Brief Summary

[0005] Disclosed herein are methods of reducing a pathogenic microorganism population in a powdered nutritional food composition which includes a fat, a protein, and a carbohydrate. The method includes the steps of forming an emulsion of the powdered nutritional food composition and extruding the emulsified powdered nutritional food composition at a temperature of less than about 100°C. In some aspects, the methods also include the step of adding a probiotic. The methods produce at least a 5 log reduction of the pathogenic microorganism population in the extruded powdered nutritional food composition, the extruded powdered nutritional food composition having a water activity level of about 0.3 to about 0.95.

[0005a] In one aspect, there is provided a method of reducing a pathogenic microorganism population in a powdered nutritional food composition comprising a fat, a protein, and a carbohydrate, the method comprising the steps of:

a) forming an emulsion of the powdered nutritional food composition; and

b) extruding the emulsified powdered nutritional food composition in an extruder at a temperature of less than about 100°C, whereby there is at least about a 5 log reduction in the pathogenic microorganism population in the extruded powdered nutritional food composition, and wherein the extruded powdered nutritional food composition has a water activity level of about 0.3 to about 0.95.

[0005b] In one aspect, there is provided a method of reducing a pathogenic microorganism population in a powdered nutritional food composition comprising a fat, a protein, and a carbohydrate, the method comprising the steps of:

a) forming an emulsion of the powdered nutritional food composition;

b) adding a probiotic to the emulsified powdered nutritional food composition to form a mixed powdered nutritional food composition; and

c) extruding the mixed powdered nutritional food composition at a temperature of less than about 100°C, whereby at least about 80% of the added probiotic is retained in the extruded powdered nutritional food composition, and whereby there is at least about a 5 log reduction in the pathogenic microorganism population in the extruded powdered nutritional food composition, wherein the extruded powdered nutritional food composition has a water activity level of about 0.3 to about 0.95.

Detailed Description

[0006] It has now been discovered that the temperature at which extrusion of nutritional food compositions takes place has a direct impact on the extent to which pathogenic microbial populations are present in resultant products. For instance, extruding a nutritional composition at a temperature of below about 100°C may decrease the presence of pathogenic microbial populations in the resulting extrudate. Nutritional food compositions and related methods for producing the nutritional food compositions with decreased pathogenic microbial populations are disclosed herein.

[0007] The elements or features of the various embodiments are described in detail hereinafter.

[0008] The terms "nutritional composition," "nutritional product," "nutritional food composition," and "nutritional formula," as used herein, refer to a nutritional formulation, which is designed for infants, children, or adults to contain sufficient protein, carbohydrate, fat, vitamins, minerals, and other nutrients to potentially serve as the sole source of

16. The method of any one of claims 1-15, wherein the powdered nutritional food composition further comprises at least one of vitamins, minerals, and other nutrients.

17. The method of any one of claims 1-16, wherein the powdered nutritional food composition comprises from about 10% to about 15% protein, from about 30% to about 50% carbohydrate, and from about 20% to about 50% fat.

18. The method of any one of claims 1-17, wherein the extruded powdered nutritional food composition, when reconstituted in liquid form, comprises from about 54 to about 108 g~~m~~/l of carbohydrate, from about 20 to about 54 g~~m~~/l of fat, and from about 7 to about 24 g~~m~~/l of protein.

19. The method of any one of claims 1-18, further comprising the step of drying the extruded powdered nutritional food composition to a moisture content of less than about 5%.

20. The method of claim 19, further comprising the steps of milling the dried powdered nutritional food composition and reconstituting the milled powdered nutritional food composition to a ready-to-feed state.

21. A method of reducing a pathogenic microorganism population in a powdered nutritional food composition comprising a fat, a protein, and a carbohydrate, the method comprising the steps of:

a) forming an emulsion of the powdered nutritional food composition;

b) adding a probiotic to the emulsified powdered nutritional food composition to form a mixed powdered nutritional food composition; and

c) extruding the mixed powdered nutritional food composition at a temperature of less than about 100°C, whereby at least about 80% of the added probiotic is retained in the extruded powdered nutritional food composition, and whereby there is at least about a 5 log reduction in the pathogenic