

Method For Preparing Enzymatic Modified Peanut Protein

Technical field

This invention involves the preparing method of enzymatic modified peanut protein and it belongs to foodstuff protein processing filed.

Background technology

Peanut (*ArachinConarachin* L.), alternate name groundnut and long life nut, is not only oil crops but also protein crops. Its fat and protein contents are 43-55% and 25-30%, respectively. Peanut protein contains eight kinds of essential amino acids and its biological value (BV) is more than soybean's, but its anti-nutritional factor is less than soybean's. Therefore, peanut protein can be a new protein resource following soybean protein, thus solving a difficult problem of limited high quality protein in a world. However, some functional characters of peanut protein isolate (PPI) produced by alkali extraction and acid sink technology and peanut protein concentrate (PPC) produced by ethanol extraction technology, such as solubility, emulsibility, emulsion stability, foaming characteristics and foam stability, are not suited to some food processing because of affecting by technological conditions. So applications of PPI and PPC are limited. This requires improving functional characters of peanut protein to meet the needs of some special food processing.

At present, there are four kinds of modification treatments for protein including physical modification, chemical modification, enzymatic modification and genetic engineering modification. Physical modification method contains thermal denaturation, squeezing, spinning and high static pressure. Physical modification method can improve some protein functional characters of foaming characteristics and emulsibility, but can do great damage to other functional characters of solubility and gelling. So physical modification method is only suited to produce some special protein products. Chemical modification method contains phosphorous modification, succinylation, glycosylation, decarboxamidation, covalent cross-linking, hydrolysis, oxidize and some chemical modification proteins have been successfully investigated. However, there exist many problems of more reaction by-products, damaging protein amino acid composition and reducing nutritional value during chemical modification processing. Therefore, chemical modification method's range of application is limited. Enzymatic modification method contains enzymatic catalysis and polymerization. There are many advantages in enzymatic modification method including the mild reaction conditions, non reaction by-products, high specificity. So enzymatic modification method is a safe modification method and it belongs to an emerging technology of enzyme engineering applying in food protein processing. The enzymatic modification method's research and development has important significance and it has broad market prospects. Genetic engineering modification method is used to improve functional characters and nutrient composition of plant protein by genetic engineering in order to achieve the purpose of modification.

In order to develop and utilize peanut protein, this invention combines enzymatic modification method with microwave assisted enzymatic hydrolysis and ultrafiltration technology. The enzymatic modification protein product can be produced with good solubility, foaming characteristics and foam stability based on the premise of less chemical reagent and short reaction time. The enzymatic modification method has the characteristics of mild conditions and low cost and is suitable for industrialized production.

Invention Content

The aim of the invention is to supply a preparing method of enzymatic modification protein product with good solubility, foaming characteristics and foam stability.

In order to achieve the above goal, this invention uses the following steps:

Slightly denatured and defatted peanut protein powder was added to distilled water and converted to a suspension by microwave-assisted dispersion; the suspension was adjusted pH value and extracted with alkali in a microwave catalytic synthesis / extraction apparatus; the supernatant obtained after centrifuging was ultra-filtrated, then the concentrated solution was added to protease after adjusting pH value and hydrolyzed in a microwave catalytic synthesis / extraction apparatus; killing enzyme, ultra-filtration separation concentration, finally, the enzymatic modified peanut protein was prepared from the concentrated solution freeze-drying.

To be specific, following the method :

- (1) Slightly denatured and defatted peanut protein powder was added to distilled water with glass rod to stir evenly and converted to a suspension by microwave-assisted dispersion;
- (2) The suspension was adjusted pH value and extracted with alkali in a microwave catalytic synthesis / extraction apparatus, then the alkaline extracting solution was obtained;
- (3) The supernatant obtained after alkaline extracting solution centrifuging was ultra-filtrated, then the concentrated solution was added to protease after adjusting pH value and hydrolyzed in a microwave catalytic synthesis / extraction apparatus, the enzymatic hydrolysis solution was obtained;
- (4) The enzymatic hydrolysis solution was killed enzyme, ultra-filtration separation concentration, finally, the enzymatic modified peanut protein was prepared from the concentrated solution freeze-drying.

Preferably, the weight of distilled water added to slightly denatured and defatted peanut protein powder is 10-12 times to the weight of protein powder, the power of microwave is 700w, temperature is 44°C, and microwave-assisted dispersion time is 10 min described in step (1).

Preferably, the peanut protein powder suspension was adjusted pH to 9.03, the power of microwave is 800w, temperature is 43°C, and microwave-assisted alkaline extracting time is

9.6min described in step (2).

Preferably, centrifugal conditions are 16°C, 5200r/min to 13min, ultra-filtration conditions of supernatant are PS-10Polysulfone membrane (molecular weight 10000Da), pressure of 0.09-0.10MPa, temperature of 36°C, time of 38 min, the concentrated solution is adjusting pH to 7.0-7.5, the rate of mixed protease is trypase:Protamex:neutral protease=2.4:1.4:1.2, the power of microwave is 800w, temperature is 48°C, and microwave-assisted enzymatic hydrolysis time is 12min described in step (3).

Preferably, killing enzyme condition is time of 12min in boiling water bath, ultra-filtration separation and concentration conditions are PS-8Polysulfone membrane (molecular weight 8000Da), pressure of 0.10MPa, temperature of 34°C, time of 28min.

The enzymatic modification protein product is white and silty fine and has good solubility, foaming characteristics and foam stability. After peanut protein powder was moderately hydrolyzed by proteases, peptide chain of protein was shorten, spatial conformation changed, hydrophobic surface was hydrolyzed, hydrophilic group exposed. All of these are favour to improve solubility, foaming characteristics and foam stability of enzymatic modification protein, at the same time, can improve other functional characters. The enzymatic modification method has the characteristics of mild conditions, short reaction time, low cost under the condition of combining with microwave treatment and it is suitable for industrialized production.

Specific implementation way

Implement sample No.1

Slightly denatured and defatted peanut protein powder was added to distilled water, the rate of weight was 1:10, using glass rod to stir evenly, and converted to a suspension by microwave-assisted dispersion under the condition of microwave of 700w, temperature of 44°C, microwave-assisted dispersion time of 10min; the peanut protein powder suspension was adjusted pH to 9.03, the alkaline extracting solution was obtained under the condition of microwave of 800w, temperature of 43°C, microwave-assisted alkaline extracting time of 9.6min; the alkaline extracting solution centrifuged at 16°C, 5200r/min to 13min, using PS-10 Polysulfone membrane (molecular weight 10000Da), under the conditions of pressure of 0.09MPa, temperature of 36°C, time of 38min, the supernatant was ultra-filtrated, then the concentrated solution was adjusting pH to 7.15 and added to the mixed protease, the rate of mixed protease was trypase: Protamex: neutral protease=2.4:1.4:1.2, the enzymatic hydrolysis solution was obtained under the microwave-assisted enzymatic hydrolysis conditions of microwave power of 800w, temperature of

48°C, and time of 12min; the enzymatic hydrolysis solution was killed enzyme for 12min in boiling water bath, using PS-8Polysulfone membrane (molecular weight 8000Da), under the conditions of pressure of 0.10MPa, temperature of 34°C, time of 28min, the enzymatic hydrolysis solution was ultra-filtrated, the enzymatic modified peanut protein was prepared from the concentrated solution freeze-drying. The solubility, foaming characteristics and foam stability of enzymatic modified peanut protein were 82.43%, 168.87% and 92.59%, respectively.

Implement sample No.2

Slightly denatured and defatted peanut protein powder was added to distilled water, the rate of weight was 1:11.4, using glass rod to stir evenly, and converted to a suspension by microwave-assisted dispersion under the condition of microwave of 700w, temperature of 44°C, microwave-assisted dispersion time of 10 min; the peanut protein powder suspension was adjusted pH to 9.03, the alkaline extracting solution was obtained under the condition of microwave of 800w, temperature of 43°C, microwave-assisted alkaline extracting time of 9.6min; the alkaline extracting solution centrifuged at 16°C, 5200r/min to 13min, using PS-10 Polysulfone membrane (molecular weight 10000Da), under the conditions of pressure of 0.09MPa, temperature of 36°C, time of 38min, the supernatant was ultra-filtrated, then the concentrated solution was adjusting pH to 7.34 and added to the mixed protease, the rate of mixed protease was trypsin: Protamex: neutral protease=2.4:1.4:1.2, the enzymatic hydrolysis solution was obtained under the microwave-assisted enzymatic hydrolysis conditions of microwave power of 800w, temperature of 48°C, and time of 12min; the enzymatic hydrolysis solution was killed enzyme for 12min in boiling water bath, using PS-8Polysulfone membrane (molecular weight 8000Da), under the conditions of pressure of 0.10MPa, temperature of 34°C, time of 28min, the enzymatic hydrolysis solution was ultra-filtrated, the enzymatic modified peanut protein was prepared from the concentrated solution freeze-drying. The solubility, foaming characteristics and foam stability of enzymatic modified peanut protein were 85.15%, 175.31% and 93.99%, respectively.

Implement sample No.3

Slightly denatured and defatted peanut protein powder was added to distilled water, the rate of weight was 1:11.8, using glass rod to stir evenly, and converted to a suspension by microwave-assisted dispersion under the condition of microwave of 700w, temperature of 44°C, microwave-assisted dispersion time of 10min; the peanut protein powder suspension was adjusted pH to 9.03, the alkaline extracting solution was obtained under the condition of microwave of 800w, temperature of 43°C, microwave-assisted alkaline extracting time of 9.6min; the alkaline

extracting solution centrifuged at 16°C, 5200r/min to 13min, using PS-10 Polysulfone membrane (molecular weight 10000Da), under the conditions of pressure of 0.10MPa, temperature of 36°C, time of 38min, the supernatant was ultra-filtrated, then the concentrated solution was adjusting pH to 7.46 and added to the mixed protease, the rate of mixed protease was trypsin: Protamex: neutral protease=2.4:1.4:1.2, the enzymatic hydrolysis solution was obtained under the microwave-assisted enzymatic hydrolysis conditions of microwave power of 800w, temperature of 48°C, and time of 12min; the enzymatic hydrolysis solution was killed enzyme for 12min in boiling water bath, using PS-8Polysulfone membrane (molecular weight 8000Da), under the conditions of pressure of 0.10MPa, temperature of 34°C, time of 28min, the enzymatic hydrolysis solution was ultra-filtrated, the enzymatic modified peanut protein was prepared from the concentrated solution freeze-drying. The solubility, foaming characteristics and foam stability of enzymatic modified peanut protein were 88.90%, 180.28% and 95.47%, respectively.

Claims

1. A method for preparing enzymatic modified peanut protein, its characteristic lies in, includes the following steps:
 - (1) Slightly denatured and defatted peanut protein powder was added to distilled water with glass rod to stir evenly and converted to a suspension by microwave-assisted dispersion;
 - (2) The suspension was adjusted pH value and extracted with alkali in a microwave catalytic synthesis / extraction apparatus, then the alkaline extracting solution was obtained;
 - (3) The supernatant obtained after alkaline extracting solution centrifuging was ultra-filtrated, then the concentrated solution was added to protease after adjusting pH value and hydrolyzed in a microwave catalytic synthesis / extraction apparatus, the enzymatic hydrolysis solution was obtained;
 - (4) The enzymatic hydrolysis solution was killed enzyme, ultra-filtration separation concentration, finally, the enzymatic modified peanut protein was prepared from the concentrated solution freeze-drying.
2. According to the method for preparing enzymatic modified peanut protein described in claims 1, its characteristic lies in, the weight of distilled water added to slightly denatured and defatted peanut protein powder is 10-12 times to the weight of protein powder, the power of microwave is 700w, temperature is 44°C, and microwave-assisted dispersion time is 10min described in step (1).
3. According to the method for preparing enzymatic modified peanut protein described in claims 1, its characteristic lies in, the peanut protein powder suspension was adjusted pH to 9.03, the power of microwave is 800w, temperature is 43°C, and microwave-assisted alkaline extracting time is 9.6min described in step (2).
4. According to the method for preparing enzymatic modified peanut protein described in claims 1, its characteristic lies in, centrifugal conditions are 16°C, 5200r/min to 13min, ultra-filtration conditions of supernatant are PS-10Polysulfone membrane (molecular weight 10000Da), pressure of 0.09-0.10MPa, temperature of 36°C, time of 38min, the concentrated solution is adjusting pH to 7.0-7.5, the rate of mixed protease is trypsin:Protamex:neutral protease=2.4:1.4:1.2, the power of microwave is 800w, temperature is 48 °C , and microwave-assisted enzymatic hydrolysis time is 12min described in step (3).
5. According to the method for preparing enzymatic modified peanut protein described in

claims 1, killing enzyme condition is time of 12min in boiling water bath, ultra-filtration separation and concentration conditions are PS-8Polysulfone membrane (molecular weight 8000Da), pressure of 0.10MPa, temperature of 34°C, time of 28min.