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A PROCESS FOR THE PRODUCTION OF A
REDUCED FAT PEANUT BUTTER PRODUCT AND THE PRODUCT THEREFROM

Technical Background

This invention relates to a process for producing reduced fat peanut butter products with flavor, texture and appearance comparable to full fat peanut butter products and the products therefrom. A peanut butter product is produced by a continuous process, within a relatively short time period, resulting in a reduced fat peanut butter which exhibits the flavor, texture and appearance of conventional peanut butter.

Background of the Invention

Peanut butter is a popular, highly nutritious food prepared by shelling, roasting and preferably, blanching peanuts before grinding them to a uniform creamy consistency. Certain optional ingredients are generally added to the ground peanuts, such as sweeteners, salt and hydrogenated vegetable oil. The hydrogenated vegetable oil is a stabilizer added to most

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Commercial peanut butters to prevent separation of an oil phase. Such peanut butter products require the additional processing steps of mixing the finely ground peanuts while hot with the stabilizer and the sugar and salt, if added, and then cooling the mixture by passing it through a heat exchanger to obtain a material which solidifies shortly after filling into jars to the typical peanut butter consistency.

To be labeled "peanut butter" under the applicable regulations of the Food and Drug Administration, the peanut ingredients must comprise at least 90% by weight of the finished product as promulgated in 21 CFR §164.150. If more than 10% of the peanut product comprises non-peanut ingredients, then the product is termed a "peanut spread" as promulgated in 21 CFR §102.23(a) so long as it meets all the conditions set forth in 21 CFR §102.23(b) which requires peanut spread to be nutritionally equivalent to peanut butter. Under 21 CFR §102.23(b), if the peanut spread is nutritionally inferior to peanut butter, then it must be labeled an "imitation peanut butter". A further description of peanut butter includes "crunchy" peanut butter, which contains substantial quantities of peanut fragments. Additionally, when only peanuts, sugar and salt are used, the peanut butter is generally designated as a "natural" or "old fashioned" peanut butter. However, the term "peanut butter product" as used herein is intended to include any peanut butters, peanut spreads, and imitation peanut butters, whether of the creamy, crunchy, old fashioned or natural varieties, and is not meant to be limited in any manner by regulatory definitions.



Although peanut butter is a highly nutritious food which contains high levels of protein, it also contains relatively large quantities of fat and is high in calories. This presents a dilemma to those people who are trying to watch their daily intake of fat and calories. Therefore, it would be advantageous to have available a peanut butter product which has a reduced caloric value, yet still exhibits taste and texture characteristics which appeal to and are acceptable to consumers.

Various attempts have been made to reduce the caloric and/or fat level in peanut butter products. In U.S. Patent No. 4,828,868 to Lasdon et al., a low calorie, low fat peanut butter-like product is disclosed which comprises milling unroasted, defatted peanut flour in water to a smooth, free-flowing consistency and then cooking it at a temperature of at least 175°F. The resulting product has a water content of from 45 to 55% and a fat content of from 1 to 25%.

In U.S. Patent No. 4,814,195 to Yokoyama et al., a reduced calorie peanut butter product is disclosed which contains from about 15 to 40% by weight of a solid bulking agent having from about 0 to about 3 calories per gram and an oil binding capacity from about 20 to 45%. Preferred solid bulking agents are polydextrose and microcrystalline cellulose.

A process for the production of a nut paste from oil seeds, preferably from peanut oil seeds, is disclosed in U.S. Patent No. 5,079,027. The nut butter spread has a Casson plastic



viscosity value of less than 23 poise and comprises from 25 to 55% peanut oil or other fat component and from 40 to 67% solid nut particles. The nut paste is produced by a process which obtains the desired particle size distribution by using a roll milling process to grind defatted peanut paste, followed by a separate smearing step.

Another process for the production for a reduced fat nut or oilseed butter composition is disclosed in U.S. Patent No. 5,230,919. The resulting composition has a Casson plastic viscosity of between 1 and 15 poise and a yield value below 300 dynes/cm². Also disclosed is the whipping of the butter composition to contain dispersed gas bubbles.

Although the previous attempts to produce a low fat peanut butter product have resulted in products which exhibit the consistency of conventional peanut butter with reduced fat or calorie content, the flavor of these products leaves much to be desired. The present invention produces a product which is not only low in fat, but which can be continuously processed in a shorter time and which exhibits texture, appearance and flavor characteristics similar to conventional, full fat peanut butter products.

Summary of the Invention

The present invention relates to an innovative process for the production of a reduced fat peanut butter product and the



product resulting therefrom. The process allows for continuous processing in a relatively short period of time and produces a product which exhibits texture, flavor and appearance characteristics comparable to conventional full fat products. The product comprises the replacement of some of the peanut component of conventional peanut butter, with a bulking agent with a required particle size distribution. Additionally, the present invention provides a continuous process which incorporates a high shear device to incorporate the bulking agent into the full fat component to ensure the desired texture. The use of the high shear device allows for full fat roasted peanuts to be used in conjunction with a large percentage of bulking agent, up to 50% by weight of the product, within the specified particle size distribution range, while maintaining desired characteristics in the final product.

Detailed Description

The present invention relates to a continuous process for producing a reduced fat peanut butter product which incorporates a relatively high percentage of bulking agent. Specifically from about 20 to about 50% by weight of the final product is comprised of a bulking agent. The method requires the use of a high shear device to incorporate the bulking agent into the full fat peanut composition. This is contrary to known methods to produce reduced fat products which requires the removal, by pressing or other means, of the oil from the roasted peanut composition.



The bulking agent can be incorporated into the product at relatively high levels, from about 15 to about 50% by weight of the final composition, because of two critical factors: the required particle size distribution of the bulking agent, and the use of a high shear device to process the product. In order to produce a reduced fat peanut butter product which comprises as much as 50% by weight bulking agent, at least about 95% by weight of the bulking agent particles must be less than 50 microns, with at least about 99% of the particles exhibiting a particle size of less than 75 microns. Furthermore, the average particle size of the bulking agent must be from about 20 to about 30 microns. The bulking agent is present in an amount of from about 15 to about 50% by weight, with a preferred range of from about 25 to about 40% by weight. The bulking agent to be incorporated may initially have a larger particle size distribution, and would then have to be milled to the required size prior to addition to the peanut butter. Milling may also be done after the large particle bulking agent is added to the peanut paste in order to achieve a small particle size distribution in the final product. By adhering to this critical requirement, a gritty texture in the final product is prevented, and a texture similar to conventional, full fat peanut butter is reduced.

The bulking agents, which can be non-nutritive or nutritional, and which preferably are low in calories, add body and texture to the product, while replacing peanuts, which are high in fat. Any available bulking agent which meets the required particle size distribution can be used, such as for



example, polydextrose, maltodextrin, corn syrup solids, microcrystalline cellulose and combinations thereof. In the preferred embodiment of the present invention, maltodextrin is used as the bulking agent.

The second critical aspect of the present invention also relates to the bulking agent, and is the use of a high shear device to incorporate the bulking agent into the full fat component. A number of high shear devices such as high shear mixers, extruders, both single and twin screw, and extruder mixers would be appropriate for use. The preferred high shear device is a high shear mixer, particularly a Littleford mixer (Littleford, Florence, Kentucky). This mixer performs the extremely important function of incorporating the bulking agent to the full fat ground roasted peanut component. Additionally, the mixer sufficiently reduces the viscosity of the dough-like mass formed when the bulking agent is added to the peanut component to allow pumping of the admixture. The Littleford mixer is especially suited for this purpose as it allows for an economical means of continuously mixing the bulking agent particles into the ground roasted peanut slurry admixture stream. The particular design of this mixer's shearing mechanism allows for the ability to vary the number, configuration and speed of the mixing blades to react to formulation variations.

The peanut component of the present invention comprises from about 40 to about 70% by weight, with a preferred range of from 50 to from 65% by weight. As peanuts are comprised of about



52% fat or oil with the remainder being peanut solids, then from about 20.8% to about 36.4% of the product is oil and from about 19.2 to about 34.6% is peanut solids. The peanuts are processed by milling the peanuts to a very fine texture. By milling the peanuts, sufficient oil is released as free oil. The free oil is important as it encapsulates the individual bulky agent particles,, and thereby enables them to slide past each other and create a smooth, peanut butter like consistency. Since there is a limited amount of free oil which is available from the milled peanuts, this dictates the criticality of the particle size distribution of the bulking agent. Too fine a particle size would result in too large of a surface area of bulking agent particles and would exceed the amount of oil available to coat them.

As peanuts are also the source of protein in the final product, reduction in the level of peanuts reduces the quantity of protein in the final product. Protein can be added to the reduced fat product to obtain the desired level of protein in the final product, by incorporating a protein supplement in the formulation. Any known protein supplement can be used. Examples of such supplements are soy protein, whey protein, egg white solids, caseinates and combinations thereof. The protein can be added at levels of from about 0.5 to about 10% by weight to obtain the desired level of protein in the final product.

The reduced fat peanut butter product can also incorporate various other ingredients, such as stabilizers,



flavorants and emulsifiers. Stabilizers can be any of the known peanut butter stabilizers, for example, hydrogenated vegetable oil, or other hydrogenated triglycerides, and can be incorporated at levels of from about 0.5 to about 2.0% by weight.

Emulsifiers can also be added to the reduced fat peanut butter product, and should also be added at levels of from about 0.5 to 2.0% by weight. Any known food compatible emulsifiers are acceptable, such as mono-diglycerides, sucrose monoesters, polyglycerol esters, polyethoxylated glycols, sorbitan esters, lecithin and combinations thereof.

The reduced fat peanut butter of the present invention optionally includes from about 0.5 to about 20% flavorants. The term flavorants as defined herein, includes any component which contributes to or enhances the flavor of the peanut butter. Flavorants therefore include sweeteners, whether natural or artificial, flavor enhancers and flavors. Sweeteners which may be incorporated include sugars, artificial sweeteners, and other naturally sweet materials. Included in this are sucrose, fructose, dextrose, high fructose corn syrup, honey, molasses, lactose, maltose, maltose syrups, aspartame, cyclamates, saccharine and acesulfame K. The amount of added sweetener will vary within the range depending upon the sweetener chosen. Obviously, a much lower amount of an artificial sweetener is needed than a natural sweetener to obtain an equivalent level of sweetness. Other flavor enhancers which can be added include



salt and salt substitutes, such as potassium chloride, sodium chloride/potassium chloride mixtures, and seasoned salts.

If the reduced fat peanut butter to be produced is a chunky product, instead of a creamy product, nut chunks (full fat or partially defatted) can also be added to the product, but would be added after milling of the roasted peanuts is completed.

The process of the present invention provides for a multiple stage milling procedure for the roasted peanuts and then admixing the milled roasted peanuts with a bulking agent in a high shear device. Specifically, roasted peanuts are first milled to produce a coarse, ground roasted peanut slurry. To this slurry is then added flavorants and stabilizers. The coarsely ground slurry is then subjected to additional milling in order to produce finely milled peanut particles, specifically with an average particle size distribution of from about 5 to about 50 microns, preferably about 10 to about 25 microns. It has been found that having two sets of mills for the ground peanut slurry to pass through, or passing it through the same mills twice, will result in a product which exhibits the desired characteristics.

After the ground roasted peanut slurry has been milled to the desired particle size, it proceeds to a high shear device, preferably a high shear mixer, where it is combined with the bulking agents and emulsifiers. This is preferably done on a continuous basis, although it can be done in batches, and it is



in the high shear mixer that the bulking agent is sufficiently incorporated into the full fat component so as to produce a reduced fat product with an exceptional texture and appearance. Specifically, the free oil which was released from the peanuts during milling, encapsulates the bulking agent particles enabling them to slide over one another and produce a smooth, creamy peanut butter product.

During the mixing of the bulking agent, emulsifiers if any, are added to the full fat ground peanut component, the temperature of the product in the high shear mixer is maintained at a level of from about 140° to 200°F preferably about 160° to 180°F. The residence time in the high shear mixer is from about 15 to about 30 minutes. If an alternate high shear device is used, the residence time will vary depending on the apparatus. After the mixing has been completed, the product is then de-aerated prior to being cooled down to a temperature of from 85° to about 100°F before proceeding to the filler or packaging line.

The following examples are meant to be illustrative and are not meant to be limiting in any manner.

Example

128 lbs. peanuts (51.5% fat, 30.8% protein) were coarsely ground into a paste. The paste was combined with 15 lbs. flavorants and 1.7 lbs. hydrogenated vegetable oil. The



resultant slurry was then passed twice through Urschel mills (Urschel, Valpiriezo, Indiana), 206 mill heads. The exit temperature of the slurry was 160°F. At this point, the slurry contained approximately 47% fat and 27% protein.

145 lbs. of the slurry were fed to a Littleford mixer, to which 48 lbs. of maltodextrin, 15 lbs. protein and 2 lbs. emulsifier were added. At this point the slurry contained approximately 33% fat. All the ingredients were fed to the Littleford mixer while simultaneously discharging product from the mixer at the same rate to result in continuous mode of operation; approximately 210 lbs./min. The temperature of the product leaving the mixer after steady state was achieved was 164°F. The product was de-aerated in a vacuum vessel and cooled down in a scrape surface heat exchanger to 95°F and then filled into jars.

The resultant low fat peanut butter product was smooth, and creamy with a flavor similar to conventional full fat peanut butter.





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We claim:

1. A process for the production of a reduced fat peanut butter product which comprises:
 - a) coarse milling the roasted peanuts;
 - b) fine milling the ground roasted peanuts to a particle size of from about 5 to about 50 microns;
 - c) admixing a bulking agent with the finely milled ground roasted peanuts in a high shear device, wherein at least 95% of the bulking agent has a particle size less than 50 microns; and
 - d) cooling and packing the product.
2. The process of claim 1 wherein the fine milling of the ground roasted peanuts comprises two separate milling steps.
3. The process of claim 1 wherein the high shear device is a high shear mixer.
4. The process of claim 1 wherein the high shear device is an extruder.
5. The process of claim 1 which further comprises the addition of stabilizers and flavorants after coarse grinding the roasted peanuts in step a).
6. The process of claim 1 wherein the process is continuous.

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7. The product of the process of claim 1.
8. A reduced fat peanut butter product comprising:
 - a) from about 40 to about 70% by weight ground roasted peanuts;
 - b) from about 15 to about 50% by weight bulking agent;
 - c) from about 0.5 to about 20% by weight flavorants;
 - d) from about 0.5 to about 2.0% by weight stabilizers; and
 - e) from about 0.5 to about 2.0% by weight emulsifierswherein at least about 95% by weight of the bulking agent has a particle size less than 50 microns and at least about 99% of the bulking agent has a particles size less than 75 microns.
9. A product according to claim 8 wherein the average particle size of the bulking agent is from about 20 to about 30 microns.
10. A product according to claim 8 which further comprises from about 0.5 to about 10% by weight protein supplement.
11. A product according to claim 8 wherein the bulking agent is chosen from the group consisting of maltodextrin, polydextrose, corn syrup solids, microcrystalline cellulose, and combinations thereof.
12. A product according to claim 8 wherein the bulking agent is maltodextrin.





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13. A product according to claim 8 which further consists of vitamin supplements, mineral supplements, or combinations thereof.
14. A product according to claim 8 which comprises from about 50 to about 65% by weight ground roasted peanuts.
15. A product according to claim 8 wherein the ground roasted peanuts have an average particles size of from about 5 to about 50 microns.
16. A product according to claim 15 wherein the ground roasted peanuts have a particle size of from about 10 to about 25 microns.

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