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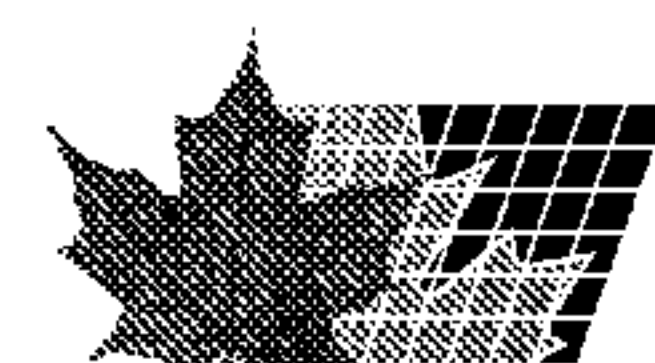
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(54) Title: MOUTHFEEL AND LUBRICITY ENHANCING COMPOSITION

(57) **Abrégé/Abstract:**

A mouthfeel and lubricity enhancing composition for use in reduced fat food products is provided. The composition is an aqueous gel matrix of ester vesicles which is provided by a mixture of diacetyl tartaric acid mono fatty acid glyceride ester and a sucrose fatty acid ester selected from the group consisting of mono-, di- and tri- fatty acid esters of sucrose.



2197838

MOUTHFEEL AND LUBRICITY ENHANCING COMPOSITION

Abstract

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which is provided by a mixture of diacetyl tartaric acid
mono fatty acid glyceride ester and a sucrose fatty acid
ester selected from the group consisting of mono-, di-
10 and tri- fatty acid esters of sucrose.

MOUTHFEEL AND LUBRICITY ENHANCING COMPOSITION**Field of the Invention**

The present invention relates generally to reduced fat food products. More particularly, the present invention relates to a mouthfeel and lubricity enhancing composition which is an aqueous matrix of ester vesicles for use in reduced fat and full fat food products.

Background of the Invention

In recent years, many efforts have been made to reduce the fat content of various foods, such as salad dressing, sour cream and frozen desserts. A problem encountered when the fat level is reduced in conventional food products is that the organoleptic properties are changed because of the lubricity and slipperiness imparted by the fat particles suspended in the food product is removed.

The term "salad dressing" refers to salad dressing as defined by the U.S. Food and Drug Administration Standards of Identity. Salad dressing, as thus defined, is the emulsified food product prepared from an edible vegetable oil, an acidifying ingredient selected from vinegar, lemon juice or lime juice, an egg-yolk containing ingredient and a partially or fully cooked starch paste prepared from a food starch. Salad dressings may also contain optional emulsifying ingredients in addition to egg yolk and cooked starch paste. Such additional emulsifying ingredients which are recognized by the FDA Standards of Identity, include gum acacia, carob bean gum, guar gum, gum karaya, gum tragacanth, carrageenan, pectin, propylene glycol ester of alginic acid, sodium carboxymethyl cellulose or any mixture of two or more of such hydrocolloid emulsifying ingredients. A salad dressing, as defined by the FDA Standards of Identity, contains not less than 30% by

weight of vegetable oil and not less egg-yolk containing ingredients than is equivalent to egg yolk solids provided by liquid egg yolk at a level of 4% by weight.

Fat-free salad dressing products have been developed which duplicate the viscosity and other textural attributes of the missing fat by means of suitable food polymers, such as gums (xanthan or alginate), cellulose and its derivatives, starches and various microparticulated polymeric complexes. What is missing in these products is the oiliness (lubricity) and thermal effects in the mouth which are present in the full fat products.

The aqueous matrix of ester vesicles which are provided by the present invention have been shown to have an impact on lubricity in fat-free salad dressing products which can be measured in two ways: decreased frictional coefficient using an instrumental technique and increased time and intensity of slipperiness using trained testers. Other benefits, which have been observed, include: residual oily mouthfeel, decreased product pastiness, modulation of flavor impact, better dispersion of dry ingredients, increased functionality of fat mimetics and decreased product density.

Many efforts have been directed to improving the mouthfeel and lubricity of reduced fat food products. PCT Application WO94/12063 to Bee, for example, is directed to a food product, such as low-fat spreads, dressings, cheese and sauces, which include gas cells prepared from a mixture of emulsifiers having a thermodynamic stability in excess of two weeks and wherein more than 90% of the gas cells have an average particle size of less than 20 microns.

EP Patent Application 547,647 A1 to Heertge, et al. is directed to a spread or dressing which includes a mesomorphic phase. The product contains from 0 to 20 weight percent of fat, from 0.05 to 30 weight percent of

- 3 -

a biopolymer, which can be a gum, and from 0.1 to 30 weight percent of an edible surfactant.

It is an object of the present invention to provide a mouthfeel and lubricity enhancing composition which can be used in food products having reduced fat or no fat.

A further object of the present invention is to provide food products having an enhanced lubricity imparted by incorporating the lubricity enhancing composition of the present invention in the food product.

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Summary of the Invention

A mouthfeel and lubricity enhancing composition for use in reduced fat food products is provided. The composition is an aqueous gel matrix of ester vesicles which is provided by a mixture of diacetyl tartaric acid mono fatty acid glyceride ester and a sucrose fatty acid ester selected from the group consisting of mono-, di- and tri- fatty acid esters of sucrose.

20

In accordance with one aspect of the invention, there is provided a mouthfeel and lubricity enhancing composition for low fat and non-fat food products comprising an aqueous gel matrix containing a dispersion of ester vesicles prepared from a mixture of first and second esters, the first ester being a diacetyl tartaric acid ester of mono fatty acid glyceride and the second ester being selected from mono-, di- and tri- fatty acid esters of sucrose. In preferred embodiments of this aspect, the fatty acid component of the first and second esters may be a C₆-C₂₂ saturated or unsaturated fatty acid, or stearic acid and the sucrose fatty acid ester may be sucrose mono-fatty acid ester. In other preferred embodiments of this aspect,

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each of the esters can be present in the mixture at a level of from about 25% to about 75% by weight, and the aqueous gel matrix can contain from about 80% to about 97% of water and from about 3% to about 20% of the ester mixture.

- 3a -

A food product containing the composition of the first aspect of the invention is also provided, preferably, the composition can be present at a level sufficient to provide ester vesicles at a level of from about 0.1% to about 3% by weight.

The invention also provides a method for making a mouthfeel and lubricity enhancing composition comprising:

10 (a) adding an ester mixture of diacetylated tartaric acid mono fatty acid glyceride ester and sucrose fatty acid ester to water to provide a dispersion;

(b) heating said dispersion with mixing; and

(c) cooling said dispersion to provide an aqueous gelled matrix containing dispersed ester vesicles provided by said ester mixture.

20 In preferred embodiments of the above method, the fatty acid component of each of the esters may be selected from the group consisting of: saturated and unsaturated fatty acids having a carbon chain length of C_6 - C_{22} and mono-, di-, tri-fatty acid esters. The sucrose fatty acid ester can be a sucrose mono fatty acid ester. In other preferred embodiments of this method, the heating can be performed at a temperature of from about 180°F to about 200°F over a period of from about 10 minutes to about 30 minutes, and the dispersion can be cooled to a temperature of from about 130°F to about 150°F within about 30 minutes while stirring is continued. In yet other preferred embodiments of this method, the ester mixture is added to said water at a level of from about 3% to about 20%.

30 In accordance with a second aspect of the invention, there is provided a composition which is useful to provide a stable aerated foam, the composition comprising an aqueous gel matrix containing a dispersion of ester vesicles in water, wherein the ester vesicles are prepared from a homogeneous mixture of powdered esters that are dispersed in water and

- 3b -

formed into an aqueous gel mixture of a first ester which is diacetyl tartaric acid esters of mono fatty acid glyceride and a second ester wherein the second ester is selected from the group consisting of mono-, di- and tri- fatty acid esters of sucrose, wherein the fatty acid component of each of the first and the second esters is selected from the group consisting of C₆-C₂₂ saturated and unsaturated fatty acids.

10 In preferred embodiments of this second aspect, the fatty acid component of each of the first and said second esters can be selected from the group consisting of: C₆-C₂₂ saturated fatty acids, palmitic and stearic acids and C₁₂-C₂₂ unsaturated fatty acids. In yet more preferred embodiments, each of the first and the second esters may be present in the mixture at a level of from about 25% to about 75% by weight, and the aqueous gel matrix may contain from about 80% to about 97% of water and from about 3% to about 20% of the ester mixture.

20 In accordance with the invention, there is provided a food product containing the composition of the second aspect, wherein the composition can be present at a level sufficient to provide the ester mixture at a level of from about 0.1% to about 3%.

There is also provided a method for making an aqueous gel matrix composition comprising:

30 (a) providing a well blended homogeneous mixture of dry powdered esters of a first ester, which is diacetylated tartaric acid mono fatty acid glyceride ester, and a second ester selected from the group consisting of sucrose fatty acid esters;

 (b) adding the homogeneous ester mixture to water to provide a dispersion;

- 3c -

(c) heating the dispersion with mixing; and

(d) cooling the dispersion to provide an aqueous gelled matrix containing dispersed ester vesicles provided by the ester mixture,

wherein the second ester is selected from the group consisting of mono-, di- and tri- fatty acid esters of sucrose, wherein the fatty acid component of each of the first and second esters is selected from the group consisting of saturated and unsaturated fatty acids having a carbon chain length of C₆-C₂₂.

In preferred embodiments of this method, the fatty acid component of each of the first and the second esters can be selected from the group consisting of: C₆-C₂₂ saturated fatty acids, palmitic and stearic acids, C₁₂-C₂₂ unsaturated fatty acids and mono-, di-, tri- fatty acid esters. More preferably, the second ester is a sucrose mono-fatty acid ester.

In other preferred embodiments of this method, each of the first and said second esters may be present in the homogeneous mixture at a level of from about 25% to about 75% by weight and the aqueous gel matrix may contain from about 80% to about 97% of water and from about 3% to about 20% of the ester mixture. In more preferred embodiments, the heating can be performed at a temperature of from about 180°F to about 200°F over a period of from about 10 minutes to about 30 minutes, and the dispersion can be cooled to a temperature of from about 130°F to about 150°F within about 30 minutes while stirring is continued. In yet more preferred embodiments of this method, the ester mixtures can be added to the water at a level of from about 3% to about 20% and the first and second esters can be present in the homogeneous mixture at a level of from about 25% to about 75%.

In accordance with the invention, there is also provided a method for preparing food product having air incorporated therein to produce aerated foam comprising the

- 3d -

steps of preparing an aqueous gel matrix, by the above-mentioned method further comprising the step of diluting the aqueous gel matrix with water to provide a foam base having from about 0.4% to about 2% of the ester mixture and whipping said foam base to provide a stable foam.

10 A mouthfeel and lubricity enhancing composition for low fat and non-fat food products comprising an aqueous gel matrix containing a dispersion of ester vesicles in water, wherein the ester vesicles are prepared from a homogeneous mixture of powdered esters that are dispersed in water and formed into an aqueous gel mixture, the powdered esters being a first ester which is diacetyl tartaric acid esters of mono fatty acid glyceride and a second ester wherein the aqueous gel matrix contains from about 80% to about 97% of water and from about 3% to about 20% of the ester mixture.

20 In preferred embodiments of this third aspect, the second ester can be selected from the group consisting of mono-di- and tri- fatty acid esters of sucrose, polyglycerol fatty acid esters. More preferably, each of the first and the second esters can be selected from the group consisting of palmitic and stearic acids, C_{12} - C_{22} unsaturated fatty acids, C_6 - C_{22} saturated and unsaturated fatty acids and C_6 - C_{22} saturated fatty acids. Also, the first and the second esters can be present in the mixture at a level of from about 25% to about 75% by weight.

30 According to the invention, a food product containing the composition of this third aspect is also provided. In preferred embodiments of this food product, the composition can be present at a level sufficient to provide the ester mixture at a level of from about 0.1% to about 3%.

There is also provided a method for making an aqueous gel matrix composition comprising:

(a) providing a well blended homogeneous mixture of dry powdered esters of a first ester, which is diacetylated

- 3e -

tartaric acid mono fatty acid glyceride ester, and a second ester selected from the group consisting of sucrose fatty acid ester and polyglycerol fatty acid esters;

(b) adding the homogeneous ester mixture to water to provide a dispersion;

(c) heating the dispersion with mixing; and

(d) cooling the dispersion to provide an aqueous gelled matrix containing dispersed ester vesicles provided by the ester mixture;

wherein the aqueous gel matrix contains from about 80% to about 97% of water and from about 3% to about 20% of the ester mixture.

Description of the Drawings

FIGURE 1 is a plot of the coefficient of fraction after a particular number of passes through a friction measurement device for various salad dressing formulations; and

FIGURE 2 is a photomicrograph of the aqueous gel matrix of ester vesicles of the present invention having a 12% level of a 50/50 mixture of esters taken at 180X.

Detailed Description of the Invention

Generally, the present invention is directed to a composition which imparts enhanced mouthfeel and lubricity to reduced fat food products. Such food products include pourable dressings, mayonnaise type dressings, frozen desserts, whipped topping, cheese and other dairy products. The reduced fat food products can have from 0 to 20% of fat. The composition is an aqueous gel matrix of ester vesicles. The ester vesicles are provided by a mixture of diacetyl tartaric acid mono fatty acid glyceride ester and a sucrose fatty acid ester selected from the group consisting of mono-, di- and tri-fatty acid esters of sucrose. The preferred sucrose fatty acid is sucrose mono- fatty acid ester.

- 4 -

The fatty acid of the diacetyl tartaric acid mono fatty acid glyceride ester is selected from the group consisting of saturated and unsaturated $C_6 - C_{22}$ fatty acids, and preferably from the group consisting of saturated and unsaturated $C_{12} - C_{22}$ fatty acids. Preferred fatty acids are stearic acid, oleic acid and palmitic acid. The fatty acid of the sucrose fatty acid is also selected from the group consisting of saturated and unsaturated $C_6 - C_{22}$ fatty acids. The preferred fatty acids for the sucrose fatty acid esters are stearic acid, oleic acid and palmitic acid.

The mixture of esters to provide the ester vesicles contains diacetyl tartaric acid mono fatty acid glyceride ester at a level of from about 90% to about 10% by weight. All percentages used herein are by weight unless otherwise indicated. The sucrose ester is present at a level of from about 10% to about 90% by weight. The sucrose ester is preferably a mono fatty acid ester of sucrose. The preferred mixture contains from about 60% to about 40%.

To prepare the mouthfeel and lubricity enhancing compositions of the invention, a well blended homogeneous mixture of the dry powdered esters are dispersed in water in a kettle. The mixture esters are present in the water at a level of from about 3% to about 20%. The dispersion is stirred with a suitable mixer, such as a propeller mixer, as it is heated to a temperature of from about 180°F to about 200°F over a period of from about 10 minutes to about 30 minutes. The heated dispersion is then cooled to about 130°F to about 150°F within 30 minutes while continuing stirring. The mixture can then be permitted to cool to ambient temperature without stirring. For very small

batches of less than about 1000 grams, stirring can be discontinued as soon as it reaches the desired elevated temperature. At the elevated temperature, the composition is a white milky fluid which gels upon cooling. The mixture of esters forms a complex in the form of multilamellar vesicles upon cooling to refrigeration temperatures. The ester vesicles are dispersed as a matrix in the aqueous medium. Under microscopic examination, the vesicles resemble the structure of an onion which appears to have alternating hydrophobic and hydrophilic layers with water trapped between the layers. FIGURE 2 clearly shows the structure and shape of the vesicles. The vesicles range in size from about 1 micron to about 20 microns.

The mouthfeel and lubricity enhancing compositions of the present invention are used in reduced fat food products, particularly pourable dressings, mayonnaise type dressings, frozen desserts, whipped topping, cheese and other dairy products. The mouthfeel and lubricity enhancing aqueous gel matrix of ester vesicles is present in the food products to provide the ester vesicles at a level of from about 0.1% to about 3% by weight.

The following examples further illustrate the compositions of the present invention, but are intended to in no way limit the scope of the invention as set forth in the appended claims.

Example 1

Various mouthfeel and lubricity enhancing ester vesicle compositions in accordance with the invention were prepared having the following compositions of Table 1:

2197838

- 6 -

TABLE 1

Ingredients	Var 1 Weight - grams	Var 2 Weight - grams	Var 3 Weight - grams
Diacetyl tartaric acid monostearate glyceride	3.75	7.5	11.25
Sucrose monostearate	3.75	7.5	11.25
Water	250	250	250

The mouthfeel and lubricity enhancing ester vesicle compositions were prepared by adding the esters and water into a kettle and heating the ingredients with vigorous stirring to a temperature of 190° F. over a period of 20 minutes to provide a white milky fluid which gelled on cooling to refrigeration temperatures to provide ester vesicles. The mouthfeel and lubricity enhancing compositions set forth above are used to prepare a salad dressing type viscous dressing. A premix was first prepared having the following compositions of Table 2:

TABLE 2

Ingredients	Control Weight-grams	Var 1 Weight-grams	Var 2 Weight-grams	Var 3 Weight-grams
Water	586.5	336.5	336.5	336.5
Microreticulated microcrystalline cellulose	112.5	102.5	95.0	87.5
Soybean oil	11.25	11.25	11.25	11.25
Salt	27.6	27.6	27.6	27.6
Xanthan gum	9.6	9.6	9.6	9.6
Potassium sorbate	3.75	3.75	3.75	3.75
Titanium dioxide	3.15	3.15	3.15	3.15
Beta carotene	0.2	0.2	0.2	0.2
Vinegar	3.6	3.6	3.6	3.6

5	Lactic acid	1.27	1.27	1.27	1.27
	H ₂ PO ₄	0.5	0.5	0.5	0.5
	EDTA	0.07	0.07	0.07	0.07
	Ester vesicle composition	0	Var 1/ Table 1	Var 2/ Table 1	Var 3/ Table 1

The above components were added to a Hobart planetary mixer and were blended until mixed. The mixture was then passed through a colloid mill to provide a homogeneous dispersion.

10 A starch base was then prepared having the following components at the indicated levels:

	<u>Ingredient</u>	<u>Percent</u>
15	Water	74.5
	Vinegar	4.87
	Sucrose	10.
	Lactic acid	1.14
	Waxy maize starch	9.5

20 The above ingredients were added to a kettle and were heated to 180° F. with stirring to provide a gelatinized starch mixture. Each of the premix compositions were added to 750 grams of the starch base to provide a 1:1 ratio of starch base to other components.

25 Each of the salad dressing compositions was then tested on a slip tester to determine the lubricity of the compositions. Also tested was a commercial mayonnaise having 80% oil and a control reduced fat salad dressing which did not have the lubricity enhancing compositions of the invention. The slip tester includes a sliding plate and a sled attached to a capacitor. The test is performed with a fresh veal tongue. The salad dressing composition is spread onto one surface of the tongue and then removed with a straight edge to leave only a residue. The other surface of the tongue is attached to the sled and a liberal amount of the salad dressing is applied to the plate. The tongue rests on

the salad dressing on the plate and the plate is repeatedly pulled across the tongue. The friction of the tongue on the plate energizes the capacitor which is attached to a readout device which is calibrated to read
5 coefficient of friction.

The results of the slip testing are set forth in FIGURE 1. As can be seen in FIGURE 1, the commercial mayonnaise (Symbol □) retains a substantially low
10 coefficient of friction throughout 10 slidings of the plate. The three salad dressings having the mouthfeel and lubricity enhancing agent of the present invention also retain their lubricity throughout 10 slidings of the plate. The control sample having none of the mouthfeel and lubricity enhancing agents of the present invention
15 rapidly breaks down, resulting in a much higher coefficient of friction after 10 slidings of the plate.

Products made according to the formulations in Example 1 were subjected to sensory analysis for time and intensity of slipperiness. Full-fat mayonnaise achieves
20 a maximum relative slipperiness, intensity of 12.3 which is detectable for 43 seconds. Fat-free mayonnaise has a maximum slipperiness of 6.35, detectable for 21 seconds. Fat-free mayonnaise made with the ester vesicles of the present invention has maximum slipperiness of 11.03,
25 detectable for 37 seconds.

Example 2

An aqueous gel matrix containing ester vesicles were prepared in accordance with the procedure of Example 1 containing 7.5 grams of diacetyl tartaric acid mono
30 stearate glyceride and 7.5 grams of sucrose monostearate in 250 grams of water to provide ester vesicles dispersed in an aqueous gel. A premix was then prepared having the following composition:

	Ingredients	Control (no ester vesicles) Weight-grams	Var 1 Weight-grams	Var 2 Weight-grams
	Water	70.40	70.40	70.40
	Inulin	10.00	10.00	10.00
	Corn Syrup (62 DE)	2.4	1.52	2.4
5	Xanthan gum	.55	.55	.55
	Potassium sorbate	.117	.117	.117
	Titanium dioxide	.25	.25	.25
	Salt	1.014	1.014	1.014
	Vinegar	1.923	1.923	1.923
10	Lactic acid	.450	.450	.450
	Mayonnaise flavor	4.21	4.21	4.21
	Diacetyl tartaric acid monostearate glyceride (from ester vesicles)	0	.54	1.05
15	Sucrose monostearate (from ester vesicles)	0	.54	1.05
	EDTA	0.07	0.07	0.07

The above components were added to a Hobart planetary mixer and were blended until mixed. The mixture was then passed through a colloid mill to provide a homogeneous dispersion.

A starch base was then prepared having the components set forth in Example 1 and prepared in accordance with the procedure of Example 1. The premix was added to 750 grams of the starch base to provide a 1:1 ratio of starch base to premix.

It was observed that the ester vesicles modulated the flavor of the dressing and formed a smoother product. There was no apparent benefit in doubling the level of the ester vesicles. Some tasters noted a residual oily mouth coating and decrease in pastiness. It was observed that there was an immediate

dispersion of inulin and xanthan gum during the mixing without caking or fish eye formation. This resulted in a smooth creamy premix and provided optimum functionality of the inulin. The inulin gel had a rapid set-up. It was also observed that air incorporation could be established through use of the ester vesicles of the present invention. The incorporation of air reduced product density and could be used to provide a whipped sandwich spread.

Inulin based fat-free mayonnaise was made with the esters of the invention added either as individual ingredients or as the multilamellar vesicle ester complex made in accordance with Example 1. The following benefits were noted by various trained tasters of the product. The flavors in the ester vesicle containing product were more tied together. The acids and spices did not come across separately, as they did in the control, but were more integrated. Off notes in the ester vesicle containing product were not as apparent. The product with ester vesicles was much smoother than the product made with the esters in the non-complex form. Residual oily mouth coating and decreased pastiness was noted. The product with ester vesicles spread out smoothly in the mouth, whereas the control product with no emulsifiers moved as a mass. The appearance of the ester vesicle containing product was fluffier than the control with visible signs of aeration. The lighter texture of the aerated product helped enhance the perception of creaminess.

Example 3

Ester vesicles were prepared in accordance with the procedure of Example 1 wherein the total amount of diacetyl tartaric acid monostearate glyceride was 3%, the amount of sucrose monostearate was 3% and the amount of water was 94%.

The ability of the ester vesicles of the present invention to incorporate air into products was demonstrated by making a fat free frozen whipped topping. The following formula was prepared:

5	<u>Ingredient</u>	<u>Weight %</u>	
	Water	33.3	
	Aqueous matrix*	33.3	
	Corn syrup (DE 24)	17.25	
	High fructose corn syrup		5.5
10	Sugar	5.35	
	Inulin	3.1	
	Dairy Lo	2.0	
	Xanthan gum	0.2	
	Vanilla flavor	to taste	
15	* the aqueous ester matrix contained 3% diacetyl tartaric acid monostearate glyceride, 3% sucrose monostearate and 94% water.		

To prepare the frozen foamed whipped topping, the water and the ester vesicles were placed in the bowl of a Hobart mixer. The inulin was sifted in and hydrated as the mixer was operated. The xanthan gum, sugar, dairy-lo were dry blended and then sifted into the mixture. The syrups were added along with the vanilla. Whipping continued with the Hobart mixer on maximum speed. Part of the product needed to be removed from the bowl of the Hobart mixer to make room for foam. The result was to provide 10 cool whip tubs of product at approximately 500% overrun.

-12-

WE CLAIM:

1. A mouthfeel and lubricity enhancing composition for low fat and non-fat food products comprising an aqueous gel matrix containing a dispersion of ester vesicles prepared from a mixture of first and second esters, said first ester being a diacetyl tartaric acid ester of mono fatty acid glyceride and said second ester being selected from mono-, di- and tri- fatty acid esters of sucrose.

2. A composition in accordance with claim 1, wherein the fatty acid component of said first and second esters is selected from the group consisting of C₆-C₂₂ saturated and unsaturated fatty acids.

3. A composition in accordance with claim 1, wherein the fatty acid component of said first and second esters is stearic acid.

4. A composition in accordance with any one of claims 1 to 3, wherein each of said esters is present in the mixture at a level of from about 25% to about 75% by weight, the total amount of the esters being 100% by weight of said mixture.

5. A composition in accordance with any one of claims 1 to 4, wherein the aqueous gel matrix contains from about 80% to about 97% of water and from about 3% to about 20% of the ester mixture.

6. A composition in accordance with any one of claims 1 to 5, wherein the sucrose fatty acid ester is sucrose mono-fatty acid ester.

7. A food product containing the composition of any one of claims 1 to 6.

-13-

8. A food product in accordance with claim 7, wherein said composition is present at a level sufficient to provide ester vesicles at a level of from about 0.1% to about 3%.

9. A method for making a mouthfeel and lubricity enhancing composition comprising:

(a) adding an ester mixture of diacetylated tartaric acid mono fatty acid glyceride ester and sucrose fatty acid ester to water to provide a dispersion;

(b) heating said dispersion with mixing; and

(c) cooling said dispersion to provide an aqueous gelled matrix containing dispersed ester vesicles provided by said ester mixture.

10. A method in accordance with claim 9, wherein the fatty acid component of each of said esters is selected from saturated and unsaturated fatty acids having a carbon chain length of C_6 - C_{22} .

11. A method in accordance with claim 9 or 10, wherein said heating is to a temperature of from about 180°F to about 200°F over a period of from about 10 minutes to about 30 minutes.

12. A method in accordance with any one of claims 9 to 11, wherein said dispersion is cooled to a temperature of from about 130°F to about 150°F within about 30 minutes while stirring is continued.

13. A method in accordance with any one of claims 9 to 12, wherein said sucrose fatty acid ester is selected from the group consisting of mono-, di-, and tri-fatty acid esters.

14. A method in accordance with claim 12, wherein said sucrose fatty acid ester is a sucrose mono fatty acid ester.

-14-

15. A method in accordance with any one of claims 9 to 14, wherein said ester mixture is added to said water at a level of from about 3% to about 20%.

16. A composition which is useful to incorporate air into food products to produce aerated foam, said composition comprising an aqueous gel matrix containing a dispersion of ester vesicles in water, wherein said ester vesicles are prepared from a homogeneous mixture of powdered esters that are dispersed in water and formed into an aqueous gel mixture of a first ester which is diacetyl tartaric acid esters of mono fatty acid glyceride and a second ester, wherein said second ester is selected from the group consisting of mono-, di- and tri- fatty acid esters of sucrose, and wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of C_6 - C_{22} saturated and unsaturated fatty acids.

17. A composition in accordance with claim 16, wherein the fatty acid component of each of said first and said second esters is selected from C_6 - C_{22} saturated fatty acids.

18. A composition in accordance with claim 16, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of palmitic and stearic acids.

19. A composition in accordance with claim 16, wherein the fatty acid component of each of said first and said second esters is selected from C_{12} - C_{22} unsaturated fatty acids.

20. A composition in accordance with any one of claims 16 to 19, wherein the total of each of said first and said second esters is present in the mixture at a level of from about 25% to about 75% by weight.

-15-

21. A composition in accordance with any one of claims 16 to 20, wherein the aqueous gel matrix contains from about 80% to about 97% of water and from about 3% to about 20% of the ester mixture.

22. A composition in accordance with any one of claims 16 to 21, wherein said second ester is a sucrose mono-fatty acid ester.

23. A food product containing the composition of any one of claims 16 to 22, wherein said composition is present at a level sufficient to provide the ester mixture at a level of from about 0.1% to about 3% by weight.

24. A method for making an aqueous gel matrix composition comprising:

(a) providing a well blended homogeneous mixture of dry powdered esters of a first ester, which is diacetylated tartaric acid mono fatty acid glyceride ester, and a second ester selected from the group consisting of sucrose fatty acid esters;

(b) adding the homogeneous ester mixture to water to provide a dispersion;

(c) heating said dispersion with mixing; and

(d) cooling said dispersion to provide an aqueous gelled matrix containing dispersed ester vesicles provided by said ester mixture,

wherein said second ester is selected from the group consisting of mono-, di- and tri- fatty acid esters of sucrose, wherein the fatty acid component of each of said first and second esters is selected from the group consisting of saturated and unsaturated fatty acids having a carbon chain length of C_6 - C_{22} .

25. A method in accordance with claim 24, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of C_6 - C_{22} saturated fatty acids.

26. A method in accordance with claim 24, wherein the fatty acid component

-16-

of each of said first and said second esters is selected from the group consisting of palmitic and stearic acids.

27. A method in accordance with claim 24, wherein the fatty acid component each of said first and said second esters is selected from the group consisting of C₁₂-C₂₂ unsaturated fatty acids.

28. A method in accordance with any one of claims 24 to 27, wherein the total of each of said first and said second esters is present in the homogeneous mixture at a level of from about 25% to about 75% by weight.

29. A method in accordance with any one of claims 24 to 28, wherein the aqueous gel matrix contains from about 80% to about 97% of water and from about 3% to about 20% of the ester mixture.

30. A method in accordance with any one of claims 24 to 29, wherein said second ester is a sucrose mono-fatty acid ester.

31. A method in accordance with any one of claims 24 to 30, wherein said heating is to a temperature of from about 180°F to about 200°F over a period of from about 10 minutes to about 30 minutes.

32. A method in accordance with any one of claims 24 to 31, wherein said dispersion is cooled to a temperature of from about 130°F to about 150°F within about 30 minutes while stirring is continued.

33. A method in accordance with any one of claims 24 to 29, wherein said second ester is sucrose fatty acid ester which is selected from the group consisting of mono-, di- and tri-fatty acid esters.

-17-

34. A method in accordance with any one of claims 24 to 33, wherein said ester mixture is added to said water at a level of from about 3% to about 20%.

35. A method in accordance with any one of claims 24 to 34, wherein the total of each of said first and said second esters is present in said homogeneous mixture at a level of from about 25% to about 75%.

36. A method for preparing a food product having air incorporated therein to produce aerated foam comprising the steps of preparing an aqueous gel matrix, by the method of any one of claims 24 to 36, diluting said aqueous gel matrix with water to provide a foam base having from about 0.4% to about 2% of the ester mixture and whipping said foam base to provide an aerated foam.

37. A method in accordance with claim 36, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of C₁₂-C₂₂ saturated fatty acids.

38. A method in accordance with claim 36, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of palmitic and stearic acids.

39. A method in accordance with claim 36, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of C₁₂-C₂₂ unsaturated fatty acids.

40. A method in accordance with any one of claims 36 to 39, wherein the second ester is a sucrose fatty acid ester which is selected from the group consisting of mono-, di- and tri- fatty acid esters.

41. A method in accordance with any one of claims 36 to 39, wherein said

-18-

sucrose fatty acid ester is a sucrose mono fatty acid ester.

42. A method in accordance with any one of claims 36 to 41, wherein said ester mixture is present in said gel matrix at a level of from about 3% to about 20%.

43. A method in accordance with any one of claims 36 to 42, wherein the total of each of said first and said second esters is present in said homogeneous mixture of esters at a level of from about 25% to about 75%.

44. A mouthfeel and lubricity enhancing composition for low fat and non-fat food products comprising an aqueous gel matrix containing a dispersion of ester vesicles in water, wherein said ester vesicles are prepared from a homogeneous mixture of powdered esters that are dispersed in water and formed into an aqueous gel mixture, the powdered esters being a first ester which is diacetyl tartaric acid esters of mono fatty acid glyceride and a second ester wherein said aqueous gel matrix contains from about 80% to about 97% of water and from about 3% to about 20% of the ester mixture.

45. A composition in accordance with claim 44, wherein said second ester is selected from the group consisting of mono-, di- and tri- fatty acid esters of sucrose, polyglycerol fatty acid esters.

46. A composition in accordance with claim 45, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of palmitic and stearic acids.

47. A composition in accordance with claim 44, 45 or 46, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of C₁₂-C₂₂ unsaturated fatty acids.

-19-

48. A composition in accordance with any one of claims 44 to 47, wherein said second ester is a sucrose mono- fatty acid ester.

49. A composition in accordance with any one of claims 45 to 48, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of C_6 - C_{22} saturated and unsaturated fatty acids.

50. A composition in accordance with any one of claims 45 to 49, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of C_6 - C_{22} saturated fatty acids.

51. A composition in accordance with any one of claims 44 to 50, wherein the total of each of said first and said second esters is present in the mixture at a level of from about 25% to about 75% by weight.

52. A food product containing the composition of any one of claims 44 to 51.

53. A food product in accordance with claim 52, wherein said composition is present at a level sufficient to provide the ester mixture at a level of from about 0.1% to about 3%.

54. A method for making an aqueous gel matrix composition comprising:
(a) providing a well blended homogeneous mixture of dry powdered esters of a first ester, which is diacetylated tartaric acid mono fatty acid glyceride ester, and a second ester selected from the group consisting of sucrose fatty acid ester and polyglycerol fatty acid esters;

(b) adding said homogeneous ester mixture to water to provide a dispersion;

(c) heating said dispersion with mixing; and

(d) cooling said dispersion to provide an aqueous gelled matrix containing dispersed ester vesicles provided by said ester mixture;

-20-

wherein said aqueous gel matrix contains from about 80% to about 97% of water and from about 3% to about 20% of the ester mixture.

55. A method in accordance with claim 54, wherein said second ester is selected from the group consisting of mono-, di- and tri- fatty acid esters of sucrose and polyglycerol fatty acid esters.

56. A method in accordance with claim 54 or 55, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of palmitic and stearic acids.

57. A method in accordance with any one of claims 54 to 56, wherein the fatty acid component each of said first and said second esters is selected from C₁₂-C₂₂ unsaturated fatty acids.

58. A method in accordance with any one of claims 54 to 57, wherein said second ester is a sucrose mono- fatty acid ester.

59. A method in accordance with any one of claims 54 to 56, wherein the fatty acid component of each of said first and said second esters is selected from the group consisting of C₆-C₂₂ saturated and unsaturated fatty acids.

60. A method in accordance with any one of claims 54 to 56, wherein the fatty acid component of each of said first and said second esters is selected from C₆-C₂₂ saturated fatty acids.

61. A method in accordance with any one of claims 54 to 60, wherein the total of each of said first and said second esters is present in the homogeneous mixture at a level of from about 25% to about 75% by weight.

-21-

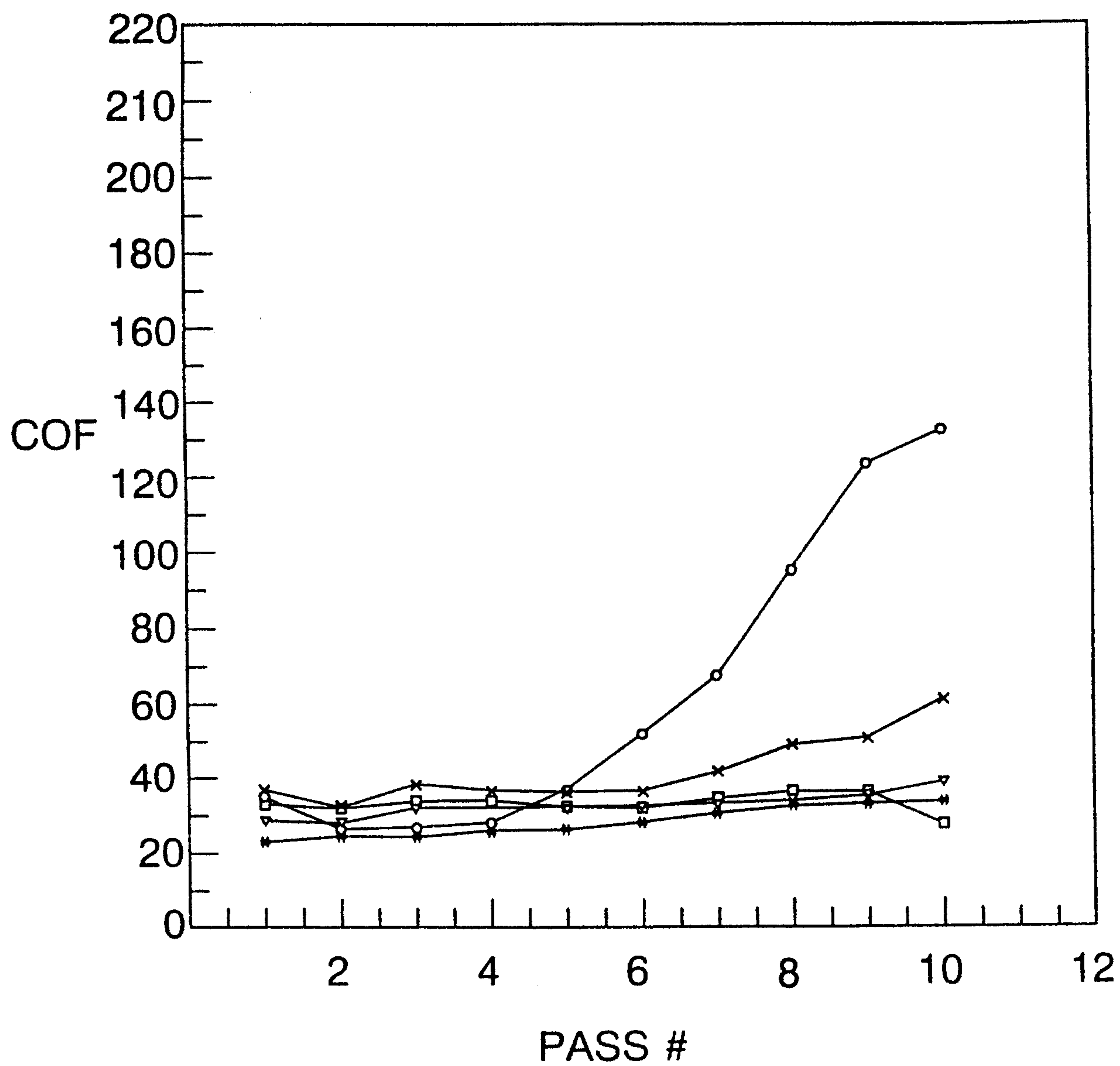
62. A method in accordance with any one of claims 54 to 61, wherein said heating is to a temperature of from about 180°F to about 200°F over a period of from about 10 minutes to about 30 minutes.

63. A method in accordance with any one of claims 54 to 62, wherein said dispersion is cooled to a temperature of from about 130°F to about 150°F within about 30 minutes while stirring is continued.

64. A method in accordance with any one of claims 54 to 63, wherein said second ester is a sucrose fatty acid ester which is selected from the group consisting of mono-, di- and tri- fatty acid esters.

65. A method in accordance with any one of claims 54 to 64 wherein said ester mixture is added to said water at a level of from about 3% to about 20%.

FIG.1



□ HF
* VAR. 1
▽ VAR. 2
*- VAR. 3
○ CONTROL

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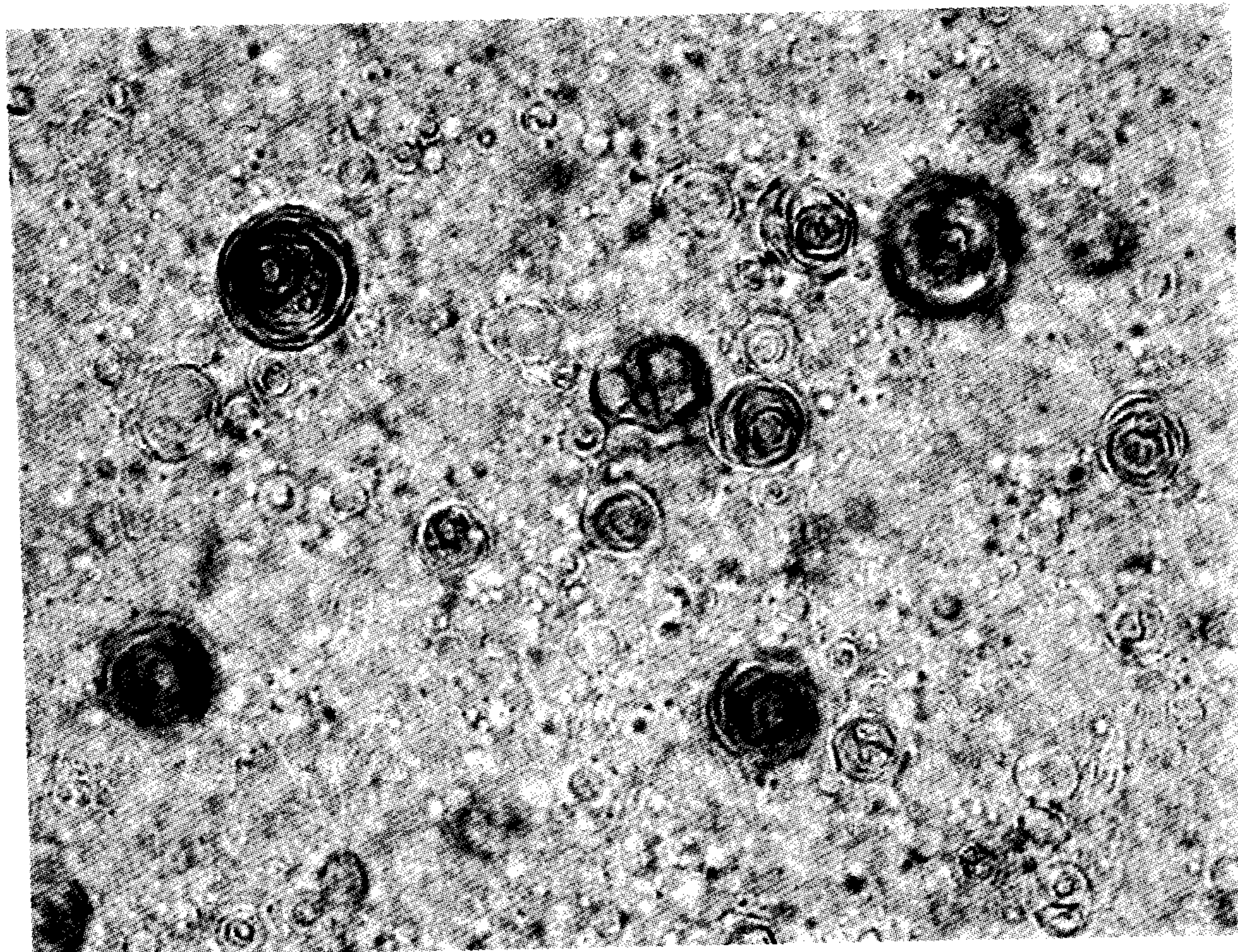


FIG.2