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(54) Title: A CREAM LIQUEUR

(57) Abstract: An acid miscible cream liqueur comprising a fat, an emulsifying agent, a stabilising emulsifier and alcohol is disclosed. The cream liqueur may also comprise sugars and polysaccharides. A floatable cream liqueur can also be provided by adding a fluid gelling agent. The acid miscible cream liqueur is suitable for mixing with acidic liquids to form an acidic cream liqueur. The acidic cream liqueur can also be prepared by adding an acidic liquid during processing. The cream liqueurs can also be carbonated. The invention also relates to a process for preparing an acid miscible cream liqueur, a floatable acid miscible cream liqueur, an acidic cream liqueur, and a floatable acidic cream liqueur.

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"A Cream Liqueur"

Introduction

The present invention relates to an acid miscible cream liqueur comprising a fat, an emulsifying agent, a stabilising emulsifier and an alcohol. The invention also relates to a floatable acid miscible cream liqueur, an acidic cream liqueur, a floatable acidic cream liqueur and a carbonated cream liqueur. The invention further relates to a process for preparing an acid miscible cream liqueur, a floatable acid miscible cream liqueur, an acidic cream liqueur, and a floatable acidic cream liqueur.

In the specification the term "cream liqueur" refers to any alcohol mixed with a fat. One of the main problems with cream liqueurs is that they are unstable oil-in-water emulsions wherein their instability is particularly exacerbated by the presence of alcohol. A further problem with cream liqueurs is that when mixed with water-based liquids they are inherently unstable, therefore necessitating the addition of one or more emulsifying agents.

Casein, an emulsifier obtained from milk protein, is regularly used because of its excellent emulsifying properties. Casein micelles have a positive charge which causes them to repel each other when suspended in a solution of neutral pH and to surround fat globules in the cream liqueur which are therefore kept suspended in the water based liquids.

UK Patent publication no. GB 2 145 111 discloses cream based liqueurs and a process for their production. The cream liqueurs comprise one or more alcoholic products, cream, water, carbohydrates, one or more substances selected from citric acid and salts thereof and one or more caseinates. The emulsion stability of the cream is improved by preparing a protein pre-mix of a salt of citric acid and caseinate in water to provide preferably sodium caseinate and mixing the sodium caseinate with the cream to provide a cream with better emulsion stability.

UK Patent publication no. GB 2 261 676 discloses a cream based liqueur comprising caseinate in the form of sodium caseinate having a consistent product stability. One

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of the disadvantages of casein, however, is that it only maintains stability under certain conditions. For example, casein is not stable and precipitates under acidic conditions and therefore is unsuitable for use as an emulsifying agent in a cream liqueur intended to be mixed with acidic liquids or in a cream liqueur which is itself acidic.

Thus, there is a need for an acid miscible cream liqueur comprising an emulsifying agent which is suitable for mixing with acidic liquids. There is further a need for an acidic cream liqueur which will retain stability after preparation.

Statements of Invention

According to the invention, there is provided an acid miscible cream liqueur comprising:

a fat;

an emulsifying agent ;

a stabilising emulsifier; and

alcohol;

characterised in that:

the emulsifying agent comprises an acid stable protein.

The advantage of using an acid stable protein as an emulsifying agent is that the resultant cream liqueur will retain stability under acidic conditions. The acid stable proteins act as emulsifying agents by enrobing the fat globules therefore allowing the cream liqueur to mix with acidic liquids. Furthermore, even after mixing with acidic liquids the proteins retain stability and continue to enrobe the fat globules and thus prevent the fat globules from coming out of solution.

Preferably, the acid stable protein is selected from the group comprising one or more

Of whey protein, egg albumin, bovine serum albumin, mammalian lactations, blood protein and blood serum albumin.

Whey protein is a particularly favourable type of acid stable protein as it is a by-product of many dairy production processes and in particular the production of cheese and caseinate and is thus a cheap and plentiful source. Furthermore whey protein does not produce any off-flavours which other proteins can but rather imparts a rich creamy taste to the liqueur and thus improves the palatability and organoleptic properties of the resultant product. Ideally, the whey protein is selected from the group comprising one or more of whey protein concentrate, whey protein isolate, hydrolysed whey protein, and whey protein particles.

Preferably, the acid stable protein comprises microparticulated protein particles having an average diameter of less than 5 μm in a dry state. Further preferably, the microparticulated protein particles have an average diameter in region of between 0.02 μm and 3 μm in a dry state. An average particle size in this region is advantageous in that the protein particles can more easily encapsulate the fat globules and act as an emulsifier. Additionally, particle sizes in this range have been found to impart more desirable organoleptic characteristics to the overall product.

Preferably, the stabilising emulsifier has a hydrophilic-lipophilic balance (HLB) value of at least 7. Further preferably, the stabilising emulsifier has a HLB value in region of between 10 and 20. The advantage of the stabilising emulsifier having a (HLB) of this value is that the stabilising emulsifier will have hydrophilic properties and thus provides an improved oil-in-water emulsion resulting in a better interaction between the cream liqueur and any water containing acidic or non-acidic liquids.

Ideally, the stabilising emulsifier is selected from the group comprising one or more of sucrose esters, polysorbates (tween), polyglycol esters, sodium stearyl lactylate (SSL), lecithin, lecithin derivatives, glycerol monostearate (GMS), polyoxyethylene sorbitan monostearate, polyoxyethylene sorbitan monooleate, ryoto polyglycerol ester, ethoxylated monoglycerides, glyceryl esters, polyethylene glycol 400 monostearate, polyoxyethylene-4-sorbitan monolaurate, polyoxyethylene-20-sorbitan monopalmitate, polyoxyethylene-40-stearate, sodium oleate, sodium lauryl sulphate.

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Preferably, the fat is selected from the group comprising one or more of milk fat, butter fat, butter oil, vegetable fat and animal fat. The advantage of using milk fat is that the resultant acid miscible cream liqueur has improved organoleptic properties.

According to the invention, there is also provided an acid miscible cream liqueur which further comprises a polysaccharide. Preferably, the polysaccharide is selected from the group comprising one or more of high ester pectins, carboxymethylcellulose, microcrystalline cellulose, propylene glycol alginate, xanthan gum, kappa carrageenan, and iota carrageenan.

The resultant cream liqueurs have been found to have better product textures by the addition of a polysaccharide. The polysaccharides bond with the whey proteins generally by electrostatic bonding which has the effect of reducing or preventing protein – protein interaction or coagulation within the cream liqueur. Protein – protein interaction can result in gelling of the proteins causing the liqueurs to thicken excessively resulting in an unsightly gel-like substance within the liqueur. Coagulation of the proteins on the other hand results in "specking", which is effectively specks or small lumps of coagulated protein in the liqueur. Thus the addition of polysaccharides reduces gelling and "specking" which results in a smoother liqueur.

Additionally, the polysaccharides assist in the enrobing of the fat globules. The polysaccharides bond with the proteins by electrostatic bonding to provide a thicker and stronger protein enrobing layer around the fat globules thus producing a cream liqueur which is more stable against creaming. This also has the advantage in that it allows for a higher percentage of fat to be used without having to increase the amount of protein required. Furthermore the polysaccharides have been found to absorb some of the water in the liqueur thus resulting in a richer and creamier liqueur.

According to the invention, there is further provided a floatable acid miscible cream liqueur comprising the acid miscible cream liqueur and a fluid gelling agent. Preferably, the fluid gelling agent is a hydrocolloid gelling agent. Further preferably, the fluid gelling agent is selected from the group comprising one or more of gellan gum, pectin, agarose, carrageenan, agar, locust bean gum and alginate.

The advantage of adding a fluid gelling agent is that it forms a matrix which encapsulates both the fat and the alcohol in the cream liqueur. This has a further effect of conferring the specific gravity properties of the fat to the fluid gelling agent thereby enabling the cream liqueur to float on both hot and cold drinks. The acid miscible cream liqueur containing the matrix formed by the fluid gelling agent does not melt when poured carefully onto a hot beverage. The matrix formed encapsulates the fat and protects the fat from the heat of the hot beverage.

According to the invention, there is still further provided an acidic cream liqueur comprising the acid miscible cream liqueur and an acidic liquid. According to the invention, there is yet still provided a floatable acidic cream liqueur comprising the floatable acid miscible cream liqueur of the invention and an acidic liquid. Ideally, the acidic liquid comprises one or more of a fruit juice and a food grade acid.

According to the invention, there is also provided a carbonated cream liqueur comprising the acid miscible cream liquor and carbon dioxide.

According to the invention, there is further provided a carbonated acidic cream liqueur comprising the acidic cream liqueur and carbon dioxide.

According to the invention, there is still further provided a carbonated cream liqueur comprising the acid miscible cream liqueur and a carbonated beverage.

According to the invention, there is yet still further provided a carbonated acidic cream liqueur comprising the acidic cream liqueur and a carbonated beverage.

A by-product of carbonation is carbonic acid. As the acid stable protein is stable under acidic conditions however, any liqueur or beverage containing the acid stable protein will also remain stable when carbonated. The carbonation or aeration of the floatable cream liqueur comprising the fluid gelling agent will enable the liqueur to have a whipped head formed by the expanding gas thus improving both floating ability and appearance.

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The invention also relates to a process for preparing an acid miscible cream liqueur;

the process comprising:

mixing a fat, a stabilising emulsifier, an acid stable protein and water to form a protein fat mix;

heating the protein fat mix;

adding alcohol to the protein fat mix;

homogenising the alcohol and the protein fat mix to form the acid miscible cream liqueur;

cooling the liqueur; and

shearing the liqueur either during or after cooling of the acid miscible cream liqueur.

The advantage of heating the protein fat mix is that more effective homogenisation is carried out if the fat globules are hot enough to liquefy. The protein fat mix should be heated to a temperature of greater than 50°C to ensure that the fat is in a liquid state prior to homogenisation.

The advantage of adding alcohol at this stage is to prevent excess evaporation of the alcohol on heating.

The fat mix should be homogenised at a sufficient pressure to ensure that the fat globules are small enough to retain stability under long term storage conditions. An homogenisation pressure of 2000 psi or greater which yields fat globules having a diameter in the region of between 0.6µm and 1µm has been found to be preferable. During homogenisation, the fat globules are enrobed by the stabilising emulsifier and the acid stable protein.

Preferably the mixture is homogenised twice to form the beverage. This ensures that all of the fat is completely homogenised and ensures emulsion stability throughout the shelf life of the cream liqueur.

In one embodiment of the invention, the process further comprises:

prior to mixing the acid stable protein and water with the fat and stabilising emulsifier, carrying out the steps of:

premixing the acid stable protein and water; and

heating the acid stable protein and water to form a hydrated protein mix.

In another embodiment of the invention the process further comprises:

prior to mixing the acid stable protein with the fat, stabilising emulsifier and water, carrying out the steps of:

premixing the fat, stabilising emulsifier and water together to form a fat mix; and

heating the fat mix.

Preferably, the liqueur is cooled rapidly after homogenising.

The invention further relates to a process for preparing a floatable acid miscible cream liqueur comprising:

preparing the acid miscible cream liqueur by the process of the invention, wherein the process further comprises:

adding a fluid gelling agent to the acid miscible cream liqueur;

cooling the acid miscible cream liqueur to a temperature below the fluid

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gelling agent setting point; and

shearing the acid miscible cream liqueur during or after cooling of the cream liqueur.

The invention still further relates to a process for preparing an acidic cream liqueur comprising:

preparing an acid miscible cream liqueur by the process of the invention; and

carrying out the additional step of adding an acidic liquid to the protein fat mix prior to homogenising the protein fat mix and the alcohol.

The invention further relates to a process for preparing a floatable acidic cream liqueur comprising:

preparing a floatable acid miscible cream liqueur by the process of the invention; and

carrying out the additional step of adding an acidic liquid to the protein fat mix prior to homogenising the protein fat mix and the alcohol.

The invention yet still further relates to a process for preparing an acidic cream liqueur comprising:

preparing an acid miscible cream liqueur by the process of the invention;

mixing an acidic liquid with the acid miscible cream liqueur to form a mixture;

homogenising the mixture to form the acidic cream liqueur; and

cooling the acidic cream liqueur.

Detailed Description of the Invention

The invention will be more clearly understood from the following description of the following processes according to the invention. Processes A, B and C describe preparation of an acid miscible or an acidic cream liqueur. Process D describes the preparation of a floatable acid miscible or acidic cream liqueur.

All of the equipment used in carrying out the process is well known equipment and accordingly does not require any further description.

Process A

The fat, stabilising emulsifier, water and acid stable protein are added to a mixing vessel and are mixed together while heating at a temperature of between 50°C and 95°C to form a protein fat mix. Alcohol is then added to the protein fat mix and the alcohol containing protein fat mix is homogenised at a pressure of greater than 2000psi at a temperature in the region of 60°C to form the acid miscible cream liqueur. Following homogenisation, the liqueur is cooled to a temperature of less than 10°C and sheared either during or after cooling of the acid miscible cream liqueur. In order to prepare an acidic cream liqueur, an acidic liquid is added to the alcohol containing protein fat mix prior to homogenisation.

Process B

The acid stable protein and water are mixed together while heating at a temperature in the region of between 50°C and 60°C. The protein is left to hydrate for approximately 30 minutes to form a hydrated protein mix. The fat and stabilising emulsifier are added to the protein mix to form the protein fat mix. Alcohol is then added to the protein fat mix and the alcohol containing protein fat mix is homogenised at a pressure of greater than 2000psi at a temperature in the region of 60°C to form the acid miscible cream liqueur. Following homogenisation, the liqueur is cooled to a temperature of less than 10°C and sheared either during or after cooling of the acid

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miscible cream liqueur. In this process the fat and stabilising emulsifier can optionally be added separately to the heated protein mix or can be preheated together with or without water to form a fat mix prior to addition to the protein mix. In order to prepare an acidic cream liqueur, an acidic liquid is added to the alcohol containing protein fat mix prior to homogenisation.

Process C

The fat, stabilising emulsifier and water are added to a mixing vessel and are mixed together while heating at a temperature in the region of between 50°C and 60°C to form a fat mix. An acid stable protein is then obtained and added to the mixing vessel and the protein is mixed with the fat mix to form a protein fat mix. The protein fat mix is then heated to a temperature of between 55°C and 95°C. Alcohol is then added to the protein fat mix and the alcohol containing protein fat mix is homogenised at a pressure of greater than 2000psi at a temperature in the region of 60°C to form the acid miscible cream liqueur. Following homogenisation, the liqueur is cooled to a temperature of less than 10°C and sheared either during or after cooling of the acid miscible cream liqueur. In this process, the water can optionally be added at the same time as the fat and stabilising emulsifier or after these components have been mixed together. In order to prepare an acidic cream liqueur, an acidic liquid is added to the alcohol containing protein fat mix prior to homogenisation.

Process D

An acid miscible or acidic cream liqueur is prepared by either process A, B or C. A fluid gelling agent is added to the cream liqueur. The cream liqueur is then cooled to a temperature below the setting point of the gelling agent and generally in the region of between 10°C and 30°C. The cream liqueur is sheared during or after cooling of the cream liqueur.

An acidic cream liqueur may be prepared directly by addition of the acidic liquid during processing and preferably prior to homogenisation as described above. Alternatively, the acid miscible cream liqueur may be combined with any consumable acidic liquid such as a fruit juice to provide an acidic cream liqueur. In the latter case, the acid

miscible cream liqueur will be mixed with a fruit juice in an organoleptically optimum ratio. The quantity of fruit juice added will largely depend on the type and concentration of the fruit juice. The mix will be homogenised twice at a pressure of at least 2000psi and cooled, either in a sealed container or by a cooling apparatus such as a heat exchanger. It will be appreciated that although homogenisation of the cream liqueur with the fruit juice will provide a more stable product, vigorous shaking of the two liquids is also possible. Although the acid miscible cream liqueur is particularly suitable for mixing with acidic liquids it will be appreciated that the cream liqueur could also be mixed with non-acidic liquids to provide a beverage.

An "acid stable protein" is defined as any protein which retains stability under acidic conditions. Once a protein loses stability, it will coagulate which will result in a large increase in viscosity. Precipitation of the protein may also occur which will result in grains of solidified material in the liquid.

The acid stable protein is preferably whey protein. The whey protein could be a whey protein concentrate or a whey protein isolate. Whey protein isolate is of higher quality and contains more protein with less fat and lactose per serving. The whey protein could also be hydrolysed whey protein, which is protein which has been pre-digested with enzymes to break the protein down into smaller peptides and amino acids. The whey protein can also be whey protein particles which are produced by splitting the whey proteins. All of the above types of whey protein can either be in a powder or liquid form.

The acid stable protein can be in a microparticulated form and this can be obtained commercially. One such example is that sold under the Trade Mark SIMPLESSE® which is a microparticulated whey protein concentrate wherein the microparticulated protein particles are obtained from sweet dairy whey protein concentrate. It will be appreciated, however, that microparticulated protein can be obtained from any protein source where the protein is substantially soluble in its undenatured state and which undergoes denaturation and insolubilisation upon exposure to heat denaturing temperatures.

Microparticulated proteins are manufactured by subjecting undenatured protein to a

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very strong shearing force, while denaturing the proteins at high temperature and low pH. The particles generally have a spherical shape. This process may be carried out on aqueous suspensions of undenatured proteins alone or mixed with aggregate blocking agents which slow down protein gelation resulting in smaller protein particles. Suitable aggregate blocking agents include xanthan gum, datem esters, lecithin, carrageenan, alginate, calcium stearyl lactylate, maltodextrin and fructose. The optimum processing conditions for obtaining microparticulated protein have been found to be a strong shearing force achieved by spinning the undenatured protein in a rotator at between 850 and 1200 revolutions per minute, while heating the proteins at a temperature of between 80°C and 150°C under acidic conditions at a pH of between 3.5 and 5.0.

In the case of whey protein, the resultant microparticulated whey protein spheres have a mean diameter of between 0.02 µm and 2.0 µm, with less than 2% of the spheres having a diameter of greater than 3 µm.

Although the acid stable protein can emulsify fat and water based products together, the emulsion is stabilised by the addition of one or more stabilising emulsifiers which are preferably small molecule surfactants.

The choice of stabilising emulsifier will be determined by its HLB value. The HLB value is a numerical value representing the hydrophilic-lipophilic balance of the agent i.e. the balance of the size and strength of the polar and the non-polar groups of the agent.

The HLB value is a well known concept and can be described from a number of equations. One equation for deriving the HLB value when the emulsifier is a polyhydric alcohol fatty acid ester is as follows:

$$\text{HLB} = 20 (1 - S/A)$$

Where S is the saponification number of the ester and A is the acid number of the acid.

When S is undetermined:

$$\text{HLB} = (E+P)/5$$

Where E is the weight percent of oxyethylene and P is the weight percent of polyhydric alcohol.

When oxyethylene is the only hydrophilic group:

$$\text{HLB} = E/5$$

HLB values can also be determined by cloud point titrations (CPT), which determine the temperature at which an oil begins to cloud as a result of crystallisation under controlled cooling.

The stabilising emulsifiers further emulsify and stabilise the interaction between the fat globules and the water phase. When the acid stable protein is mixed with the fat mix, the acid stable protein further interacts with the stabilising emulsifiers and the fat globules. During homogenisation, an emulsion of fat globules surrounded by a continuous water phase is formed. The acid stable protein and the stabilising emulsifiers work together to enrobe the fat globules, thus preventing the fat globules from coalescing and ensuring the stability of the emulsion. Thus when the cream liqueur is mixed with an acidic liquid the acid stable protein retains stability, and both the acid stable protein and the stabilising emulsifiers stabilise the fat-water emulsion. If the acidic cream liqueur is being prepared directly, this will affect the choice of stabilising emulsifier. If it is desired to produce an acidic cream liqueur, that is a cream liqueur of acid pH which will be stable throughout a commercially viable shelf life, the high HLB value small molecule surfactant emulsifier must retain its emulsifying powers at acid pHs. Best results are obtained from sucrose esters, polyglycerol esters, polysorbates, tweens.

If a product which is only acid miscible is required, that is a product which is made, bottled and transported at neutral pH and which has an acidic liquid added immediately prior to consumption, any suitable high HLB value small molecule

surfactant emulsifier may be used. Best results are obtained using sodium stearyl lactylate SSL. This acid miscible cream liqueur may then be carbonated or have an acidic liquid added and will remain stable for consumption.

It will further be appreciated that other optional ingredients such as sugars can be added to the mixing vessel when preparing the liqueurs. These ingredients are generally added at the same time as the ingredients of the fat mix. The addition of sugars improves the organoleptic properties of the cream liqueur. Sugars also have a role in prolonging the shelf life of the resultant liqueurs.

The addition of a polysaccharide to the cream liqueurs has been found to impart improved texture to the cream liqueur. The polysaccharides bond with the acid stable proteins most often by electrostatic bonding which has the effect of reducing or preventing protein-protein interaction or coagulation. This results in a reduction in the tendency of the acid stable proteins to coagulate thereby reducing the gelation of the protein and thickening of the cream liqueur. The addition of polysaccharides also prevents the formation of specks of gelled protein in the liqueur and on the side of the serving glass which would be unattractive in the cream liqueur.

It has been found however, that bonding of the polysaccharides will only occur under certain pH conditions. Therefore if the acidic cream liqueur is being prepared directly, this will also affect the choice of polysaccharide which can be used. Specifically, polysaccharides which will retain stability at low pHs should be chosen. The following table indicates the most effective pH ranges for each of the polysaccharides as well as their most effective addition rates:

Polysaccharide addition rates and pH active ranges:

Polysaccharide	Addition Rate (%)	pH Range
High ester pectin	0.5	3.5 – 4.2
Carboxymethylcellulose	0.025 – 0.1	4.2 – 5.0
Microcrystalline cellulose	0.05 – 0.4	4.0 – 5.0 optimal, but may function outside this range.
Propylene glycol alginate	0.1 – 0.5	2.9 – 7.0

Kappa and Iota Carrageenan	0.005 – 0.1	5.0 – 7.0 optimal, but may function outside this range.
Xanthan gum	0.05 – 0.1	4.0 – 6.0

Fluid gelling agents are pourable gels. The gelling agent that is used preferably in the present invention is gellan gum but other gelling agents can be used. Gellan gum is a low acyl product sold under the Trade Mark Kelcogel®. Gellan gum is considered heat resistant due to its high melting point exceeding 80°C.

In order to form a gel, the fluid gelling agent must first be hydrated. Hydration may be provided by the water in the cream liqueur or the gelling agent may be pre-hydrated before addition. It has been found that the addition of a fluid gelling agent to the cream liqueur in the range of between 0.05% and 0.5% by weight of the cream liqueur provides a floatable cream liqueur.

It has also been found that by carbonating the acid miscible cream liqueur either by directly carbonating the liqueur or by mixing it with a carbonated beverage that this produces a whipped head within the floating cream formed by the expanding gases. This results in a cream liqueur with improved floating ability and appearance. The resulting floating pourable liquid has an internal lattice gel structure which prevents it mixing with other liquids. The fluid gelling agent has the advantage that it is formed at approximately 20°C and does not remelt until over 90°C, this means that temperature fluctuations do not cause the fluid gelling agent to form a solid gel. This technology has many possibilities in developing new products which can be poured giving liquids with a sharp definition between layers and in the case of carbonated cream liqueurs can be used to give carbonated drinks or whipped topping type heads to cocktails or Irish coffees

In each of the processes described, either the protein mix or the protein fat mix can be heated to a temperature in the region of between 55°C and 90°C. If the protein or protein fat mix is heated to a temperature of less than 65°C the protein therein will not denature. Thus the protein particles will remain intact and will encapsulate the fat globules in the cream liqueur thus acting as an emulsifying agent. On the other hand, if the protein or protein fat mix is heated to a temperature of greater than 65°C and

more specifically to a temperature greater than 80°C the protein therein will denature. In this case the denatured unravelled protein particles will form a lattice structure and enrobe the fat globules more loosely. Although encapsulation of the fat globules will occur at these temperatures, in this state the protein has lower solubility which may lead to syneresis in the resultant cream liqueur.

Both the undenatured acid stable proteins and the microparticulated proteins have a particle size of less than 5µm. As the denatured whey proteins have unravelled and are agglomerated together, their particle size is generally greater and is in the region of between 15 and 175 µm.

The resultant beverage can also be carbonated by the addition of carbon dioxide or other methods of carbonation which release carbon dioxide gas either prior to bottling or prior to consumption. This can be achieved by direct carbonation or by mixing the cream liqueur with a carbonated beverage.

The invention will be more clearly understood from the description of the following examples. In this specification for consistency in the examples, the addition of alcohol has been referred to as being added by weight when in almost all instances in practice it is always referred to as being added by volume whether it is absolutely pure or not. In all examples the alcohol was diluted to approximately 60% volume strength prior to addition.

In the interest of clarity, each of the examples has been divided into sub-processing steps. It will be appreciated however that in practice each of these steps is carried out one after the other usually in one mixing vessel.

Example 1

The preparation of the acid miscible cream liqueur was carried out using Process A and according to the quantities outlined in Tables 1A and 1B

Table 1A

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Preparation of Protein Fat Mix

Component	% by Weight of Protein Fat Mix
Butterfat	14.94
Sugar ester (HLB 16)	0.57
Simplese ® whey protein	10.34
Water	74.14

The components were mixed together and heated to 60°C

Table 1B**Preparation of Acid-Miscible Cream liqueur**

Component	% by Weight of cream liqueur
Protein Fat Mix	87
Alcohol	13

Homogenisation was carried out twice in a two stage homogeniser at 4000 psi and 500psi at 60°C to form the acid miscible cream liqueur. The cream liqueur was cooled to 5°C and sheared after cooling.

Table 1C – Acid-miscible cream liqueur

Components	% in total w/w
Butterfat	13
Sugar ester (HLB 16)	0.5
Simplese ® whey protein	9
Alcohol	13
Water	64.5

Example 2

The preparation of the acid miscible cream liqueur was carried out using Process B and according to the quantities outlined in Tables 2A, 2B and 2C

Table 2A

Preparation of Protein Mix

Component	% by Weight of Protein Mix
Whey protein isolate	10.97
Water	89.03

The components were mixed together and heated to 55°C and the protein was allowed to hydrate for 30 minutes.

Table 2B

Preparation of Fat Mix

Component	% by Weight of Fat Mix
Milk fat	28.27
Polysorbate (tween)	0.11
Sugar	71.62

The components were mixed together and added to the protein mix while heating to 60°C to form the protein fat mix.

Table 2C

Preparation of Acid-Miscible Cream Liqueur

Component	% by Weight of cream liqueur
Fat Mix	28.3
Protein Mix	54.7

Alcohol 17

Homogenisation was carried out twice in a two stage homogeniser at 4000psi and 500psi at 60°C to form the acid miscible cream liqueur. The cream liqueur was cooled to 3°C and sheared during cooling.

Table 2D – Acid-miscible cream liqueur

Components	% in total w/w
Milk fat	8
Sugar	20
Polysorbate (tween)	0.3
Whey protein isolate	6
Alcohol	17
Water	48.7

Example 3

The preparation of the acid miscible cream liqueur was carried out using Process C and according to the quantities outlined in Tables 3A and 3B

Table 3A

Preparation of Fat Mix

Component	% by Weight of Fat Mix
Butter oil	15.95
Polyglycol ester	0.61
Sugar	24.54
Water	58.90

The components were mixed together and heated to 60°C.

Table 3B

Preparation of Acid-Miscible Cream liqueur

Component	% by Weight of cream liqueur
Fat Mix	81.5
Whey Protein Concentrate (85% protein)	5.5
Alcohol	13

The whey protein concentrate was mixed with the fat mix at a temperature of 90°C. Homogenisation was carried out twice in a two stage homogeniser at 4000psi and 500psi at 60°C to form the acid miscible cream liqueur. The cream liqueur was cooled to 4°C and sheared after cooling.

Table 3C – Acid-miscible cream liqueur

Components	% in total w/w
Butter oil	13
Sugar	20
Polyglycol ester	0.5
Whey protein concentrate	5.5
Alcohol	13
Water	48

Example 4

The preparation of the acidic cream liqueur was carried out using Process A and according to the quantities outlined in Tables 4A and 4B

Table 4A

Preparation of Protein Fat Mix

Component	% by Weight of Protein Fat Mix
Vegetable fat	10
Sugar ester (HLB 16)	0.5
Sugar	20
Hydrolysed Whey protein	4.5
Water	65

The components were mixed together and heated to 55°C

Table 4B

Preparation of Acidic Cream liqueur

Component	% by Weight of cream liqueur
Protein Fat Mix	83
Alcohol	17

Sufficient citric acid was added to the alcohol containing protein fat mix to reduce the pH to 4.6. Homogenisation was carried out twice in a two stage homogeniser at 4000psi and 500psi at 60°C to form the acid miscible cream liqueur. The cream liqueur was cooled to 2°C and sheared during cooling.

Table 4C – Acidic cream liqueur

Components	% in total w/w
Vegetable fat	10
Sugar	20
Sugar ester (HLB 16)	0.5
Hydrolysed whey protein	4.5
Alcohol	17
Water	48

Example 5

The preparation of the acidic cream liqueur was carried out using Process B and according to the quantities outlined in Tables 5A, 5B and 5C.

Table 5A

Preparation of Protein Mix

Component	% by Weight of Protein Mix
Whey protein concentrate (85% protein)	10.36
Water	89.64

The components were mixed together and heated to 50°C and the protein was allowed to hydrate for 30 minutes.

Table 5B

Preparation of Fat Mix

Component	% by Weight of Fat Mix
Animal fat	38.35
Sucrose ester (HLB 16)	1.47
Sugar	59
High ester pectin	1.18

The components were mixed together and sufficient citric acid was added to the mixture to bring the pH to 3.8 to form a fat mix. The fat mix was added to the protein mix to form the protein fat mix.

Table 5C

Preparation of Acidic Cream liqueur

Component	% by Weight of cream liqueur
Fat Mix	33.9
Protein Mix	53.1
Alcohol	13

Sufficient citric acid was added to reduce the pH to 4.2. Homogenisation was carried out twice in a two stage homogeniser at 4000psi and 500psi at 60°C to form the acid miscible cream liqueur. The liqueur was cooled to 5°C and sheared after cooling.

Table 5D – Acidic cream liqueur

Components	% in total w/w
Animal fat	13
Sugar	20
Sucrose ester (HLB 16)	0.5
High ester pectin	0.4
Whey protein concentrate (85% protein)	5.5
Alcohol	13
Water	47.6

Example 6

The preparation of the acidic cream liqueur was carried out using Process C and according to the quantities outlined in Tables 6A and 6B

Table 6A

Preparation of Fat Mix

Component	% by Weight of Fat Mix
Butterfat	15.95
Sucrose esters	0.61
Sugar	24.54

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Carboxymethylcellulose	0.074
Water	58.82

The components were mixed together and heated to 55°C to form a fat mix.

Table 6B

Preparation of Acidic Cream liqueur

Component	% by Weight of cream liqueur
Fat Mix	81.5
Simplese © Whey Protein	5.5
Alcohol	13

Sufficient citric acid was added to reduce the pH to 4.5. Homogenisation was carried out twice in a two stage homogeniser at 4000psi and 500psi at 60°C to form the acid miscible cream liqueur. The cream liqueur was cooled to 4°C and sheared during cooling.

Table 6C – Acidic cream liqueur

Components	% in total w/w
Butterfat	13
Sugar	20
Sucrose ester (HLB 16)	0.5
Carboxymethylcellulose	0.06
Simplese © Whey protein	5.5
Alcohol	13
Water	47.94

Example 7

The preparation of the acid miscible cream liqueur was carried out using Process A

and according to the quantities outlined in Tables 7A and 7B

Table 7A

Preparation of Protein Fat Mix

Component	% by Weight of Protein Fat Mix
Milk fat	14.94
Sugar ester (HLB 16)	0.57
Sugar	22.99
Propylene glycol alginate	0.11
Whey protein concentrate (85% protein)	6.32
Water	55.06

The components were mixed together and heated to 55°C.

Table 7B

Preparation of Acid-Miscible Cream liqueur

Component	% by Weight of cream liqueur
Protein Fat Mix	87
Alcohol	13

Homogenisation was carried out twice in a two stage homogeniser at 4000psi and 500psi at 60°C to form the acid miscible cream liqueur. The cream liqueur was cooled to 4°C and sheared during cooling.

Table 7C – Acid-miscible cream liqueur

Components	% in total w/w
Milk fat	13
Sugar	20
Sucrose ester (HLB 16)	0.5

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Propylene glycol alginate	0.1
Whey protein concentrate (85% protein)	5.5
Alcohol	13
Water	47.9

Example 8

The preparation of the acid miscible cream liqueur was carried out using Process D and according to the quantities outlined in Tables 8A, 8B and 8C

Table 8A

Preparation of Protein Mix

Component	% by Weight of Protein Mix
Whey protein concentrate (85% protein)	10.34
Water	89.66

The components were mixed together and heated to 55°C and the protein was allowed to hydrate for 30 minutes.

Table 8B

Preparation of Fat Mix

Component	% by Weight of Fat Mix
Butterfat	38.81
Sugar ester (HLB 16)	1.49
Sugar	59.70

The components were mixed together and added to the protein mix to form the protein fat mix.

Table 8C**Preparation of Acid-Miscible Cream liqueur**

Component	% by Weight of cream liqueur
Fat Mix	33.5
Protein Mix	53.2
Alcohol	13
Gellan gum	0.3

Homogenisation was carried out twice in a two stage homogeniser at 4000psi and 500psi to form the acid miscible cream liqueur. The gellan gum was added to the acid miscible cream liqueur and the cream liqueur was then cooled to 20°C. The acid miscible cream liqueur was sheared during cooling to form the floatable acid miscible cream liqueur.

Table 8D – Acid-miscible cream liqueur

Components	% in total w/w
Butterfat	13
Sugar	20
Sucrose ester	0.5
Whey protein concentrate (85% protein)	5.5
Gellan gum	0.3
Alcohol	13
Water	47.7

Example 9

The preparation of the acidic cream liqueur was carried out using Process D and according to the quantities outlined in Tables 9A and 9B

Table 9A

Preparation of Fat Mix

Component	% by Weight of Fat Mix
Butterfat	15.98
Sugar ester (HLB 16)	0.61
Sugar	24.59
Xanthan gum	0.06
Water	58.77

The components were mixed together and heated to 60°C to form a fat mix. The components were mixed together.

Table 9C

Preparation of Acidic Cream liqueur

Component	% by Weight of cream liqueur
Fat Mix	81.35
Whey protein concentrate (85% protein)	5.5
Alcohol	13
Pectin	0.15

Sufficient citric acid was added to reduce the pH to 5.1. Homogenisation was carried out twice in a two stage homogeniser at 4000 psi and 500 psi to form the acidic cream liqueur. The pectin was added to the acidic cream liqueur. The cream liqueur was then cooled to 25°C. The acidic cream liqueur was sheared during cooling to form the floatable acidic cream liqueur.

Table 9D – Acidic cream liqueur

Components	% in total w/w
Butterfat	13

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Sugar	20
Sucrose ester	0.5
Whey protein concentrate (85% protein)	5.5
Pectin	0.15
Alcohol	13
Water	47.85

Example 10

This Example demonstrates the stability tests that were performed on the acid miscible cream liqueurs and acidic cream liqueurs over a 15 week period.

1. Samples were stored ambient temperature.
2. Samples were examined visually once every second week up to week 5, and then and then again at week 10, week 12 and week 15 for signs of protein specking and gelling.

The results are tabulated in Table 10.

Table 10

Time	Week 1	Week 3	Week 5	Week 10	Week 12	Week 15
Example 1	Stable – slight protein specking	Slight thixotropic gelling – reversible on shaking				
Example 2	Stable – slight protein specking	Stable – no gelling	Slight thixotropic gelling – reversible on shaking			
Example 3	Stable – slight protein specking	Slight thixotropic gelling – reversible on shaking				
Example 4	Stable – slight protein specking	Stable – no gelling				
Example 5	Stable – no protein flecks	Stable – no gelling				
Example 6	Stable – no protein flecks	Slight thixotropic gelling – reversible on shaking				
Example 7	Stable – no protein flecks	Stable – no gelling				
Example 8	Stable – no protein flecks	Stable – no gelling				
Example 9	Stable – no protein flecks	Some thickening – reversible on shaking				

In the specification the terms "comprise, comprises, comprised and comprising" or any variation thereof and the terms "include, includes, included and including" or any variation thereof are considered to be totally interchangeable and they should all be afforded the widest possible interpretation and vice versa.

The invention is not limited to the embodiment hereinbefore described, but may be

varied in both construction and detail within the scope of the appended claims.

CLAIMS

1. An acid miscible cream liqueur comprising:

a fat;

an emulsifying agent ;

a stabilising emulsifier; and

alcohol;

characterised in that:

the emulsifying agent comprises an acid stable protein.
2. An acid miscible cream liqueur as claimed in claim 1, wherein the acid stable protein is selected from the group comprising one or more of whey protein, egg albumin, bovine serum albumin, mammalian lactations, blood protein and blood serum albumin.
3. An acid miscible cream liqueur as claimed in claim 2 wherein the whey protein is selected from the group comprising one or more of whey protein concentrate, whey protein isolate, hydrolysed whey protein, and whey protein particles.
4. An acid miscible cream liqueur as claimed in any preceding claim, wherein the acid stable protein comprises microparticulated protein particles having an average diameter of less than 5 μm in a dry state.
5. An acid miscible cream liqueur as claimed in claim 4, wherein the microparticulated protein particles have an average diameter in region of between 0.02 μm and 3 μm in a dry state.

6. An acid miscible cream liqueur as claimed in any preceding claim, wherein the stabilising emulsifier has a hydrophilic-lipophilic balance (HLB) value of at least 7.
7. An acid miscible cream liqueur as claimed in any preceding claim, wherein the stabilising emulsifier has a HLB value in region of between 10 and 20.
8. An acid miscible cream liqueur as claimed in any preceding claim, wherein the stabilising emulsifier is selected from the group comprising one or more of sucrose esters, polysorbates (tween), polyglycol esters, sodium stearyl lactylate (SSL), lecithin, lecithin derivatives, glycerol monostearate (GMS), polyoxyethylene sorbitan monostearate, polyoxyethylene sorbitan monooleate, ryoto polyglycerol ester, ethoxylated monoglycerides, glyceryl esters, polyethylene glycol 400 monostearate, polyoxyethylene-4-sorbitan monolaurate, polyoxyethylene-20-sorbitan monopalmitate, polyoxyethylene-40-stearate, sodium oleate, sodium lauryl sulphate.
9. An acid miscible cream liqueur as claimed in any preceding claim, wherein the fat is selected from the group comprising one or more of milk fat, butter fat, butter oil, vegetable fat and animal fat.
10. An acid miscible cream liqueur as claimed in any preceding claim further comprising a polysaccharide.
11. An acid miscible cream liqueur as claimed in claim 10 wherein the polysaccharide is selected from the group comprising one or more of high ester pectins, carboxymethylcellulose, microcrystalline cellulose, propylene glycol alginate, xanthan gum, kappa carrageenan, and iota carrageenan.
12. A floatable acid miscible cream liqueur comprising the acid miscible cream liqueur as claimed in any preceding claim and a fluid gelling agent.
13. A floatable acid miscible cream liqueur as claimed in claim 12 wherein the fluid

gelling agent is a hydrocolloid gelling agent.

14. A floatable acid miscible cream liqueur as claimed in claims 12 or 13 wherein the fluid gelling agent is selected from the group comprising one or more of gellan gum, pectin, agarose, carrageenan, agar, locust bean gum and alginate.
15. An acidic cream liqueur comprising the acid miscible cream liqueur as claimed in any of claims 1 to 11 and an acidic liquid.
16. An floatable acidic cream liqueur comprising the floatable acid miscible cream liqueur as claimed in any of claims 12 to 14 and an acidic liquid.
17. An acidic cream liqueur as claimed in claims 15 or 16 wherein the acidic liquid comprises one or more of a fruit juice and a food grade acid.
18. A carbonated cream liqueur comprising the acid miscible cream liqueur, as claimed in claims 1 to 14 and carbon dioxide.
19. A carbonated acidic cream liqueur comprising the acidic cream liqueur as claimed in claims 15 to 17 and carbon dioxide.
20. A carbonated cream liqueur comprising the acid miscible cream liqueur as claimed in claims 1 to 14 and a carbonated beverage.
21. A carbonated acidic cream liqueur comprising the acidic cream liqueur as claimed in claims 15 to 17 and a carbonated beverage.
22. A process for preparing an acid miscible cream liqueur:

the process comprising:

mixing a fat, a stabilising emulsifier, an acid stable protein and water to form a protein fat mix;

heating the protein fat mix;

adding alcohol to the protein fat mix;

homogenising the alcohol and the protein fat mix to form the acid miscible cream liqueur;

cooling the liqueur; and

shearing the liqueur either during or after cooling of the acid miscible cream liqueur.

23. A process for preparing an acid miscible cream liqueur as claimed in claim 22; the process further comprising:

prior to mixing the acid stable protein and water with the fat and stabilising emulsifier, carrying out the steps of:

premixing the acid stable protein and water; and

heating the acid stable protein and water to form a hydrated protein mix.

24. A process for preparing an acid miscible cream liqueur as claimed in claim 22; the process further comprising:

prior to mixing the acid stable protein with the fat, stabilising emulsifier and water, carrying out the steps of:

premixing the fat, stabilising emulsifier and water together to form a fat mix; and

heating the fat mix.

25. A process for preparing an acid miscible cream liqueur as claimed in any of

claims 22 to 24 in which the liqueur is cooled rapidly after homogenising.

26. A process for preparing a floatable acid miscible cream liqueur comprising:

preparing the acid miscible cream liqueur by the process as claimed in any of claims 22 to 25, wherein the process further comprises:

adding a fluid gelling agent to the acid miscible cream liqueur;

cooling the acid miscible cream liqueur to a temperature below the fluid gelling agent setting point; and

shearing the acid miscible cream liqueur during or after cooling of the cream liqueur.

27. A process for preparing an acidic cream liqueur comprising:

preparing an acid miscible cream liqueur by the process as claimed in any of claims 22 to 25; and

carrying out the additional step of adding an acidic liquid to the protein fat mix prior to homogenising the protein fat mix and the alcohol.

28. A process for preparing a floatable acidic cream liqueur comprising:

preparing a floatable acid miscible cream liqueur by the process as claimed in claim 26; and

carrying out the additional step of adding an acidic liquid to the protein fat mix prior to homogenising the protein fat mix and the alcohol.

29. A process for preparing an acidic cream liqueur comprising:

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preparing an acid miscible cream liqueur by the process as claimed in any of claims 22 to 26;

mixing an acidic liquid with the acid miscible cream liqueur to form a mixture;

homogenising the mixture to form the acidic cream liqueur; and

cooling the acidic cream liqueur.