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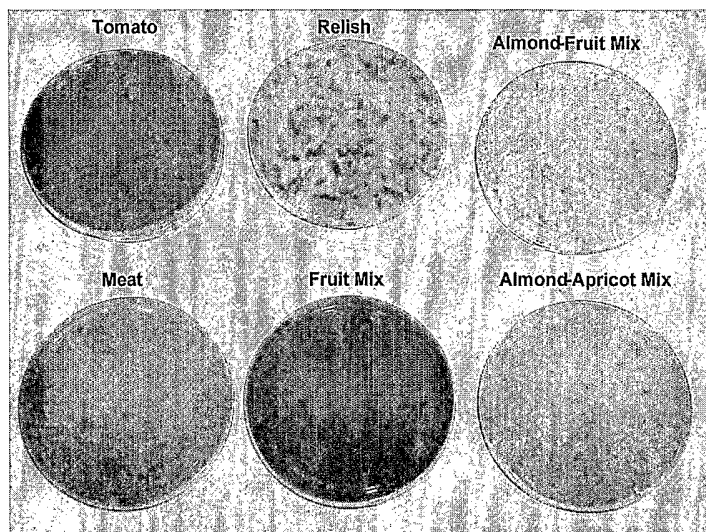
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(54) Title: FOOD PRODUCT AND METHOD FOR PREPARING SAME

Figure 1: Illustrative Product Formulations



(57) Abstract: The present invention provides a food product comprising a food ingredient dispersed in a matrix, the matrix comprising a xanthan gum and locust bean gum, and optionally, an edible oil. The present invention also provides methods of producing a food product as described herein.



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FOOD PRODUCT AND METHOD FOR PREPARING SAME**1. RELATED APPLICATIONS**

[0001] This application claims the benefit of U.S. provisional application No. 60/587,123, filed July 13, 2004, which is incorporated herein by reference in its entirety.

2. FIELD OF THE INVENTION

[0002] The present invention relates to the area of food products, more particularly to a food product comprising food ingredients dispersed in a gum matrix and methods of producing such food products.

3. BACKGROUND

[0003] Convenience, ease of preparation, low cost, appealing flavor, and nutritional value are desirable attributes of foods for consumers and manufacturers alike. The increasing body of knowledge linking diet and health has fueled a trend in the food industry for the production of more healthful food products. At the same time, consumers' busy lifestyles and strong desires to enjoy the foods they eat dictate that such healthful foods offer convenience and ease of preparation while not sacrificing the multitude of organoleptic properties people have come to associate with the foods they enjoy eating. Thus, to appeal to consumers, food manufacturers strive to provide healthful, flavorful, satisfying foods in a convenient, inexpensive format offering the portability and ease of preparation necessary to fit into today's fast-paced lifestyles.

[0004] Traditional thinking in the arts of food and nutrition has defined a healthy diet to include a variety of food types, including fruits, vegetables, grains, dairy, meats, fish, eggs, and nuts. Such thinking has also indicated that fats and sweets be incorporated no more than sparingly in the diet. Alarming, despite these recommendations, as well as the ever-increasing body of knowledge linking diet and health, a large proportion of the population fails to eat healthy due to the failure to eat enough wholesome foods, the overconsumption of junk foods, or a combination of the two. The chief considerations of those who disregard the dietary recommendations of health specialists are often related to issues of personal enjoyment and convenience.

[0005] Most if not all individuals look to the diet not merely as sustenance, but as a source of enjoyment. Those who do not enjoy the organoleptic properties of a given food will naturally be averse to eating that food. In the case of natural healthy foods, such as fruits and vegetables, such an aversion inevitably results in poor nutrition. Recognizing

this, the food industry has developed a wide array of processed foods that attempt to incorporate the nutrients lacking in diets failing to incorporate sufficient levels of naturally wholesome foods. Such products, in turn, may or may not be acceptable to consumers' liking, and it has long been recognized in the industry that the nutritional value of such foods is typically counterbalanced with the level of consumer acceptance of their organoleptic properties. Accordingly, it is widely accepted as a challenge to create a wholesome food product that will be liked by consumers.

[0006] An additional concern highlighted by the issue of consumers' desire to enjoy the foods they eat conversely involves the overeating of pleasurable foods. The detrimental health effects attendant to this problem are often exacerbated by the fact that enjoyable organoleptic properties are typically associated with foods rich in fat, sugar, and caloric content. Public health officials have recently chastised food manufacturers and eating establishments for contributing to the problem of obesity by implicitly encouraging consumers to overeat through their offering of excessively large portion sizes. Thus, portion control is now a hot button issue for manufacturers, retailers, and consumers alike. In a personal setting, portion control represents an important issue for regulating caloric intake. In a food service setting, cost factors are implicated as well as nutrition. Specifically, restaurants and cafeterias must balance the cost of ingredients with the expense of the extra manual labor or equipment required to ensure uniformity in apportioning ingredients between units of a food item. Additionally, many establishments face increasing pressure from the public to declare the nutritional content of their meals, again stressing the importance of accurate and uniform portion control.

[0007] With respect to the issue of convenience, many feel the stress of increasingly busy lifestyles and thus demand foods that require a minimal amount of preparatory work and time, can largely be prepared in advance of the time of consumption, are sufficiently portable to allow for eating "on the run", and are sufficiently inexpensive that they can be purchased regularly without overextending consumers' budgets. Unfortunately, many of the means to incorporate numerous naturally wholesome foods in the diet run afoul of one or more of these criteria. For example, although fresh vegetables are very nutritious, incorporating them in meals requires time and labor for preparative steps such as cleaning and cutting. As many enjoy the flavor of a mixture of vegetables and spices, preparative steps are required for each of a number of different vegetables to be used in a meal. Moreover, depending on the way in which they are consumed, fresh vegetables can pose problems when meals are prepared in advance as, for example, when they are used in sandwiches, where water inherent in the vegetables can soak through breads and/or other

vegetables and impart an unappealing soggy texture to the sandwich. Also with respect to the issue of advanced preparation, as fresh vegetables are perishable items, it is important to prepare them as close to the time of consumption as possible to avoid detrimental effects to their organoleptic properties as well as microbial contamination. Lack of portability can become an issue because of the high water content of fresh vegetables, which often dictates the use of special containers to avoid leakage, preserve flavor and texture, and avoid contamination. Notably, as flavor and texture can be lost over time not only via oxidation and contamination but also by being overpowered and "wetted out" by the presence of other vegetables, it is often necessary to maintain such incompatible ingredients separately until the time of consumption, thus necessitating multiple storage containers and further hindering portability. Also, in the case of hand-held foods, high moisture ingredients such as cut vegetables create leakage problems during eating giving rise to messes and the potential for stains. Finally, although most fresh vegetables are not necessarily expensive, as noted above the potential problems of spoilage of the vegetables themselves and microbiological and/or organoleptic ruining of food items in which they are incorporated can result in a considerable amount of wasted food and thus have potentially substantial cost implications. The need for packaging materials, whether disposable or reusable, sufficient to allow meal portability while avoiding such problems also poses significant cost considerations.

[0008] The issues of convenience and personal enjoyment are both implicated in the effects of the globalization of society upon dietary preferences. Specifically, with the global availability of information via the Internet as well as the migration of individuals representing a wide variety of ethnic groups to numerous countries, people are constantly exposed to new cuisines, yet busy lifestyles keep many from the kitchen. The result is a population that is exposed to a wider variety of dishes than ever before yet knows relatively little about how to prepare such foods and/or has little if any time to do so. Also, as the flavors of many of these cultural dishes reflect numerous unique combinations of routine and/or exotic ingredients, many such meals are difficult to prepare correctly. In response to these needs, many food manufacturers have formulated a variety of products in an attempt to incorporate an ethnic flair in traditional meals. Condiments accessorize a multitude of dishes and thus represent the most widespread avenue to introduce exotic tastes in the diet.

[0009] Condiments obviate much of the preparative time and labor required for the incorporation of natural healthy foods in the diet and many of these provide unique ethnic flavors by combining a variety of ingredients in a prepared format for the consumer. However, many of these products incorporate large amounts of fat and/or sugar, have low

"nutrient values," fail to assist consumers in the area of portion control, and are somewhat expensive. Additionally, as these products generally have high moisture contents, they suffer from many of the same problems as a number of fresh vegetables, namely the soaking through of breads and potential microbiological contamination that hinder advanced meal preparation and the problems of leakage during storage and eating that inhibit portability. Although condiments can be packaged in single-serving portions that obviate many of these problems, such products are typically only available in food service settings and incorporate large amounts of plastic packaging that gives rise to cost and environmental issues.

[0010] The following patent documents attempt to address some issues discussed above.

[0011] U.S. Patent No. 5,858,426 to Bienvenu discloses a meltable food product containing seasonings embedded in a matrix and useful for applying seasoning mixtures to foods. The seasonings are embedded in the matrix near its surface, and are applied to a food product via melting of the matrix to form a gravy or sauce.

[0012] U.S. Patent Nos. 5,681,602 and 5,894,028 to Alden *et al.* disclose preformed pizza topping disks useful for decreasing time and labor in assembling pizzas. Alden *et al.* incorporates a layer of pizza sauce in the disk in addition to the cheese and toppings. This is accomplished by the use of a thermoreversible gelling agent in the pizza sauce such that it is at least partially congealed at room temperature, allowing the disk to be cast and mechanically manipulated without tearing, while at elevated temperatures the congealed pizza sauce layer melts to a fluid consistency typical of pizza sauce.

[0013] U.S. Patent Nos. 5,009,867 and 5,063,073 to Kratochvil disclose a variety of food products comprising one or more foods dispersed in a matrix of gelatin and kappa carrageenan. The food may be meat, seafood, vegetable, fruit, synthetic protein fiber, chocolate, or a mixture thereof, and the products include sauces and sliced products. The matrix is structurally firm at room temperature, and individually wrapped slices are prepared by filling a packaging tube with the product mixture at around 155 F, and passing the tube through rollers to seal the packaging about the slices. The matrix of gelatin and kappa carrageenan disclosed in the Kratochvil patents has a very high gel strength, which poses some distinct disadvantages for its use in food products. First, the presence of carrageenan in the matrix and the attendant high degree of gel strength results in a high level of flavor binding by the matrix, thus reducing the perceived flavor of food particles entrained within the matrix. In many instances, this results in a product that is blander than intended, giving rise to the need to add additional flavor to compensate for losses due to binding by the matrix. Second, the high gel strength of the matrix also results in a product

that suffers large textural changes during freeze-thaw cycles, resulting in decreased consumer acceptance and increased waste. Both of these issues have cost implications. Furthermore, as gelatin is an animal product, issues arise concerning religious certifications such as Kosher and Halal.

[0014] Accordingly, there remains a strong need in the art for nutritious foods that are organoleptically pleasing and are sufficiently convenient and cost-effective as to encourage healthy dietary choices in a modern, fast-paced society.

4. SUMMARY

[0015] In one aspect, the present invention provides food products comprising food ingredients dispersed in a gum matrix. In some embodiments, the present invention provides a food product comprising a food ingredient dispersed in a matrix, wherein the matrix comprises xanthan gum and locust bean gum.

[0016] In certain embodiments, the matrix comprises about 0.1% to about 20% xanthan gum by weight of the food product and about 0.1% to about 20% locust bean gum by weight of the food product. In certain embodiments, the matrix comprises about 0.5% to about 1% xanthan gum by weight of the food product and about 0.5% to about 1% locust bean gum by weight of the food product.

[0017] In some embodiments, the food product of the present invention further comprises an edible oil. Typically, the edible oil can comprise about 0.25% to about 25% by weight of the food product. In certain embodiments, the edible oil comprises about 1% to about 5% by weight of the food product.

[0018] In certain embodiments, the present invention provides a food product comprising a matrix, the matrix comprising about 0.5% to about 1% xanthan gum by weight of the food product and about 0.5% to about 1% locust bean gum by weight of the food product; an edible oil, the edible oil comprising about 1% to about 5% by weight of the food product; and a food ingredient dispersed in the matrix.

[0019] In another aspect, methods for producing a food product of the invention are provided. In particular, the present invention provides a method for producing a food product comprising mixing a food ingredient with xanthan gum, locust bean gum, and, optionally, an edible oil, thereby forming the food product.

[0020] In certain embodiments, the food ingredient is mixed with xanthan gum, locust bean gum, and, optionally, an edible oil, at an elevated temperature. In certain embodiments, the elevated temperature is between about 175 °F to about 195 °F. In some

embodiments, the elevated temperature is about 180 °F to about 190 °F. In some embodiments, the elevated temperature is about 185 °F.

[0021] In certain embodiments, the present invention provides a method for producing a food product comprising mixing xanthan gum, locust bean gum, and, optionally, an edible oil, to form a gum mixture, and mixing a food ingredient with the gum mixture at an elevated temperature.

[0022] Typically, the food ingredient can be mixed with the gum mixture for a time sufficient to hydrate the xanthan gum and locust bean gum.

[0023] In certain embodiments, the methods provided further comprise cooling the food product.

[0024] In certain embodiments, the methods provided further comprise forming the food product by a process selected from the group consisting of molding, pressing, and extrusion.

[0025] In some embodiments of the methods provided, the food ingredient is a solid food ingredient.

[0026] Typically, a solid food ingredient can be sized to be no larger than about 2 mm on an edge or in diameter before mixing with xanthan gum, locust bean gum and, optionally, an edible oil in the methods described herein.

[0027] In certain embodiments of the methods provided, the food ingredient comprises liquid and solids, wherein the solids content is about 15° Brix, about 20° Brix, about 25° Brix, about 30° Brix, about 40° Brix, about 50° Brix, or about 60° Brix.

[0028] In certain embodiments the present invention provides a method for the production of the food product comprising dispersing an xanthan gum and an locust bean gum in an edible oil to form a mixed gum dispersion; mixing at least one dispersed food ingredient with the mixed gum dispersion at elevated temperature for a time sufficient to hydrate the xanthan gum and the locust bean gum; and forming the food product by a process selected from the group consisting of molding, pressing, and extrusion, wherein the food product comprises a matrix, the matrix comprising about 0.5% to about 1% xanthan gum by weight of the food product and about 0.5% to about 1% locust bean gum by weight of the food product; an edible oil, the edible oil comprising about 1% to about 5% by weight of the food product; and a food ingredient dispersed in the matrix.

5. BRIEF DESCRIPTION OF THE FIGURES

[0029] Figure 1 provides illustrative food product formulations.

[0030] Figure 2 provides an exemplary process flow diagram.

[0031] Figure 3 provides force deformation curves of an exemplary tomato based food product.

[0032] Figure 4 provides scanning electron micrographs of an exemplary tomato based food product.

6. DETAILED DESCRIPTION

[0033] The present invention provides food products comprising food ingredients dispersed in a gum matrix, and methods for manufacturing the food products. As exemplified in Section 7 below, food products provided herein are uniform in consistency, nutritious, flavorful, have advantageous thermoreversible properties, and are convenient in form for the consumer to prepare and eat. For example, a food product of the invention can be eaten in its original shape or melted on sandwiches or various other dishes. The food product can be stable to multiple cycles of freeze-thaw as evidenced by texture analysis and scanning electron microscopy measurements of the matrix of the exemplary food product described in Section 7.3. As supported by the examples in Section 7, the food products of the present invention achieve the objectives of portion control, enjoyable organoleptic properties, convenience, and cost-effectiveness.

[0034] As used herein, the term “about” refers to a value that is no more than 10% above or below the value being modified by the term. For example, the term “about 5%” means a range of from 4.5% to 5.5%.

6.1. Food Products

[0035] In certain embodiments, the present invention provides a food product comprising a food ingredient dispersed in a matrix, wherein the matrix comprises xanthan gum and locust bean gum.

[0036] The food ingredient can be solid (including, but not limited to, vegetable, pasta, fruit, nut, meat, seafood, herb, or spice or any combination thereof), liquid, (including, but not limited to, broth, fruit or vegetable juices, sauce, or paste or any combination thereof), or a combination of solid and liquid. The food ingredient can be any edible natural or synthetic food. As used herein, the term “food ingredient” does not include xanthan or locust bean gums.

[0037] In certain embodiments, the food product comprises a solid food ingredient where the solid food ingredient is in portions no longer than about 2 mm on an edge or in diameter. Larger pieces have the potential to severely disrupt matrix formation by the gums.

[0038] Without intending to be bound by any particular theory, it is believed that textural properties of certain solid food ingredients, for example, crunchy vegetables, are

retained where the size of the solid food ingredient is not substantially less than about 1 mm on an edge or in diameter. Thus, in some embodiments, where the food product comprises a solid food ingredient, the solid food ingredient is in portions of about 1 mm to about 2 mm on an edge or in diameter.

[0039] The matrix of the food product comprises a mixture of xanthan gum and locust bean gum. Depending upon the proportions of xanthan gum and locust bean gum, the matrix can be thermoreversible. In certain embodiments, the matrix is not thermoreversible.

[0040] In certain embodiments, the matrix of the food product comprises xanthan gum and locust bean gum in a ratio of about 5:1, about 2:1, about 1:1, about 1:2, or about 1:5 of xanthan gum to locust bean gum. In preferred embodiments, the matrix of the food product comprises a 1:1 mixture of xanthan gum and locust bean gum. Without intending to be bound by any particular theory, it is believed that a 1:1 mixture of the two gums provides the strongest matrices.

[0041] Xanthan gum and locust bean gum are generally available from a number of commercial sources. Particularly preferred is xanthan gum provided by Rhodia (Cranbury, NJ) during at least September of 2002 to July of 2003.

[0042] In certain embodiments, the matrix comprises about 0.1% to about 10% xanthan gum by weight of the food product and about 0.1% to about 10% locust bean gum by weight of the food product. In certain embodiments, the matrix comprises about 0.5% to about 1% xanthan gum by weight of the food product and about 0.5% to about 1% locust bean gum by weight of the food product.

[0043] In some embodiments, a food product of the present invention further comprises an edible oil. Edible oils can be, for example, corn, cottonseed, peanut, canola, olive oil, or combinations thereof, and the like.

[0044] Typically, the edible oil comprises about 0.25% to about 15% by weight of the food product. In certain embodiments, the edible oil comprises about 1% to about 5% by weight of the food product.

[0045] In certain embodiments, the food product further comprises a preservative. A food preservative can be any additive used for the preservation of edible food known to those skill in the art. For example, in certain embodiments, the food preservative is potassium sorbate.

[0046] Advantageously, the matrix of the food product described herein has a fibrous microstructure, for example, as demonstrated in Section 7.3, that provides the food product with a relatively low gel strength. These properties can impart improved freeze-thaw stability and decreased flavor binding by the matrix to the food products of the present

invention. Moreover, the relative softness of the matrix results in improved preservation of the textural integrity of dispersed solid food ingredients as perceived when the food product is in the mouth.

[0047] In certain embodiments, the food product of the present invention is penetrated with a force, expressed as grams, that is less than about 40 g, about 35 g, about 30 g, about 28 g, about 25 g, about 23 g, about 20 g, or about 18 g.

[0048] In certain preferred embodiments of the present invention, the food product is a sliced product. For example, a sliced food product can be sold individually wrapped and can be designed to be eaten alone or to accessorize sandwiches as well as a multitude of other dishes. The textural properties of the gum matrix of the present invention, as well as the compatibility of the matrix with numerous types of dispersed food ingredients, afford a wealth of versatility to the sliced food products of the present invention. Specifically, these sliced food products can incorporate an endless variety of flavors and can be sufficiently strong as to allow rolling and even folding of the product without tearing, yet the products can be spread on food substrates such as breads in a manner reminiscent of fruit preserves.

[0049] Due to the great versatility of these products, the food products described herein can be incorporated in a host of meals and snacks in numerous ways and thus represent foods that can be consumed often without imparting a sense of monotony to the diner. Such routinely consumed foods provide an excellent target for the introduction of nutrients in the diet. Accordingly, in a particularly preferred embodiment, the sliced food product comprises vegetable pieces, spices, and a tomato base dispersed in the gum matrix.

[0050] Exemplary food products are described in Section 7 below.

6.2. Methods of Manufacture

[0051] In one aspect, the present invention provides methods for producing food products described herein.

[0052] For example, in certain embodiments, the method provided comprises mixing a food ingredient with xanthan gum, locust bean gum, and, optionally, an edible oil, thereby forming the food product.

[0053] In some embodiments, the method comprises mixing or dispersing xanthan gum, locust bean gum and, optionally, an edible oil, to form a gum mixture and mixing or dispersing a food ingredient in the gum mixture.

[0054] Typically, a food ingredient is prepared into an edible form prior to mixing with the gum mixture. For example, with a solid food ingredient, the food is washed, peeled, cored, pitted, or otherwise prepared by removing undesirable or nonedible portions. In certain embodiments, the solid food ingredient can be cooked, baked, stewed, boiled, and

the like, prior to mixing with the gum mixture. In some embodiments, a solid food ingredient is minced, chopped, sliced, and the like, into pieces no longer than about 2 mm on an edge or in diameter.

[0055] Preferably, in certain embodiments where a vegetable food product is manufactured, the food ingredient comprises fresh vegetables.

[0056] In certain embodiments of the methods provided, the food ingredient is a combination of liquid and solids comprising a solids content of about 15° Brix, about 20° Brix, about 25° Brix, about 30° Brix, about 40° Brix, about 50° Brix, or about 60° Brix.

[0057] In certain embodiments, the food ingredient can be mixed directly with xanthan gum, locust bean gum and, optionally, an edible oil.

[0058] In preferred embodiments, the xanthan gum and locust bean gum and, optionally, an edible oil are mixed to form a gum mixture, and the food ingredient is mixed with gum mixture. Preferably, the xanthan and locust bean gum mixture comprises approximately 30 to 70% xanthan gum, more preferably approximately 40 to 60% xanthan gum, and most preferably approximately 50% xanthan gum.

[0059] Without intending to be bound by any particular theory or mechanism, it is believed that xanthan gum, a cold-hydrating gum, allows the food products as described herein to be prepared with relatively short thermal processing, further allowing for reduced energy expenditures during processing. This reduction in thermal processing also gives rise to improved retention of organoleptic and nutritional quality of many types of potential ingredients and expands the pool of ingredients available for incorporation in products without detracting from consumer acceptance of those products.

[0060] In general, the food ingredient can be mixed with the gum mixture at an elevated temperature. In certain embodiments, as used herein, "an elevated temperature" is a temperature from about 175 °F to about 210 °F. In some embodiments, the elevated temperature is from about 175 °F to about 195 °F. In some embodiments, the elevated temperature is from about 180 °F to about 190 °F. In some embodiments, the elevated temperature is about 185 °F.

[0061] Without intending to be bound by any particular theory or mechanism, it is believed that mixing a food ingredient and gum mixture at an elevated temperature, as defined above, allows for hydration of the gums.

[0062] In certain embodiments, the methods provided further comprise the step of molding the food product into a shape. For example, in some embodiments, the food product is poured at an elevated temperature, as defined above, into a mold.

[0063] In certain embodiments, the methods provided further comprise forming the food product by a process selected from the group consisting of molding, pressing, and extrusion.

[0064] In certain embodiments, the methods provided further comprise the step of cooling the food product. In some embodiments, the food product can be cooled to between about -5 °F to about 45 °F. In certain embodiments, the food product is cooled to room temperature. For example, the food product can be cooled for storing.

[0065] In some embodiments, the methods provided further comprise delivering the food product at an elevated temperature to an individually-wrapping slice extruder. As known to those skilled in the art, an individually-wrapping slice extruder pumps fluid inside a continuous tube of a packaging film which is passed through a series of forming belts and rollers, which flatten it to a thin, continuous sheet. A rotating hot knife cuts the sheet into individual slices that are then carried on a conveyor belt through a rapid cooling means, such as a forced-convection air tunnel.

[0066] Figure 2 provides a process flow diagram exemplifying an embodiment of the methods described herein.

[0067] In certain embodiments, the method provided further comprise packing the food product in a 1.5 mil polypropylene-EVOH film with a release agent and a sealant layer. Polypropylene acts as a moisture and oxygen barrier that maintains product quality and extends shelf life by minimizing dehydration and lipid oxidation.

[0068] For example, where a individually-wrapping slice extruder is utilized, slices wrapped in polypropylene-EVOH film as described above, can be stacked mechanically and placed on a conveyor belt to be fed to the secondary packaging using resealable bags constructed of 1 mil polyester-aluminum-2 mil linear low density polyethylene laminates. The outer laminated bag confers an additional barrier that prevents moisture loss and light-induced discoloration and protects the slices from handling damage. The convenient zip-lock seal adds reclosability and prevents dehydration of the slices after package opening. In certain embodiments, the final product is refrigerated and shipped at 40 °F.

7. EXAMPLES

7.1. Example 1: Exemplary Food Products

[0069] This example illustrates that the methods of the invention are applicable to a wide variety of food ingredients. Exemplary food products prepared include food ingredients such as vegetables, fruits, meats and nuts.

[0070] A 1:1 xanthan gum/locust bean gum mixture was prepared by mixing together xanthan gum, locust bean gum and olive oil. Food ingredients, as described in Table 1, were mixed with the gum mixture. The resulting food products comprised 1.5% gum mixture by weight of the food product and 3% olive oil by weight of the food product, and are shown in Figure 1.

TABLE 1

Exemplary Food Products	Food Ingredients in the Exemplary Food Products
Relish Product	Relish
Almond-Fruit Mix Product	40% almond, 40% fruit-mix, 20 % water
Meat Product	Beef and chicken broth
Fruit Mix Product	Mixed fruits
Almond-Apricot Mix Product	40% almond, 40% apricot preserve, 20% water

7.2. Example 2: Tomato Based Sliced Food Product

[0071] This example illustrates that the manufacture of a tomato based sliced food product.

[0072] Tomatoes were washed and cored, and the peels softened by passage through a boiling water bath. Cold water spraying followed immediately to crack the peel and to prevent overheating of the tomatoes. The peels was removed by machine. The onions and garlic cloves were skinned and washed, the tips and bases removed, and the remains were chopped to yield cubes with edges of about 2 mm. Washed green and red bell peppers were cored and chopped to yield cubes with edges of about 2 mm. Ready-to-use sweet pickles were chopped to about 2 mm edge cubes. Ingredients were refrigerated in large storage bins until further product preparation steps. Ingredient functionalities and proportion of ingredients by weight in the product as made are shown in Table 2, and an overall process flow diagram is shown in Figure 2.

Table 2: Functionality and Proportion of Ingredients by Weight in Final Product

Ingredients	% (w/w)	Functionality
Tomato mix		
Tomato	53.47	Brings fresh notes, acidity, color and sweetness
Tomato paste	10.75	Brings tomato like flavor and the attractive red color
Sweet Pickles	7.53	Gives crunchiness and sweet/sour sensation.
Red peppers	7.53	Gives crunchiness, flavor and color
Vinegar (5%)	4.30	Gives tartness and inhibits the microbial growth.
Onion	3.76	Provides distinct flavor
Olive oil	2.87	Gives flavor and acts as a dispersion medium for gums
Sugar	2.68	Enhances natural flavors

Ingredients	% (w/w)	Functionality
Green peppers	2.15	Gives crunchiness, flavor and color
Salt	2.15	Brings out natural flavors
Garlic	0.53	Adds distinct flavor
Red pepper flakes	0.16	Adds spicy-hot flavor
Cilantro	0.32	Adds aroma and color
Chili powder	0.10	Adds spicy-hot flavor
Paprika	0.21	Enhance tomato-like red color
Gum-mix		
Xanthan gum	0.72	Forms a viscoelastic thermo-reversible gel in combination with locust bean gum
Locust Bean gum	0.72	Forms an elastic, thermoreversible gel with excellent gel-forming synergy with xanthan gum
Preservative		
Potassium sorbate	0.05	Preservative to inhibit mold and yeast and aerophilic bacteria

[0073] Chopped tomatoes were fed to a steam-jacketed swept surface kettle and heated at 215 °F, with stirring, to concentrate the slurry to a constant soluble solids content of approximately 20° Brix and to improve the color by releasing lycopene from the tissue matrix. Chopped onions, garlic, and peppers were blended in the bowl of a steam-injection mixer and steam was injected for 3 minutes at 252°F to slightly soften the textures and release flavor. The objective was to inactivate the plant enzymes and soften the texture of these ingredients slightly without cooking them and/or adding a great deal of water. Approximately 3-5 minutes before the end of the tomato heating, the steamed onions, garlic, peppers, pickles, tomato paste, and minor ingredients comprising spices, salt, sugar, vinegar, and potassium sorbate, were fed into the steam-jacketed swept surface kettle, then heated and mixed to homogeneity for about 3 minutes. The mixture was cooled to 185 °F and the gums, dispersed in olive oil, were added and blended thoroughly for 5 minutes to ensure complete hydration. The total mixture was then held at 185°F to prevent gelling during subsequent handling.

[0074] Slices of the product were prepared by pouring the hot product mixture into a mold. Figure 1 provides an exemplary tomato based sliced food product.

[0075] Alternatively, individually wrapped slices can be prepared using an individually wrapped slice extruder as known in the art. To accomplish this, the product mixture is fed to the hopper of the extruder, which is held at 185 °F. The packaging machine pumps the product mixture inside a continuous tube of packaging film at about 170 °F. The tube of film filled with product passes through a series of forming belts and rollers, which flatten it to a continuous sheet with a thickness of approximately 1/10 in. A

rotating hot knife cuts the sheet into individual slices that are then carried on a conveyor belt through a forced-convection air tunnel for rapid cooling.

7.3. Example 3: Freeze-Thaw Stability of Tomato Based Sliced Product

[0076] This example illustrates that the food product of the invention is stable to multiple cycles of freeze-thaw as evidenced by texture analysis and scanning electron microscopy measurements of the matrix.

[0077] The tomato based sliced food product prepared as described in Example 2, above, was subjected to five cycles of freeze-thaw and monitored changes by texture analysis and scanning electron microscopy (SEM).

7.3.1. *Texture Analysis*

[0078] The penetration test was performed with a TA-XT2i-HR Texture Analyzer (Texture Technologies Corp., NY). The force-deformation curves for product samples that were refrigerated (no freeze-thaws) and subjected to 3 and 5 freeze-thaw cycles are shown in Figure 3, and the corresponding hardness data are presented in Table 3. From these data, overall hardness of the product as evidenced by the force required for penetration of the samples is relatively low.

[0079] The matrix of the product has a soft, spongy texture that does not interfere with the perception of the texture of incorporated particulate ingredients. Moreover, subjecting the product to five cycles of freezing and thawing results in relatively minor changes in product texture (only a 21% change relative to the refrigerated product.)

Table 3: Penetration Forces of Tomato Based Product

Tomato Based Product Treatment	Penetration Force (g)	% Change Relative to Refrigerated
Refrigerated	23	0
After 3 Freeze-Thaw Cycles	18	21
After 5 Freeze-Thaw Cycles	18	21

7.3.2. *SEM Analysis*

[0080] Figure 4 shows scanning electron micrographs of the tomato based product upon refrigeration and after one, three, and five cycles of freezing and thawing. Overall, the product matrix has a fibrous structure that accounts for the soft texture of the product matrix and is largely uninterrupted by freezing and thawing. Moisture migration and loss is minimized by this fibrous microstructure even after five freeze-thaw cycles, and the changes in structure upon freezing and thawing are limited to small, evenly dispersed holes due to

the fibrous microstructure of the product, as can be seen in the latter micrographs. Thus, the fibrous matrix microstructure accounts for the preservation of organoleptic qualities of the product even after five cycles of freezing and thawing.

[0081] All references cited herein are incorporated herein by reference in their entirety and for all purposes to the same extent as if each individual publication or patent or patent application was specifically and individually indicated to be incorporated by reference in its entirety for all purposes.

[0082] Many modifications and variations of this invention can be made without departing from its spirit and scope, as will be apparent to those skilled in the art. The specific embodiments described herein are offered by way of example only, and the invention is to be limited only by the terms of the appended claims along with the full scope of equivalents to which such claims are entitled.

WHAT IS CLAIMED:

1. A food product comprising
 - (a) a matrix, the matrix comprising about 0.5% to about 1% xanthan gum by weight of the food product and about 0.5% to about 1% locust bean gum by weight of the food product;
 - (b) an edible oil, the edible oil comprising about 1% to about 5% by weight of the food product; and
 - (c) a food ingredient dispersed in the matrix.
2. A method for the production of the food product of claim 1 comprising
 - dispersing the xanthan gum and the locust bean gum in the edible oil to form a mixed gum dispersion;
 - mixing the at least one dispersed food ingredient with the mixed gum dispersion at elevated temperature for a time sufficient to hydrate the xanthan gum and the locust bean gum; and
 - forming the food product by a process selected from the group consisting of molding, pressing, and extrusion.
3. The method of claim 2 wherein at least one dispersed food ingredient is a solid food ingredient, further comprising sizing the solid food ingredient to be no larger than about 2 mm on an edge or in diameter before mixing the solid food ingredient with the mixed gum dispersion at elevated temperature.
4. A method for the production of the food product of claim 1 comprising mixing a food ingredient, xanthan gum, locust bean gum, and, optionally, an edible oil at an elevated temperature.
5. A method for the production of the food product of claim 1 comprising
 - (a) mixing xanthan gum, locust bean gum and an edible oil to form a gum mixture;
 - (b) mixing a food ingredient with the gum mixture at an elevated temperature to form a dispersed food mixture.

6. The method of claim 4, wherein the mixing in step (b) is for a time sufficient to hydrate the xanthan gum and the locust bean gum.
7. The method of claim 4, further comprising forming the food product by a process selected from the group consisting of molding, pressing, and extrusion.
8. The method of claim 4, wherein the mixing in step (b) is at the elevated temperature of between about 175 °F to about 195 °F.
9. The method of claim 4, further comprising cooling the mixture of the dispersed food ingredient, xanthan gum, locust bean gum and edible oil.
10. The method of claim 4 the food ingredient is a solid food ingredient.
11. The method 10 further comprising sizing the solid food ingredient to be no larger than about 2 mm on an edge or in diameter before mixing as in step (b).

Figure 1: Illustrative Product Formulations

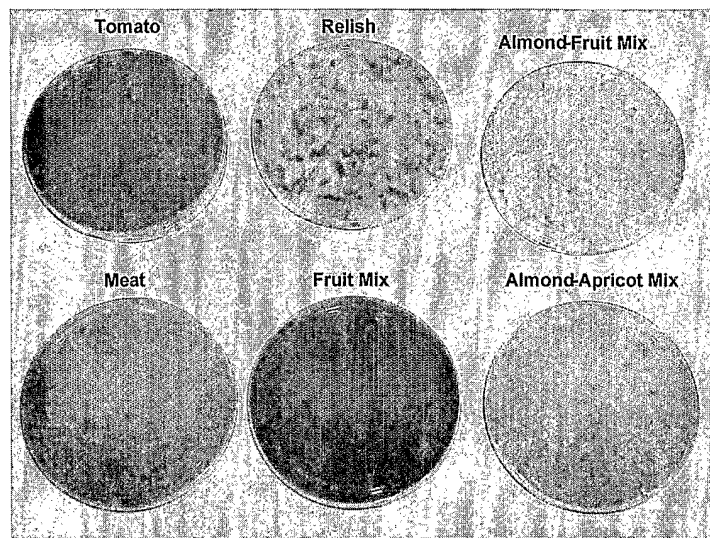


Figure 2: Overall Process Flow Diagram

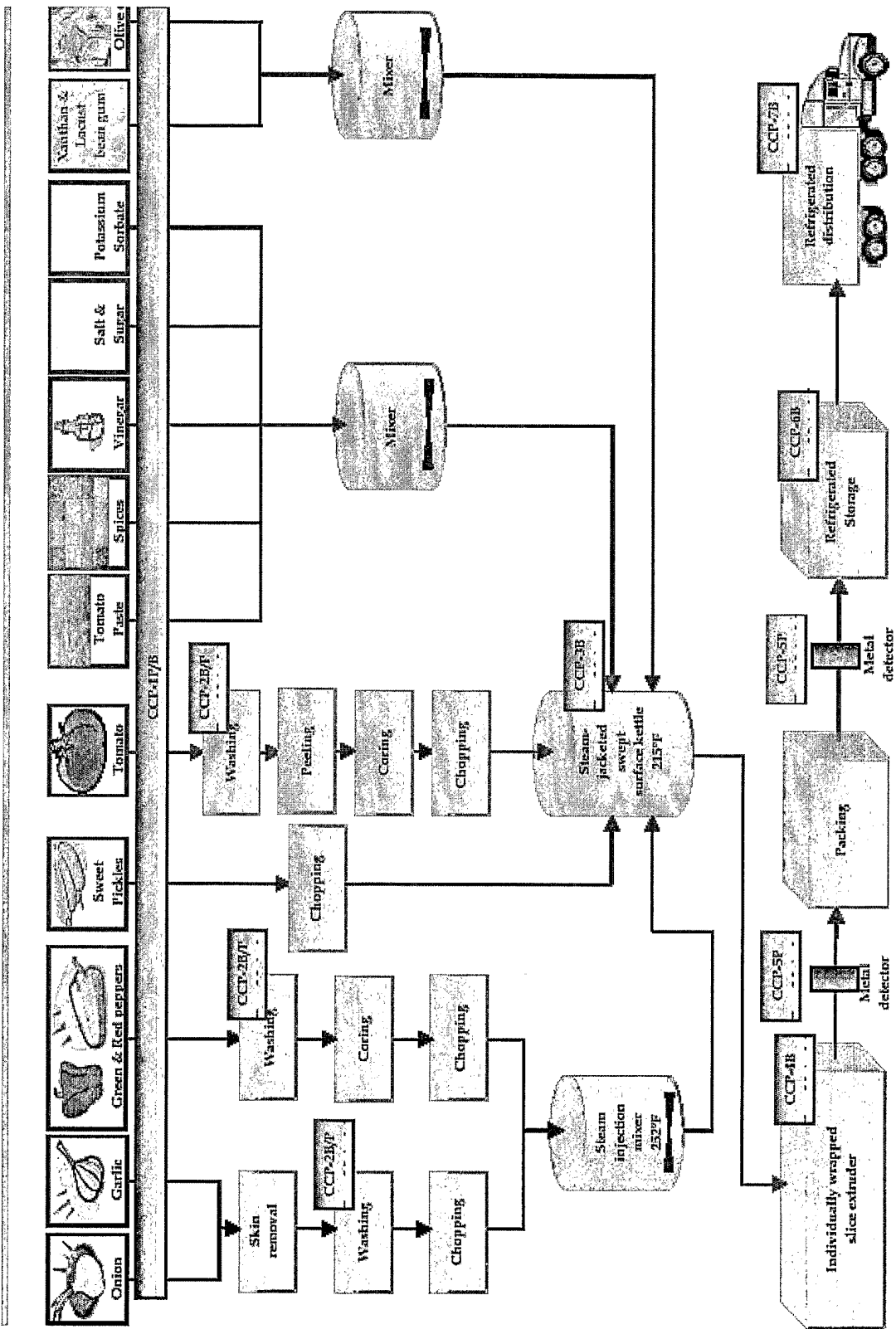


Figure 3: Force Deformation Curves of Tomato Based Product

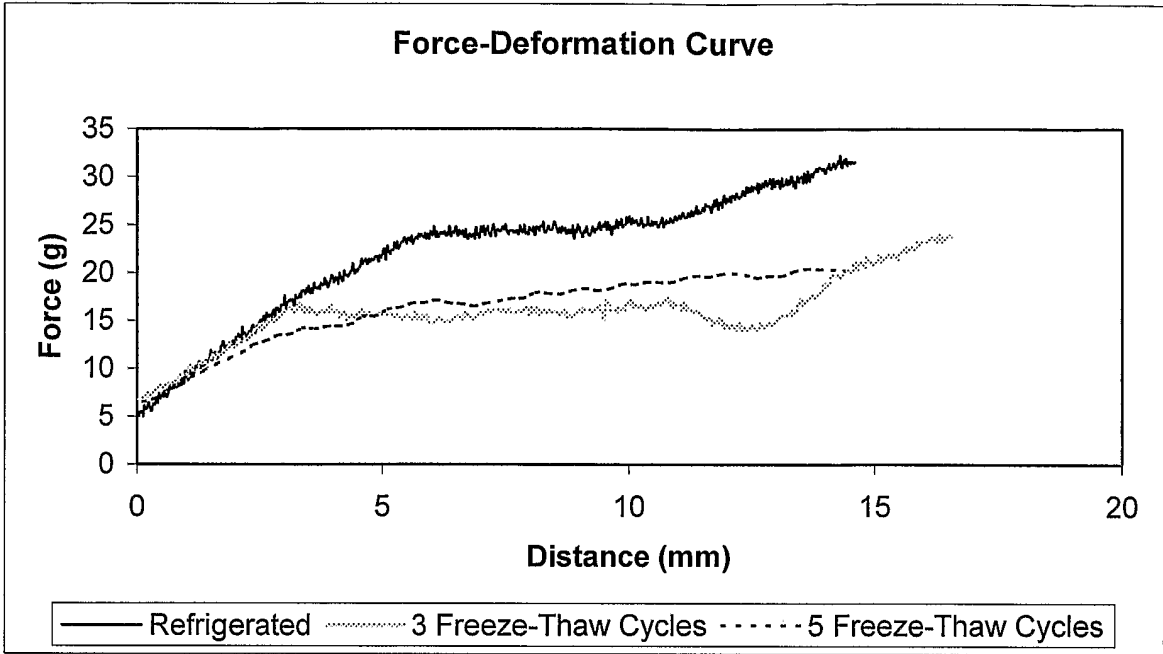
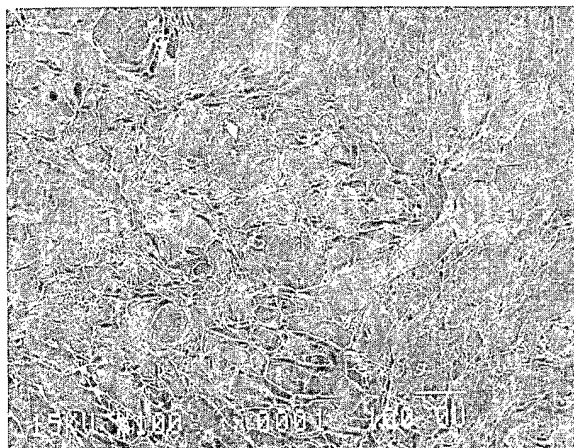
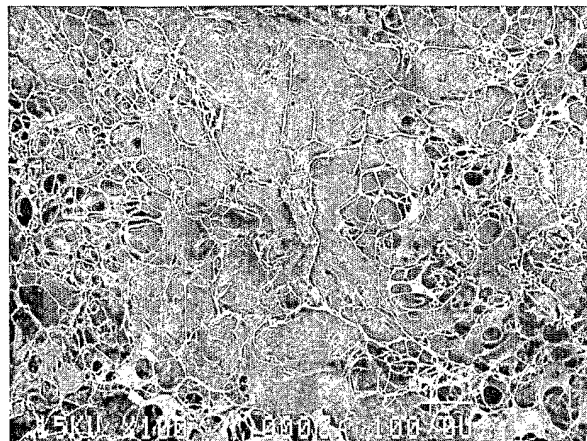


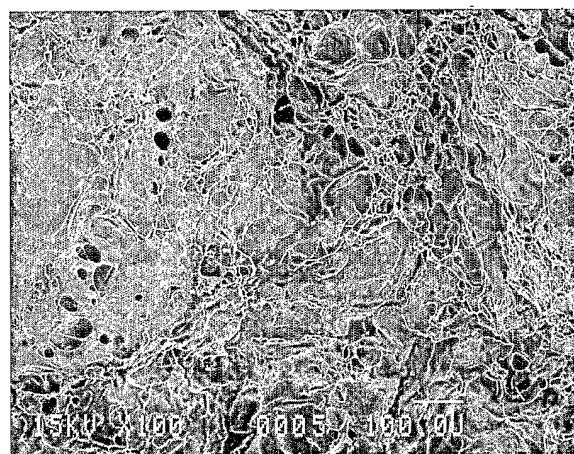
Figure 4: Scanning Electron Micrographs of Tomato Based Product



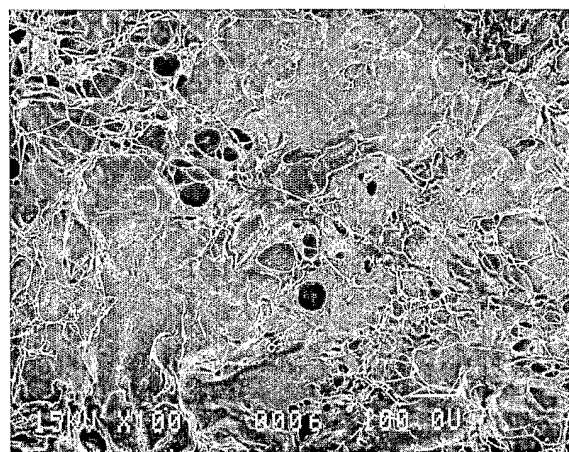
Refrigerated



After 1 Freeze/Thaw Cycle



After 3 Freeze/Thaw Cycles



After 5 Freeze/Thaw Cycles