferably 40:60 to 80:20, most preferably 50:50 to 70:30.

The combined weight percentage of alginate and pectin is
5 preferably 0.50-4.0 wt%, more preferably 0.70-3.0 wt%, most preferably 0.90-2.0 wt%.

The dressing composition based on alginate / pectin is acidified according to the requirements of titratable acidity (given later) but limited by the need for a
10 (product) pH <4.0, more preferably <3.85, most preferably 3.2-3.8.

These synergistic gels are made preferably in the substantial absence of Ca^{2+} cations so that no chemically
15 set gels are formed. Preferably, when synergistic gels are made, the level of Ca^{2+} is 0-0.01 wt% and more preferably 0-0.001 wt%. The most preferred compositions of the invention are substantially free from Ca^{2+} . By reducing the level of calcium ions the taste of the dressing is
20 improved.

The water used for preparing the dressing preferably is free from calcium, e.g. by employing deionized or demineralized water.

25 Although preferably the compositions of the invention are substantially free from xanthan, it is well known to use small amounts of xanthan gum to minimize water separation and these small amounts may be used provided they have not the deleterious effect on rheology mentioned above.

30 Therefore some xanthan is allowed at a level of 0 - 0.1 wt%, preferably 0 - 0.01 wt%.

Dressings are essentially food compositions with an acid taste. An acidulant is incorporated for imparting the
35 desired taste and flavour and for microbiological preservation. Suitable acidifiers comprise acetic acid, lactic acid, citric acid and phosphoric acid. Vinegar and

acetic acid are preferred dressing acidulants. The optimum amount of acidulant is established by sensory evaluation and microbiological stability. It is known that a sensory appreciation has no good correspondence with the pH of the dressing, because ingredients such as proteins may interfere with the acidity perception. A better parameter for measuring acidity is the so-called Titratable Acidity (TA). The titratable acidity is the amount (g) of titratable acid on the total amount (g) of dressing * 100%. The titratable acidity is 0.5-2.5%, preferably 0.9-1.8% and more preferably 1.1-1.4%. A way of measuring titratable acidity is included below with the examples.

Compositions of the invention may comprise 0-50 wt% of fat. More preferably the level of fat is 0-15 wt%, most preferred are fat levels 0-10 wt%, including substantially fat-free dressings and dressings having a fat content of only 0.5-8 wt%. However, the invention also enables the production of 30% fat dressings such as full fat Italian dressings.

Throughout this specification the terms oil and fat are used interchangeably. Also indigestible fats such as sucrose polyesters may be used. Fats for use in the dressings of the invention preferably are liquid at room temperature. Preferably their SAFA content is ≤ 15 wt%. Traditional salad dressing oils or other suitable naturally occurring oils or mixtures thereof may be used, for example olive oil, linseed oil (about 10 wt% SAFA), rapeseed oil (about 9 wt% SAFA), safflower oil (about 9 wt% SAFA), sesame oil (about 9 wt% SAFA). Also oils obtained from (genetically) modified sources may be chosen. It is also possible to obtain low SAFA oils by fractionation and/or modification of naturally occurring oils. An example of a very low SAFA oil and its method of preparing is disclosed in EP 326 198.

The invention also enables the preparation of a storage-stable dressing which allows an oil phase as a separate layer in addition to an aqueous phase containing suspended pieces. On shaking, both phases form an emulsion with a
5 viscosity and surface coating properties similar to traditional oil and vinegar dressings without xanthan. Droplets of oil phase in shaken dressings of the invention remain substantially dispersed for at least one hour. This is superior over traditional dressings and over xanthan
10 containing dressings with the same viscosity. Traditional dressings refer to home-made and non storage-stable dressings.

According to a preferred embodiment, the fat is present in
15 an stably emulsified form, comprising small fat globules, having a volume weighted mean diameter of less than 20 microns, more preferably 0.1-5 microns, most preferably 0.5-2 microns.

20 The compositions of the invention contain water at a level of 46-99 wt%, preferably 60-95 wt%.

If desired, compositions of the invention may contain, in addition to the above mentioned preferred gels, other
25 gelling or thickening agents.

Examples of such materials are non-gelling hydrolysed starch, amylose, denatured whey protein, denatured soy protein, locust bean gum, guar gum, gum arabic and microcrystalline cellulose. Preferably, the total level of
30 these additional gelling and/or thickening ingredients is 0-10 wt%, more preferably 0-5 wt%, most preferably 0-0.5 wt%. However, for taste reasons, dressings are substantially free from these ingredients.

35 According to a further embodiment, a sheared gel with the composition of the invented dressing may be diluted either with water or with the aqueous phase composition in order

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to adjust the finished product parameters so that these fit in the claimed ranges.

Optional ingredients of the dressing of the invention further include flavours, salts, preservatives, vitamins and colouring materials, to be added in the usual amounts. Suitable concentrations are: salt (e.g. sodium chloride) 0-4 wt%, preservatives (preferably potassium sorbate and sodium benzoate) 0-4 wt%, colouring material (e.g. beta-carotene) 0-1 wt%.

The low/zero fat pourable dressing of the present invention possesses several advantageous properties. The dressing contains pieces of vegetables, herbs and/or spices of a visible size. Although substantially free from xanthan, the dressings consistency allows to keep the pieces suspended for at least four weeks. Moreover, the dressing has good rheological and surface coating properties. The slimy mouthfeel of xanthan based dressings is substantially reduced or even eliminated.

The invented dressing also displays an increased emulsion stability if oil is present and, moreover, better surface coating behaviour when poured onto salad.

The invented dressing forms a suitable base for the manufacture of e.g. "Italian", "French" or vinaigrette type dressings.

The invention will be further illustrated by means of the following examples:

30 **Titratable acidity (TA)**

35 The titratable acidity is the amount (g) of titratable acid on the total amount (g) of dressing * 100%. It is established as follows:

Disperse a sample of 5-10 g salad dressing containing e.g. acetic acid as acidulant in 100 ml of distilled water and stir. Titrate with 0.1 N sodium hydroxide (bracket the meter for pH 8.1 using a two-point standardization technique and standardize with a pH 7.00 buffer) until pH 8.1 after 30 seconds of stabilisation (A ml). Do the same for distilled water instead of salad dressing (B ml). The TA (%) = $[(C * (A-B) * 0.1 / \text{exact sample weight})] * 100\%$. C * 1000 = relative molecular mass of the acid divided by the number of the dissociated acid groups in the molecule (for e.g. acetic acid C = 0.060). Ref.: Vogel, Textbook for Quantitative Inorganic Analysis.

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Examples 1-5

For the nature and the amount of the ingredients see Table I.

A dispersion of the gelling agent in cold water is heated to 85-90°C. Sodium chloride, potassium sorbate and sodium benzoate are added and subsequently the liquid flavour components and the vinegar.

The mixture is processed by conducting it through a scraped surface heat exchanger while cooling to a final temperature below 10°C and applying shear so that the gel when formed has a lower modulus than a corresponding gel when formed under quiescent conditions, yet retaining a yield stress. Pieces of herbs, spices and/or vegetables are added after shearing. The yield stress of the gel system enables keeping suspended these pieces.

Example 6

Example 6 is carried out as described in the previous paragraph. The processed aqueous part of the dressing is

distributed into the container and then - on top of this part - oil in the appropriate ratio is added.

Example 7

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Example 3 was repeated but the herb/spice/vegetable pieces were added before the shearing step together with the other ingredients.

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Comparison examples A, B and C for xanthan containing dressings

For the nature and the amount of the ingredients see Table I.

15

Xanthan is dispersed in cold water. Then sodium chloride, potassium sorbate, sodium benzoate and sucrose are dissolved and finally the flavour blend, including particulates such as herbs, vegetables and spices, and the vinegar are added and the mixture is stirred until

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homogeneous.

The oil part in example C is added as described in ex. 6.

RESULTS

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Table II shows that all dressings of the invention have good particle suspending properties. The surface coating capability as well as pouring and mouthfeel (particularly absence of sliminess) are satisfactory. Even when the vegetable etc. pieces are added before shearing, in the

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obtained dressings the pieces remain suspended during at least four weeks. The traditional compositions refer to home-made, non storage-stable dressing compositions.

Table I - Example Compositions.

INGREDIENTS	Example Number									
ATTRIBUTES	A ¹	B ¹	C ¹	1	2	3	4	5	6	7
xanthan gum	0.55	0.25	0.18	—	—	—	—	—	—	—
agar	—	—	—	1.00	0.40	—	—	0.80	0.28	—
HM pectin ²	—	—	—	—	—	0.80	0.40	—	—	0.80
Na alginate	—	—	—	—	—	1.20	0.60	—	—	1.20
sucrose	4.00	4.00	—	4.00	4.00	4.00	4.00	4.00	4.00	4.00
sodium chloride	2.02	2.02	4.79	2.02	2.02	2.02	2.02	2.02	4.79	2.02
K sorbate	0.10	0.10	—	0.10	0.10	0.10	0.10	0.10	—	0.10
Na benzoate	0.10	0.10	—	0.10	0.10	0.10	0.10	0.10	—	0.10
flavour blend ³	3.12	3.12	1.96	3.12	3.12	3.12	3.12	3.12	2.19	3.12
vinegar	11.50	11.50	16.17	11.50	11.50	11.50	11.50	11.00	16.17	11.50
corn syrup	—	—	9.16	—	—	—	—	—	—	—
soybean oil	—	—	29.69	—	—	—	—	1.50	29.69	—
demin./ water	78.61	78.91	38.05	78.16	78.76	77.16	78.16	77.36	42.88	77.16

1) comparison examples within xanthan

2) high methoxy pectin

3) includes vegetable / spice pieces

Table II - Example Attributes.

INGREDIENTS	Example Number									
	A ¹	B ¹	C ¹	1	2	3	4	5	6	7
Brookfield (cps)	3283	613	870	3650	367	3793	272	2480	371	3219
Yield stress (Pa)	9.4	0.5	0.9	5.9	0.6	4.6	0.3	4.8	0.7	3.6
Titrateable acid (%) %	1.21	1.18	1.63	1.23	1.25	1.25	1.22	1.09	2.30*	1.35
Particle Suspension ⁴ cf. xanthan comps.	0	-	-	0	0	0	0	0	+	0
Particle Suspension ⁴ cf. traditional comps.	+	0	0	+	+	+	+	+	+	+
Surface Coating ⁴ cf. xanthan comps.	0	+	-	+	+	+	+	+	+	+
Surface Coating ⁴ cf. traditional comps.	-	-	0	+	+	+	+	+	+	+
Dispersed Oil Stab. ⁴ cf. xanthan comps.			-					0	+	
Dispersed Oil Stab. ⁴ cf. traditional comps.			0					+	+	
Mouthfeel ⁵	-	-	+	+	+	+	+	+	+	+

4) + improved performance

0 equivalent performance

- poorer performance

5) + not slimy

- slimy



CLAIMS

1. Pourable acidic dressing comprising
 - a. 0-50 wt% of fat,
 - b. 46-99 wt% of water,
 - c. pieces of vegetables, herbs and/or spices of a visible size,
 - d. an acidulant enough for a titratable acidity of 0.5-2.5%,
 - e. 0.1-4 wt% of one or more non-starch polysaccharides present in a sheared gel form, which polysaccharides used either singly or in combination, if applied under quiescent gelling conditions, at the concentration used in the dressing composition, and at the appropriate pH, titratable acidity and salt content, are capable to form in water either
 - (A) a rigid thermoreversible gel; or
 - (B) a rigid chemically set gel; or
 - (C) a rigid synergistic gel;where the dressing has a Brookfield viscosity of 100-4,500 cps. (centipoise) and a yield stress ($\tan \delta = 1$) of 0.1-10 Pa.
2. Dressing according to claim 1, having a Brookfield viscosity of 200-2000 cps. and a yield stress ($\tan \delta = 1$) of 0.2-5 Pa.
3. Dressing according to claims 1 or 2, having an titratable acidity of 0.9-1.8% and more preferably 1.1-1.4%.
4. Dressing according to any one of claims 1-3, where the acidulant is vinegar or acetic acid.
5. Dressing according to any one of claims 1-4, wherein the gel is selected from the group consisting of agar,



calcium pectinate, calcium alginate, kappa-carrageenan and iota-carrageenan and the synergistic gels sodium alginate with high-methoxy pectin and konjac mannan with either agar or carrageenan.

6. Dressing according to any one of claims 1-4, wherein the gel is a synergistic gel comprised of sodium alginate and high-methoxy pectin.

7. Dressing according to any one of claims 1-6, which is substantially free of Ca^{2+} .

8. Dressing according to any one of claims 1-7, which is substantially free of xanthan.

9. Dressing according to any one of claims 1-8, wherein droplets of oil phase remain substantially dispersed for at least one hour.

10. Dressing according to any one of claims 1-9, where the pieces of vegetables, herbs and/or spices remain suspended for at least four weeks.

11. A process for preparing a pourable dressing comprising

- a. 0-50 wt% of fat,
- b. 46-99 wt% of water,
- c. pieces of vegetables, herbs and/or spices of a visible size,
- d. an acidulant, enough for a titratable acidity of 0.5-2.5%,
- e. 0.1-4 wt% of one or more non-starch polysaccharides present in a sheared gel form,

which polysaccharides used either singly or in combination, if applied under quiescent gelling conditions, at the concentration used in the dressing composition, and at the appropriate pH, titratable



acidity and salt content, are capable to form in water either

- (A) a rigid thermoreversible gel; or
- (B) a rigid chemically set gel; or
- (C) a rigid synergistic gel;

said process comprising the steps of

- a. dispersing the polysaccharides in water to obtain a pre-mix, optionally adding one or more other ingredients, including the pieces of herbs, vegetables and spices to the dressing composition;
- b. applying shear during the formation of the gel;
- c. adding the remaining ingredients of the dressing to the sheared gel dispersion;

such that the final dressing has

a Brookfield viscosity of 100-4,500 cps. and
a yield stress ($\tan \delta = 1$) of 0.1-10 Pa.

12. Process according to claim 11, wherein the pieces of herbs, vegetables and spices are added after formation of the sheared gel dispersion.

13. Process according to claims 11 or 12 whereby the dressing premix before shearing is subjected to a pasteurisation treatment.