

thin boiling oxidized starches, e.g. those having a Scott hot paste viscosity of about 45 to 90, etherified starches including hydroxyethyl, hydroxypropyl, methyl and ethyl derivatives having a degree of substitution of 0.04 to 0.25 ether group per glucose unit as well as acid or oxidation modified etherized starches, starch esters, e.g. starch acetate and starch sulfonate, waxy maize starch, waxy sorghum starch, hydroxyethyl torrefaction dextrin, converted starches having a D.E. value of 4 to 20.

The invention is of particular value in forming stable emulsions and spray dried products from mixture of fats with converted starches or sugars that cannot be employed in Schoch. Such converted starches include corn syrups having D.E. values of 24 to 70 (e.g. 42) and higher. Thus there can be spray dried emulsions containing 20 to 50% fat with 80 to 20% of d-glucose and/or sucrose with lactose, e.g. where the lactose is 20 to 50% of the total of glucose and/or sucrose and lactose by using the polyglycerol esters as emulsifying agents.

The fat is normally 5 to 75% based on the total of fat and carbohydrate.

While corn syrup having a D.E. value of 15 to 60 or 70 is commonly used as the carbohydrate, there can be employed syrups of the same D.E. value prepared from tapioca, wheat, rice, sorghum, sago, potato, arrowroot, waxy maize or waxy sorghum starches or mixtures of these converted starches with each other or corn syrups.

It has been found that surprisingly very stable aqueous emulsions are prepared from the mixture of fat and corn syrups of D.E. values 24 and above and the sugars, even without using colloidal carbohydrates or proteins. Surprisingly, it is also possible to spray dry such compositions in the absence of colloidal carbohydrates and proteins. Thus good results have been obtained in spray drying mixtures of 50% of sugar or corn syrup, D.E. value 42, and 50% of cottonseed oil.

In order to obtain the best spray dried compositions containing large amounts, e.g. 50% or more of difficultly drier carbohydrates such as products containing large amounts of sucrose or dextrose or corn syrups of D.E. value 24 and above, based on the total of carbohydrate and fat, it is frequently desirable to add in addition to the polyglycerol ester 0.05-5%, preferably 0.2-2%, of a colloidal carbohydrate stabilizer based on the dry weight of the composition.

Such colloidal carbohydrate stabilizers include cellulose ethers such as methyl cellulose, e.g. Methocel MC (dimethyl ether of cellulose having 1.64-1.92 methoxy groups per glucose unit), mixed methyl hydropropyl cellulose, e.g. Methocel 90 HG (an etherified cellulose having 1.08-1.42 methoxy groups and 0.1-0.3 hydroxypropyl groups per glucose unit) and Methocel 65 HG (an etherified cellulose having 1.61-1.75 methoxy groups and 0.1-0.18 hydroxypropyl groups per glucose unit), carboxymethyl cellulose, low methoxy pectin, i.e. pectin having a methoxyl content of 2.5-4.5%, inulin, guar, Irish moss (carrageen), sodium alginate, gum tragacanth, gum karaya and locust bean gum.

In preparing emulsions of the products in groups (I) and (II) supra, the water is generally 40 to 95% and the solids 60 to 5%. In preparing emulsions of the products of group (III), the concentration of solids is generally quite low, e.g. 2-10% solids and 98-90% water.

The mixtures are pasteurized in conventional fashion, e.g. at 140-165° F. for 40-20 minutes, usually 155-160° F. for 30 minutes. The pasteurization conditions are not critical. Conveniently pasteurization is carried out at above the melting point of the fat.

The emulsions are homogenized in conventional fashion to a particle size between >1 to 10 microns. For many uses the particle size of the emulsified material is not over 5 microns although in preparing whipping products the particle size is usually somewhat larger, e.g. 3 to 8 microns.

Homogenization is carried out in conventional fashion at about the pasteurization temperature at pressures which can vary from 100 p.s.i. to 2000 p.s.i. or somewhat higher. Preferably the homogenization pressure is not over 2500 p.s.i. and in the examples unless otherwise indicated was 1500 p.s.i.

The emulsified, homogenized products are spray dried in commercial apparatus to give a particle size of 50 to 200 microns.

It has been found that when gum arabic is the carbohydrate it is possible to have up to 75% fat based on the total of fat and carbohydrate whereas when dextrans are the carbohydrate, the percent fat can be up to 65-70%. With corn syrup D.E. value of 42 there can be used up to 60% fat with 40% of the corn syrups.

The polyglycerol esters of the present invention aid the carbohydrate gums in entrapping fat better than the gums alone. They also have been found to prevent volatiles from going off in clouds and similar essential oil-containing formulations.

The compositions of the present invention are useful as shortening compositions, whipping compositions, clouds, etc.

EXAMPLE 1

A mixture of 50% cottonseed oil, 48.5% of corn syrup 42 D.E. and 1.5% of decaglycerol monostearate were pasteurized at 155-160° F. for 30 minutes and homogenized in water at 35% total solids. The product was then spray dried. It was found that a good coating of the corn syrups on the oil was obtained. This was surprising since normally the cottonseed oil is tough to coat properly.

EXAMPLE 2

Stable homogenized and emulsified mixtures were made from each of the following compositions in water.

	a	b	c	d	e
Decaglycerol tristearate.....	1.5	1.5	1.5	1.5	1.5
Cottonseed oil.....	5	19	30	40	50
Corn syrups 42 D.E.....	93.5	88.5	68.5	58.5	48.5

In each case water was added to give 35% solids. The mixtures were then spray dried at a particle size of about 125 microns.

In place of the 42 D.E. corn syrups in Examples 2(a), 2(b), 2(c), 2(d) and 2(e), there were also used corn syrups of 15 D.E. and 70 D.E. to successfully obtain spray dried products.

EXAMPLE 3

	Parts
White Crest (hydrogenated cottonseed oil)	59.0
Decaglycerol tetraoleate	1.0
Mono and diglycerides	4.8
Glycerol lacto monopalmitate	3.1
Glycerol monooleate	0.6
Sodium caseinate	6.25
Cane sugar	12.5
Frodex 15 (corn syrup 15 D.E.)	12.5
Sodium alginate	0.05
Salt	0.225

This mixture was pasteurized, emulsified and homogenized at 50 p.s.i. in water at 155-160° F. at 55% total solids and was then spray dried to give a whip topping.

A similar product can be obtained by omitting the glycerol monooleate.

The mono and diglycerides employed was a standard commercial product composed of about 40 to 42% mono glycerides, 43 to 45% diglycerides and the remainder triglycerides. The mono and diglyceride product itself is not a polyglycerol ester but instead is a mixture of materials such as glycerol monostearate and glycerol distearate.

The glycerol lactomonopalmitate can be replaced by propylene glycol monostearate, glycerol lacto monooleate, glycerol lacto monostearate, propylene glycol mono-palmitate, dipropylene glycol monostearate or the like.