

1

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PROTEIN COMPOSITION

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1 Claim. (Cl. 99—14)

This invention relates to novel improved protein compositions which are characterized by a high foam volume and high foam stability, when the composition is whipped. More specifically this invention relates to compositions containing a protein material and a minor amount of an alkyl ester of an aliphatic polycarboxylic acid and an alkali metal polyphosphate.

The principal object of this invention is to provide protein compositions having improved whipping qualities. Another object of this invention is to provide protein compositions having improved stability as a whipped material. Still another object of this invention is to provide an improved dry-mix composition for products requiring a foamed protein base, as for example, bakery products such as angel food and sponge cakes. A further object is to provide protein compositions which are particularly suitable for use in the preparation of a large variety of food products, as hereinafter more fully exemplified. A still further object is to provide a protein base composition which can be whipped to a high specific volume and has good foam stability in the presence of relatively large amounts of sugar. Other objects will be apparent from the following disclosure.

It has now been found that a combination of an alkyl ester of an aliphatic polycarboxylic acid and a linear alkali metal polyphosphate effect a synergistic improvement to various protein compositions which are particularly useful due to their ability to be whipped to provide a protein foam. The aforesaid combination is also effective to provide foamed compositions which heretofore have not been regarded as suitable protein compositions for the preparation of products requiring a high degree of whipping ability and foam stability.

The instant invention is applicable to a large variety of protein compositions, as for example various dehydrated protein foods such as nonfat milk solids, fat-free soybean flour, dried egg-white solids, dried whole eggs, gelatin, soluble caseinates, and the like, which are suitable in dry-mix formulations such as angel food and sponge cakes, and in the production of numerous other food products such as meringues, fruit whips, toppings, candy, marshmallows, biscuits, and the like. The instant invention also provides improved whipped products even in the presence of a relatively large amount of fat as in whipping cream, ice cream, and vegetable fat desserts. Furthermore, the novel combination of the instant invention is also effective in the presence of relatively large quantities of sugar as hereinafter more fully exemplified.

The suitable alkyl esters of the aliphatic polycarboxylic acids can include all edible compositions which are characterized by an appreciable solubility in water, i.e. at least about 0.01 percent, and a maximum molecular weight of about 280. The polycarboxylic acids can be partially or fully esterified and can also be esterified with more than a single alcohol to provide a mixed ester. The alkyl group of the ester should be a low molecular weight group, for example, methyl and ethyl and the like, but the ethyl radical is preferred. The various aliphatic poly-

2

carboxylic acids which can be employed to provide the above class of compounds can be exemplified by the group consisting of malonic acid, succinic acid, glutaric acid, tartaric acid, malic acid, tartaric acid, citric acid, and the like. Illustrative specific compounds are diethyl malonate, diethyl succinate, diethyl glutarate, diethyl tartronate, diethyl maleate, diethyl d-tartrate, diethyl l-tartrate, diethyl racemate, triethyl citrate, monoethyl malonate, monoethyl succinate, monoethyl glutarate, monoethyl tartronate, monoethyl maleate, monoethyl d-tartrate, diethyl citrate, monoethyl citrate, dimethyl tartronate, dimethyl succinate, dimethyl glutarate, dimethyl tartronate, dimethyl maleate, dimethyl d-tartrate, trimethyl citrate, dimethyl citrate, diethyl methyl citrate, ethyl methyl succinate, ethyl methyl maleate, and the like.

The quantity of the alkyl polycarboxylate can be varied from about 0.1 to about 1.0 percent by weight of the protein base material and preferably ranges from about 0.4 to about 0.6 percent thereof.

The linear alkali metal polyphosphates which are employed in this invention include any condensed phosphate containing the —P—O—P— chain formed by the sharing of oxygen atoms between adjacent phosphorus atoms. The chain length of said polyphosphates preferably can range from two phosphorus atoms up to about 200 phosphorus atoms or more and can contain up to several thousand phosphorus atoms. The alkali metal moiety of said polyphosphate is selected from the group consisting of sodium, potassium, and ammonium. It will be understood that the ammonium radical is often classified with the alkali metals for many purposes, and it is so classified in the instant invention. Suitable chain polyphosphates can thus be exemplified as sodium acid pyrophosphate, tetrasodium pyrophosphate, sodium tripolyphosphate, and longer chain sodium polyphosphate glasses wherein the number of phosphorus atoms, n , varies from about 4 up to several thousand, and preferably from about 4 up to about 200 or more, including sodium tetrapolyphosphate, sodium hexametaphosphate, and the various sodium phosphate glasses known as Graham's salts; tetrapotassium pyrophosphate, potassium tripolyphosphate, and longer chain potassium polyphosphates wherein n varies from about 4 up to several thousand, e.g. the potassium Kurrol's salts; tetraammonium pyrophosphate, diammonium disodium pyrophosphate and the like. Mixed alkali metal phosphates are also included in the suitable chain polyphosphates as for example, various potassium-sodium phosphate glasses and the like.

The quantity of the alkali metal polyphosphate to be used in combination with the alkyl polycarboxylate can be varied from about 0.5 to about 5 percent by weight of the protein base material and preferably is employed in an amount of from about 1.5 to about 3.0 percent by weight of the protein base material.

A further advantage of the combination of the alkali metal polyphosphate and alkyl polycarboxylate as synergistic agents to improve the whipping ability of various protein compositions by increasing the foam volume and foam stability of said compositions is the materially improved tolerance for the presence of relatively large amounts of sugars in formulations containing the aforesaid whipping agents. The stability of the whipped composition can also be improved by the presence of relatively small amounts of various thickening agents, as for example, Irish moss extractives, gum arabic, gum karaya, gum tragacanth, guar gum, locust bean gum, soluble pectins and pectic acid, sodium alginates, and the like. These effects are more fully shown in the illustrative examples below.

Whereas the subject matter of this invention is directed primarily to edible compositions for human consumption, it is obvious that the invention is also applicable to other