

+ 20
31

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
División de Nuevas Creaciones
E. S. D.

SUPERINDUSTRIA Y COMERCIO
Radicación : 01027893 00000003 Folios: 42
Fecha (RAD): 2001-08-17 11:05:20
Trámite : 002 PATENTES D 1 REGISTRO 444 REPUESTA
Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

Ref: EXPEDIENTE N° 01-027893
Solicitud de patente a nombre de
KRAFT FOODS, INC

Me refiero al examen de forma realizado en el asunto de la referencia y adjunto presento los siguientes documentos:

- 1- El documento de cesión del derecho a la patente otorgado por el inventor a la solicitante con su traducción simple.
- 2- El poder otorgado por el solicitante en el que se acredita su existencia y representación legal debidamente legalizado hasta por el Cónsul de Colombia.
- 3- La copia certificada de la solicitud estadounidense No 09/456.450 del 10 de abril del 2000, de la cual se reclama prioridad con la traducción simple de sus aportes principales y reivindicaciones.

No coincide

La sociedad solicitante está constituida de acuerdo a las leyes del Estado de Delaware, Estados Unidos de América.

Como el expediente queda así completo, pido se ordene la publicación de la solicitud.

Atentamente,


JERONIMO CASTILLO BONILLA
C.C. 79.462.057 Bogotá
T.P 104167

LAW OFFICES
PEDRO CASTILLO PINEDA &
ASSOCIATES

P.O. BOX 48362

Bogotá, Colombia / South America

FOR PATENTS AND TRADE MARKS IN
COLOMBIA

Poder General

General Power of Attorney

1 Applicant's
name (1)

KRAFT FOODS, INC

(1)

KRAFT FOODS, INC

2 Applicant's
address

domiciliado en (2) Three Lakes
Drive, Northfield, Illinois
Estados Unidos de America

domiciled in (2) Three Lakes, Drive,
Northfield, Illinois, United
States of America

nombra al Dr. Jerónimo Castillo Bonilla y/o Ximena Bonilla Pereira y/o Alvaro Castillo Grau, domiciliados en la Calle 93A#14-17, Bogotá, Colombia como sus representantes con poder especial, amplio y suficiente, para recibir de las oficinas y autoridades Colombianas, administrativas, judiciales o de policía, en primera o segunda instancia, la obtención de Patentes de Invención, Registro de Marcas, de Modelos y de Dibujos Industriales, de Nombres Comerciales y Enseñas, Letras Comerciales y Denominaciones de Origen, lo mismo que trasposos, extensiones, renovaciones, cambios de nombre, registro de licencias de explotación y registro de licencias de uso referentes a tales actuaciones, cancelación de Registros de marca, a cuyo efecto les faculta para dar ante dichas autoridades todos los pasos necesarios al objeto indicado, elevar solicitudes, formular descripciones, enmiendas, protestas, declaraciones, apelaciones y reclamos, solicitar la aplicación de medidas cautelares, solicitar la nulidad de Patentes de Invención, modelos de utilidad, diseños industriales, así como la de registros de marcas ante la autoridad nacional competente; aceptar en nuestro nombre y representación la Cesión de derechos de invención y de patente de invención que se nos haga por cualquier persona, abonar todos los impuestos, cuotas y pagos determinados por la ley, recibir todos los documentos y valores dando el descargo respectivo, llenar cualesquiera otros requisitos, desistir y tomar en fin todas las medidas que creyeran conducentes al resguardo de nuestros intereses y en caso de presentarse oposiciones y/o observaciones para que intervengan como demandantes o como demandados, con todas las demás facultades necesarias. Este poder comprende además las facultades de recibir, desistir, transigir, comprometer, sustituir, revocar sustituciones, recibir notificaciones y nombrar apoderados judiciales o extrajudiciales.

Dado y firmado en (3).....
Northfield, Illinois April 25, 2001

4) Signature (s)

IMPORTANT NOTE

The lodging of this GENERAL POWER with the Patent Office obviates the need of presenting special powers with each individual trade mark application.

hereby appoint Jerónimo Castillo Bonilla and/or Ximena Bonilla Pereira and/or Alvaro Castillo Grau domiciled at Calle 93A#14-17, Bogotá, Colombia as our representatives with special, ample and sufficient power to obtain from the offices and Colombian authorities, administrative, judicial and police, in first or in second instance, Privileged Patents of invention, Registration of Trade Marks, of Models and Industrial Drawings, of Commercial Names and ensigns, Commercial slogans and Origin Denominations as well as assignments, extensions, renewals, changes of name, registration of license of exploitation and of license of use referred to said actions, Cancellation Actions against trademark Registrations, who are empowered to take before said authorities all of the necessary steps for the purposes indicated, to file applications, to formulate descriptions, corrections, protests, declarations, appeals, and claims, apply for precautionary measures; apply for the nullity of Patent Inventions, Utility Models, Industrial Designs, as well as for Trademark Registrations before the competent national authority; to accept on our behalf and representation the assignment of rights of inventions and titles of invention that may be done to us by any person, to pay all taxes, quotas and payments prescribed by law, to receive all the documents and proceeds giving the respective acquittance or receipt, to fulfill any other requisites to desist and take in fact any other measures that may be deemed conducive to the safeguard of our interests, and in case that oppositions and/or observations are presented to intervene as complainant and defendant, with all necessary legal faculties.

This power of attorney includes the faculties to receive, desist, compromise, transact substitute it in all or in part, to revoke substitutions, to receive notifications and to appoint extra-judicial or judicial attorneys.

Given and signed in (3).....
Northfield, Illinois.....
April 25, 2001.....

Robert L. Herst
KRAFT FOODS, INC.

Robert L. Herst
Assistant Secretary

3 Date

4 Applicant's
signature

The Applicant's signature must be attested by a Notary Public through the NOTARIAL CERTIFICATE: In the "(Individual)", when the signer is a natural person; and in the "(Corporations)", when is a legal one. The Notary's signatures must then be legalized by a Colombian Consular Officer. La firma del solicitante debe ser atestada por un Notario Público por medio de la DECLARACIÓN NOTARIAL: en la "(Individual)", cuando el firmante es una persona natural; y en la de "(Sociedades)" cuando es una persona jurídica. La firma del Notario deberá ser legalizada por el Consulado Colombiano.





Consulado General de Colombia - Chicago

332
33

No. 674

Chicago, 12 de julio de 2001

El suscrito Cónsul General de Colombia, **CERTIFICA**, que el señor(a) **KATHLEEN HARTWIG**, quien como **NOTARIA PUBLICA DEL ESTADO DE ILLINOIS**, autenticó la firma del signatario del poder precedente, quien ejercía en la fecha las funciones indicadas y su firma corresponde a la registrada en este Consulado. Que la compañía **KRAFT FOODS, INC.**, es una sociedad constituida de acuerdo con las leyes de EE.UU. y cumple su objeto conforme a las mismas. Que el(la) señor **ROBERT L. HERST**, quien en su carácter de representante legal de la citada compañía confiere el poder precedente.

La presente certificación se expide en cumplimiento del artículo 480 del Código de Comercio.

El Cónsul General no asume responsabilidad alguna por el contenido del documento.

PAGADO IMPUESTO DE TIMBRE Y DERECHOS CONSULARES
US\$57.00 (Cincuenta y siete dólares)



MINISTERIO DE RELACIONES
EXTERIORES
C-148686
COYA FIRMA APARECE EN EL
DOCUMENTO DESEÑE EN
LAS FUNCIONES INDICADAS

NO SE ASUME
RESPONSABILIDAD DEL TEXTO
2001 JUL 24 9:14
JEFE DE LEGALIZACIONES
SANTAFE DE BOGOTA D.C.

500 NORTH MICHIGAN AVE. SUITE 2040 • CHICAGO, IL • 60611
PHONE: 312 - 923 1100 • FAX: 312 - 923 1107
E-MAIL: chileag95@aol.com

65512/00

34

LAW OFFICES

PEDRO CASTILLO PINEDA & ASSOCIATES

P.O. BOX 48362

Bogotá, Colombia / South America

Power with Assignment

Insert here
Full name
And address
Assignor

The undersigned

RICHARD S. SILVER
828 Leyden Lane
Wilmette, Illinois 60091
United States of America

hereby appoints José María Castillo Bonilla and/or Ximena Bonilla Parada and/or Alvaro Castillo Espin domiciled at Calle 93A N° 14-17 of Bogotá, Colombia, separately, alternatively or indistinctly as attorneys with special and sufficient power to apply and obtain from the competent offices and authorities of Colombia Patent of Invention, Utility Model or Industrial Design for

LOW-COST SOY-PROTEINACEOUS FOOD INGREDIENTS

USSH: D9/546,450

Filed: 20 APRIL 2000

Name and
Address of
Assignee

to be issued in the name of KRAFT FOODS, INC., Three Lakes Drive, Northfield, Illinois 60093, United States of America to whom assignment has been made of all right and title of said patent

for the territory of Colombia without any restriction.

The assignee also gives these powers in token of acceptance of the said assignment and hereby authorizes the said attorneys to take all necessary steps before the said offices and authorities for the purpose above stated; to make petitions, declarations and claims and to use all means which said attorneys shall deem proper for the safeguard of the interests of the assignee. This power includes the faculties to receive, deposit, renounce, compromise, transmit, substitute in all or in part, to revoke substitutions, to receive notifications and to appoint extra-judicial or judicial attorneys. The attorneys mentioned above can exercise this power alternatively or indistinctly.

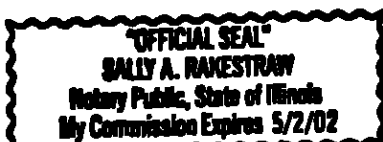
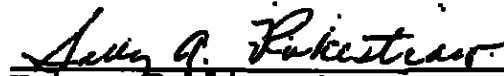
Signatures



RICHARD S. SILVER

June 15

2001



Notary Public



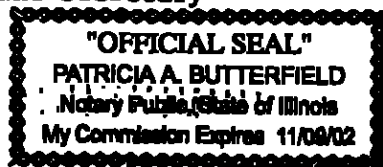
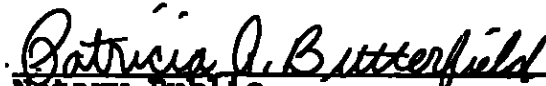
KRAFT FOODS, INC.

Deborah L. Galvin

Assistant Secretary

6/19

2001



Notary Public

5
34
35

TRADUCCION PORDER CON CESION

El abajo firmado RICHARD S. SILVER , DE 828 Leyden Lane, Wilmette, Illinois, Estados Unidos de América, nombra aquí a JERONIMO CASTILLO BONILLA y/o XIMENA BONILLA PEREIRA y/o ALVARO CASTILLO GRAU domiciliados en la Calle 93ª No 14-17 de Bogotá , Colombia , conjuntamente , alternativamente o indistintamente como apoderados con poder especial y suficiente para solicitar y obtener de las oficinas y autoridades competentes de Colombia, Patente de Invención , Modelo de Utilidad o Diseño o Industrial para **INGREDIENTES ALIMENTICIOS PROTEINICOS DE SOYA DE BAJO COSTO**
USSN: 09/546.450

Presentado: 10 de abril del 2000

Para ser expedido a nombre de KRAFT FOODS, INC, de Three Lakes Drive, Northfield, Illinois, Estados Unidos de América, a quien ha cedido todos los derechos y títulos en dicha patente para el territorio de Colombia sin ninguna restricción.

El cesionario firma también el presente en señal de aceptación de dicha cesión y autoriza a dichos apoderados para tomar ante dichas oficinas y autoridades los pasos necesarios al objeto indicado , para formular peticiones , declaraciones y reivindicaciones y para usar todos los medios que crean necesarios para salvaguardar los intereses del constituyente. Este poder incluye además las facultades de recibir desistir , renunciar , comprometer, transar , substituir en todo o en parte , revocar sustituciones , recibir notificaciones, nombrar apoderados Judiciales o extrajudiciales .

Los mencionados apoderados podrán ejercer el poder alternativa o indistintamente.

Firmas.

fdo. RICHARD S. SILVER Junio 15, 2001

fdo. Sally A. Rakestraw

Sello Oficial

Sally A. Rakestraw

Notario Público , Estado de Illinois

Mi comision expira 5/2/02

Fdo. Deborah L. Galvin 6/19/2001

Asistente Secretaria

KRAFT FOODS, INC.

Fdo. Patricia A. Butterfield

Sello Oficial

Patricia A. Butterfield

Notario Publico , Estado de Illinois

Mi comision Expira 11/09/02

64
27
32

LOS ESTADOS UNIDOS DE AMERICA
A TODOS A QUIENES ESTE DOCUMENTO PUEDA IMPORTAR
DEPARTAMENTO DE COMERCIO DE ESTADOS UNIDOS
Oficina de Patentes y Marcas de Los Estados Unidos

LO SIGUIENTE ES PARA CERTIFICAR QUE LO QUE AQUÍ SE ANEXA ES UNA COPIA VERDADERA DE LOS ARCHIVOS DE LA OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS, SOBRE AQUELLOS DOCUMENTOS ABAJO IDENTIFICADOS COMO UNA SOLICITUD DE PATENTE, Y QUE LOS MISMOS REUNEN LOS REQUISITOS PARA QUE SE LES OTORQUE UNA FECHA DE PRESENTACION BAJO EL 35 USC 111.

NUMERO DE SOLICITUD: 09/546.450
FECHA DE PRESENTACION: Abril 10, 2000

Por la Autoridad del
COMISIONADO PARA PATENTES Y MARCAS

Firmado
T LAWRENCE
Oficial Certificador

PA 388067



72/6
37

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

April 16, 2001

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 09/546,450 ✓

FILING DATE: April 10, 2000



**By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS**

T. Lawrence

**T. LAWRENCE
Certifying Officer**

4-11-00

UTILITY PATENT APPLICATION TRANSMITTAL
(for Noncontinuing, Nonprovisional
Applications under 37 C.F.R. §1.53(b))

Attorney Docket No. 65512

1c604 U.S. PTO



04/10/00

1c630 U.S. PTO
09/546450
04/10/00

A 37
S
38

Box PATENT APPLICATION
Commissioner of Patents and Trademarks
ATTENTION: Assistant Commissioner
for Patents
Washington, D.C. 20231

Sir:

Transmitted herewith for filing
under 37 C.F.R. §1.53(b) is the
nonprovisional, noncontinuing
patent application for:

Title: LOW-COST PROTEINACEOUS
FOOD INGREDIENTS

First Named Inventor or
Application Identifier: Richard S. Silver

CERTIFICATE OF MAILING BY "EXPRESS MAIL"

"Express Mail" Mailing Label Number
E152861558008

Date of Deposit 4-10-00

I hereby certify that this paper or fee is being
deposited with the United States Postal Service
"Express Mail Post Office to Addressee" Service
under 37 CFR §1.10 on the date indicated above and
is addressed to the Commissioner of Patents and
Trademarks, Washington, D.C. 20231.

ED PRICE
(Typed or printed name of person mailing)

(Signature of person mailing)

- (X) 23 pages of the specification (including claims) are enclosed.
- () sheet(s) of drawings are enclosed. () Formal () Informal
- (X) An executed Oath or Declaration and Power of Attorney naming the
actual inventors is enclosed.
- () The names of persons believed to be the actual inventors are set forth
in the enclosed unexecuted Oath or Declaration and Power of Attorney
(§1.41(a) and §1.53(b)).
- (X) An Assignment(s) of the invention to KRAFT FOODS, INC.,
and cover sheet are enclosed.
- (X) A check in the amount of \$ 40.00 to cover the fee for recording the
assignment(s) is enclosed.
- () A 37 C.F.R. §3.73(b) Statement is enclosed (where an Assignee seeks
to take action in a matter before the Patent Office).
- () An Information Disclosure Statement is enclosed.
- () A Form PTO-1449 is enclosed.
- () References (copies) listed on the Form PTO-1449 are
enclosed.
- (X) A Return Receipt Postcard is enclosed (MPEP §503).

() Priority of application number / filed on in is claimed under 35 U.S.C. §119.

() A certified copy of the priority document is enclosed.

() A MicroFiche Computer Program (Appendix) is enclosed.

() A Nucleotide and/or Amino Acid Sequence Submission is enclosed.

() A Computer Readable Copy is enclosed.

() A Paper Copy (Identical to Computer Copy) is enclosed.

() A Statement Verifying Identity of above Copies is enclosed.

(X) The filing fee is calculated below:

Fee Calculation For Claims As Filed

(a) Basic Fee		\$ 690.00
(b) Independent Claims	<u>2</u> - <u>3</u> = <u>-</u> x \$ 78.00 = \$ <u>-</u>	
(c) Total Claims	<u>20</u> - <u>20</u> = <u>-</u> x \$ 18.00 = \$ <u>-</u>	
(d) Fee for Multiply Dependent Claims	\$260.00	\$ <u>-</u>
	Total Filing Fee	\$ <u>690.00</u>

() A Statement(s) of Status as Small Entity is enclosed, reducing the Filing Fee by half to: \$

(X) A check in the amount of \$ 690.00 to cover the filing fee is enclosed.

() Charge \$ to Deposit Account No. 06-1135.

() The payment of the Filing Fee is to be deferred until the Declaration is filed. Do not charge our Deposit Account.

(X) A separate written request under 37 C.F.R. §1.136(a)(3), which is a general authorization to treat any concurrent or future reply requiring a petition for an extension of time under 37 C.F.R. §1.136(a) for its timely submission as incorporating a petition for an extension of time for the appropriate length of time, is enclosed.

(X) The Commissioner is hereby authorized to charge any additional fees which may be required in this application under 37 C.F.R. §§1.16-1.17 during its entire pendency, or credit any overpayment, to Deposit Account No. 06-1135. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1135. This sheet is filed in triplicate.

000140-0549450-041000

(X) Also enclosed:

Associate Power of Attorney

(X) Address all future communications to Customer Number 22242.



FITCH, EVEN, TABIN & FLANNERY
☐ Suite 1600
√ 120 South LaSalle Street
√ Chicago, Illinois 60603-3406
☐ Telephone: (312) 577-7000
☐ Facsimile: (312) 577-7007

April 10, 2000
(Date)

Richard A. Kaba
Registration No. 30,562

41 TT 10

LOW-COST SOY PROTEINACEOUS FOOD INGREDIENTS

FIELD OF THE INVENTION

This invention relates to a novel soy proteinaceous food ingredient from which undesirable flatulence-inducing oligosaccharides have been removed while, at the same time, conserving the desirable isoflavone components. Such soy proteinaceous food ingredient can be prepared by means of a simple, low-cost process involving simultaneous treatment of crude soy protein-containing materials with a source of glycosidase activity and a lactic acid-producing culture. The low-cost soy proteinaceous food ingredient may be used in the manufacture of a variety of finished food products.

BACKGROUND OF THE INVENTION

Soy derived compositions have been subjected to various enzyme treatments to transform their properties or to reduce the content of certain components. U.S. Patent 4,478,854 discloses the hydrolysis of polysaccharides from plants by treatment with an enzyme adapted to hydrolyzing the water-soluble, protein binding, polysaccharide present in soy flour. In particular, the substrate polysaccharide, which is believed to be widespread in plant kingdom substances, is decomposed by use of conventional pectinases. This treatment can be used to clarify juices, wines and beers, hydrolyze process wastes such as sugar beet pulp, pomace, and soy milk remanence, improve the digestability of silage, and reduce the viscosity of wort.

U.S. Patent 4,806,367 relates to treating soybean milk with protease under conditions wherein neither acid nor magnesium coagulation occurs. The protein in the treated soybean milk is then flocculated to provide a food material with good mouthfeel and high processability. U.S. Patent 5,100,679 discloses a process for making a proteinaceous product which comprises

09546450-041000

42 x 2 1/2

000710-05494560

preparing a relatively viscous aqueous slurry of soy protein; treating the slurry by adjusting the pH to about 3.5 to about 6; adding a viscosity reducing agent selected from among a proteolytic enzyme, a carbohydrase enzyme, an antioxidant, and mixtures thereof, to form a pretreated slurry; heating the
5 pretreated slurry to a temperature not greater than 155°C. such that the pretreated slurry does not contain a substantial amount of proteinaceous anti-nutritional or antigenicity factors; treating the pretreated slurry with a hydrolyzing agent from a source of alpha-galactosidase; and drying the proteinaceous material to form a soy product. The pretreatment of the soy
10 slurry causes partial degradation of the non-starch polysaccharides which results in a significant reduction in the slurry viscosity before the heat treatment and during further processing. The patent discloses that this permits the solids content of the slurry to be increased which reduces drying costs and results in overall process economy. In a preferred embodiment, the
15 alpha-galactosidase hydrolyzing agent also includes a carbohydrase enzyme for further degradation of non-starch polysaccharides, thereby resulting in further lowering of the slurry viscosity. A protease type of enzyme can also be added to the hydrolyzing agent with or without the carbohydrase enzyme.

PCT Publication WO95/27406 provides a dietetic soy based product
20 which is high in soluble dietary fibers but which contains only negligible amounts of phytate, stachyose and raffinose. The dietetic soy-based product is reported to be relatively cheap and to exhibit good organoleptic properties. Such a product is prepared by adding the enzymes phytase, alpha-galactosidase, and plant cell wall polysaccharide solubilizing enzymes to a
25 suspension of soy-based raw material in water.

PCT Publication WO98/12209 relates to a method for isolating proteins from vegetable sources by subjecting the vegetable proteinaceous material to the action of one or more carbohydrate degrading enzymes. After the carbohydrate degradation step, the mixture is separated to isolate the
30 proteins from the hydrolyzed carbohydrates. The enzymes disclosed for use

09546450.041000

5

10

20

26

30

44
44

in a conventional cheese-making manner to a solid form by compacting and pressing, thereby fixing said curds, and (ii) subjecting the fixed curds to fermentative ripening in a brewing material containing at least one type of koji as the substrate to which lactic acid bacteria and/or yeast are added.

5 U.S. Patent 5,006,350 provides a bacteria which releases a soybean protein clotting enzyme that is effective in the production of a new soybean protein food, such as for example, a soy-milk cheese or a soy-milk cream. U.S. Patent 5,597,594 relates to a cheese-like food prepared by using soybean milk from which 60% or more of the soluble saccharide fractions in
10 the raw soybean have been removed. The process includes first filtering soybean milk with an ultrafiltration membrane (preferably with a molecular weight of 30,000 to 300,000) to remove soluble saccharide fractions. The soybean milk is then subjected to lactic acid fermentation using a conventional mesophilic lactic acid bacterium to form curds. After molding,
15 fermenting, and maturing the curd, the resulting cheese-like food is said to resembles cheese prepared using milk as the raw material.

Ph
4-5-00

More recently, U.S. Patent 5,858,449 provided a method of preparing isoflavone-enriched soy products which can be used as ingredients in food products. To obtain the isoflavone-enriched product, a separately prepared
20 soy flour having a stachyose content of less than 2 percent a sucrose content of greater than 9 percent, and a total isoflavone content of greater than 2000 micrograms per gram (all based on dry weight) was treated with a solvent to preferentially remove the dietary fiber, collecting the soluble material by centrifugation or equivalent process, and drying the soluble material. The
25 low-stachyose soy flour was obtained by either physically removing the stachyose or using genetically modified soy bean plants to produce low-stachyose soy beans.

As seen from the description of the current state of soy protein preparations described above, the application of soy materials in preparing
30 intermediate food ingredients and/or food products still faces certain

000140-05494560

45
X
44

000710-05191560

problems. Although the cost of crude soy materials such as soy flour is low, methods to make soy protein isolates and/or soy protein concentrates tend to be costly. Furthermore these processes, including the process of ultrafiltration, typically remove some or all beneficial ingredients such as the phytochemicals, including isoflavone components. Isoflavones are naturally occurring components of soybeans which are reported to have significant health benefits, such as, for example, reducing the risk of some types of cancer, reducing the risk of osteoporosis, and lowering serum cholesterol. Existing commercial processes for making soy protein isolates generally capture only about 3 to 35 percent of the isoflavones available in the starting material. Additional difficulties relate to a need in many of these processes to separate a protein-enriched (solids) fraction from an aqueous or solvent wash fraction. Yet another disadvantage of current technology is that processes that remove the undesirable oligosaccharides, and deplete the "beany" flavor components from crude soy materials are likewise very costly, since the soy protein concentrates and soy protein isolates that result therefrom cost from 5 to 30 times as much as the starting material.

Thus there remains a clear need for an inexpensive, simple and effective method for producing a soy protein food ingredient from which the undesirable flatulence-inducing oligosaccharides (i.e., stachyose and raffinose) have been largely depleted, and in which the isoflavone components have been largely retained. There further remains a need for a method for producing such soy ingredients that eliminates the need for a solid-liquid separation. The present invention addresses these needs.

25

SUMMARY OF THE INVENTION

This invention discloses a method for preparing a low cost soy proteinaceous food ingredient having reduced levels of flatulence-inducing oligosaccharides and conserved levels of isoflavones as compared to the levels present in crude soy materials. The method includes the steps of:

48/6/45

(a) providing an aqueous crude soy material containing soy protein, flatulence-inducing oligosaccharides, and isoflavones; and

(b) simultaneous treating the aqueous crude soy material with (1) a source of glycosidase activity that is effective to hydrolyze the flatulence-inducing oligosaccharides to fermentable saccharides and (2) a lactic acid-producing culture that ferments the fermentable saccharide under conditions that promote glycosidase activity and lactic acid fermentation to produce the soy proteinaceous food ingredient having reduced levels of flatulence-inducing oligosaccharides and conserved levels of isoflavones as compared to the levels present in crude soy materials. The lactic acid-producing culture may also produce desirable flavor characteristics which improve the flavor of the finished food product. The crude soy material may be defatted or fat-containing.

For purposes of this invention, "simultaneous treatment" of the crude soy material with (1) a source of glycosidase activity and (2) a lactic acid-producing culture is intended to cover processes where both glycosidase and lactic acid activities are present and active at the same time for at least a portion of the treatment time. Thus, for example, the glycosidase enzymes and the lactic acid culture could be added at the same or different times. Generally, however, it is preferred that both are added at the same time or that the glycosidase activity is added first followed by lactic acid activity. Significantly, the flatulence-inducing oligosaccharides acted upon by the source of glycosidase activity include raffinose and/or stachyose.

For purposes of this invention, the phrase "reduced levels" of flatulence-inducing oligosaccharides is intended to indicate that the level of the flatulence-inducing oligosaccharides is reduced by an amount sufficient to avoid excessive flatulence when consumed at the current FDA recommended amounts (i.e., about 6.25 g of soy protein per meal). Generally, "reduced levels" indicate that the flatulence-inducing oligosaccharides are reduced by at least 20 percent, preferably by at least 50 percent, and more preferably by at least 75 percent, compared to levels in the starting crude soy material.

000140-05494560

7746
47

000140-05494560

Likewise, the phrase "conserved levels" of isoflavones is intended to indicate that the level of isoflavones in the soy proteinaceous food product is at least about 75 percent, and more preferably at least about 90 percent, of the isoflavones in the starting crude soy material. Generally, greater than about 5 90 percent, and preferably greater than about 99 percent, of the original isoflavones in the starting crude materials are captured or retained in the soy proteinaceous material.

In further significant embodiments, the crude soy material is chosen from the group consisting of soy flour, soy grits, soy milk, and mixtures 10 thereof. The crude soy material may be defatted or non-defatted. In yet other significant embodiments, the source of glycosidase activity is a source of alpha-galactosidase activity, a source of beta-fructosidase activity, or mixtures thereof. Preferably, the source of alpha-galactosidase activity is an alpha-galactosidase enzyme; suitable alpha-galactosidase enzymes may be 15 from an *Aspergillus* strain, a *Monascus* strain, a *Bacillus* strain, *Mortierella*, *Penicillia*, *Saccharomyces*, plant sources such as maize and coffee beans, and the like. Additionally, the source of beta-fructosidase activity may be a beta-fructosidase enzyme; suitable beta-fructosidase enzymes can be obtained from carrots and Jerusalem artichokes or microorganisms such as 20 *Saccharomyces cerevisiae* (i.e., yeast), *Fusarium oxysporum*, *Bacillus stearothermophilus*, and the like. In further significant embodiments, the lactic acid-producing culture is chosen from among *Streptococcus cremoris*, *Streptococcus lactis*, *Streptococcus durans*, *Leuconostoc cremoris*, *Streptococcus diacetylactis*, *Lactobacillus acidophilus*, *Lactobacillus* 25 *bulgaricus*, *Lactobacillus casei*, *Lactobacillus helveticus*, *Streptococcus faecalis*, *Streptococcus thermophilus*, and *Leuconostoc citrovorum*, and mixtures thereof. The soy proteinaceous food ingredient provided by this method retains most or essentially all of the isoflavones present in the crude soy material.

48

000770- 5494560

The significant reduction of flatulence-inducing oligosaccharides and the retention of high levels of isoflavones make the soy proteinaceous materials provided by this invention ideally suited for incorporation into a wide variety of food products. Such food products include, for example, process
 5 cheeses, cottage cheese, cream cheese, yogurt, puddings, pasta, meat products, meat substitutes, tofu, cereals, and beverages. Generally the flatulence-inducing oligosaccharides (i.e., those that lead to abdominal discomfort due to gas production when ingested by a monogastric mammal) are reduced by at least about 20 percent as compared to the levels in the
 10 original crude soy material. Preferably, the flatulence-inducing oligosaccharides are reduced by at least about 50 percent and more preferably by at least about 75 percent. At the same time, the amount of beneficial isoflavones remains essentially unchanged or only slightly reduced from levels found in the original crude soy material.

15 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention provides a method for preparing a soy proteinaceous food ingredient with reduced levels of flatulence-inducing, oligosaccharides (especially raffinose and stachyose) while retaining most or essentially all of the isoflavones present in the starting crude soy material.
 20 The soy proteinaceous food ingredient prepared by the method of this invention is ideally suited for use in a wide range of food products.

The method involves a minimum number of unit operations and reduces the need for capital-intensive equipment, and therefore is inexpensive to implement. As an example, the method eliminates a
 25 requirement for a solid-liquid separation. It also eliminates an ultrafiltration step used in certain processes known in the field. The soy protein food ingredient provided by the method has a greatly reduced level of the undesirable oligosaccharides while retaining most or all of the desirable isoflavone components.

49

A soy proteinaceous food ingredient provided by the methods of the present invention generally include soy protein-containing products in the form of a suspension, a slurry, a soy protein-containing paste, a soy coagulum, soy curd, and the like. An important property of the ingredient is that levels of oligosaccharides that lead to abdominal discomfort due to gas production when ingested by a mammal are significantly reduced, compared to the levels present in the starting crude soy materials. A further important attribute of the soy ingredient is that it retains most or essentially all of the isoflavones present in the starting crude soy materials.

The starting material employed in the methods of the invention may be any crude soy material, such as soy flour, soy grits, soy milk, and similar soy protein-containing starting materials. The term "soy milk" is intended to include any aqueous dispersion containing soy bean proteins with reduced levels of insoluble fiber. For example, soy milk is obtained by extraction of soy beans with water or aqueous alkali solution, if necessary, followed by removal of water-insoluble materials therefrom. Any of the crude soy materials employed may have been defatted or may be left untreated, such that the material remains with most or all of the oil originally present. If the crude soy material is supplied as a solid, such as a dry powder or particulate preparation, it is suspended in water to provide an aqueous fermentable soy composition; soy milk is already in the form of such an aqueous composition. The crude soy material further contains phytochemicals such as isoflavones which may provide numerous health benefits. In the methods of the invention, these isoflavones are retained essentially undiminished. The material additionally contains oligosaccharides, including, for example, raffinose and stachyose, which commonly are not hydrolyzed to nutrient saccharides nor absorbed to be metabolized by a monogastric mammal that consumes the soy material. They therefore remain available for fermentative degradation by the flora of the large intestine, producing gases and causing discomfort and flatulence. The present methods successfully remove a significant proportion of these oligosaccharides so that they, and their

000140-05494560

50

flatulence-inducing effects, are significantly reduced in the resulting soy food ingredient.

A major advantage of the present method is that the process conditions can be varied to give essentially any desired reduction in the flatulence-inducing oligosaccharides. Thus, the level of flatulence-inducing oligosaccharides can range from approximately 25 percent reduction up to about 90 percent or even up to almost 100 percent reduction. By controlling the amounts of glycosidase and lactic acid culture activities, time of treatment, treatment temperatures, pH levels, and the like, the level of reduction of the flatulence-inducing oligosaccharides can be widely varied. Generally, high levels of reduction in the flatulence-inducing oligosaccharides will increase processing costs and, in many case, may not be necessary to provide the desired physiologically benefit (i.e., reduction of flatulence associated with consuming the flatulence-inducing oligosaccharides). Recently, Suarez et al., "Gas Production in Humans Ingesting a Soybean Flour Derived from Beans Naturally Low in Oligosaccharides," Am. J. Clin. Nutr., 69, 135-39 (1999), suggested that a soy-based diet of less than about 0.5 g/meal of stachyose and raffinose did not trigger the undesirable physiological symptoms.

The crude soy material described above and employed in the present methods is prepared as an aqueous fermentable soy composition. A fraction of the soluble saccharides present in soy composition (e.g., sucrose) are fermentable by most lactic acid bacteria. Raffinose and stachyose, however, are not fermentable by most lactic acid bacteria. Treatment of the soy material with certain glycosidic enzymes can convert raffinose and stachyose into sugars which can be fermented by lactic acid bacteria.

Suitable sources of glycosidase activity include, for example, alpha-galactosidase activity and beta-fructosidase activity. Preferably the source of alpha-galactosidase activity is an alpha-galactosidase enzyme. Such alpha-galactosidase enzymes can include, for example, fungal or bacterial alpha-galactosidases and mixtures thereof. A preferred alpha-galactosidase can be obtained from Valley Research, Inc., South Bend, Indiana, under the

000140-05494560

9
51

tradenam AGS25. Alpha-galactosidase can also be produced from fungi of the *Aspergillus* strain, preferably *Aspergillus niger* and *Aspergillus oryzae*; the *Monascus* strain, preferably *Monascus pilosus*; and from bacteria from the *Bacillus* strain, preferably *Bacillus stearothermophilus*. Alpha-galactosidase
5 can also be produced from *Mortierella* strain, *Penicillia* strain, *Saccharomyces* strain, and plant sources such as maize and coffee beans, and the like. Alternatively, a source of beta-fructosidase activity can be used. Suitable beta-fructosidase enzymes can be obtained from carrots and Jerusalem artichokes or microorganisms such as *Saccharomyces cerevisiae* (i.e., yeast),
10 *Fusarium oxysporum*, *Bacillus stearothermophilus*, and the like. Any of these activities is effective to hydrolyze the oligosaccharides, such as the raffinose and the stachyose, to lower saccharides which are fermentable by the lactic acid fermenting bacterium. In the absence of the lactic acid-producing culture, however, the hydrolysis reactions become so slow that a significant
15 amount of the flatulence-inducing oligosaccharides remain. By the addition of the lactic acid-producing culture, the hydrolysis reactions can be driven toward completion.

The lactic acid-producing culture to be used in the methods of the present invention may be any of the fermentation cultures which convert
20 nutrient substrates, especially saccharides, to lactic acid. It is believed that in the methods of the present invention, the hydrolysis of the oligosaccharides by the action of the glycosidase activity generates additional fermentable substrates for the lactic acid culture to act upon. The additional fermentable substrates are then fermented by the lactic acid culture, thereby allowing
25 further hydrolysis of the oligosaccharides. In this manner, the hydrolysis of the oligosaccharides tends to be driven towards completion, thereby reducing the levels of flatulence-inducing oligosaccharides derived from the crude soy materials. In this manner, it is believed, the oligosaccharides are largely consumed and ultimately converted by fermentation to lactic acid. It is further
30 believed that removal of the product saccharides generated by the glycosidase activity by virtue of the fermentation prevents inhibition of the

09546450-041000

22
52

000740-05494560

glycosidase by the products of its own activity. Lactic acid cultures that may be employed in the present invention include those that are employed in the fermentative production of various cheeses, yogurts, sour cream, and the like. Such cultures generally include, for example, lactic acid bacteria used
5 for lactic fermentation belonging to the *Lactobacillus* genus, *Streptococcus* genus, *Leuconostoc* genus, *Pediococcus* genus, and the like. Specific examples of suitable lactic acid bacterium are *Streptococcus cremoris*, *Streptococcus lactis*, *Streptococcus durans*, *Leuconostoc cremoris*, *Streptococcus diacetylactis*, *Lactobacillus acidophilus*, *Lactobacillus*
10 *bulgaricus*, *Lactobacillus casei*, *Lactobacillus helveticus*, *Streptococcus faecalis*, *Streptococcus thermophilus*, *Leuconostoc citrovorum*, and mixtures thereof. The fermentation induced by the lactic acid culture results in the production of lactic acid, and a drop in the pH of the fermenting composition concomitant with the acid production. Generally, the pH of the resulting soy
15 proteinaceous food ingredient is in the range of about 3.8 to about 5.2, and preferably in the range of about 4.0 to about 4.8.

In conducting the method of the invention, an aqueous fermentable soy composition is formed from the crude soy material. The crude soy material will generally contain, in addition to soy protein, both flatulence-inducing
20 oligosaccharides and beneficial isoflavones. Liquid crude soy materials such as, for example, soy milk can be used directly in the present process; of course, if desired, water and/or other components (e.g., additional soy protein) can be added. For solid, powdered, or particulate crude soy materials, an aqueous suspension or slurry is preferred. Generally the
25 aqueous crude soy materials have solids in the range of about 10 to about 50 percent. Preferably, the solids content is between about 30 and 40 percent.

If desired, the aqueous fermentable soy composition may be pasteurized prior to treatment with glycosidase activity and the lactic acid cultures. Such pasteurization can be used to minimize the growth of
30 adventitious microbes which might be present during treatment.

53

Pasteurization can be carried in batch, semi-continuous, or continuous processes. For example, the aqueous fermentable soy composition may be heated to a temperature of about 163°F for about 15 minutes. After pasteurization, the composition is cooled to a suitable temperature (generally about 75 to about 115°F) before the glycosidase activity and lactic acid cultures are added.

The aqueous crude soy material is contacted with the source of glycosidase activity. The amount of glycosidase activity added should be sufficient to effectively hydrolyze the flatulence-inducing oligosaccharides within a reasonable period of time (generally about 1 to about 24 hours, and preferably about 2 to about 12 hours). Preferably, the glycosidase-treated composition is adjusted to a pH at which the source of glycosidase activity is in fact active and which will promote fermentation by the lactic acid culture. Generally, the initial pH is in the range of about 6 to 7, and preferably in the range of about 6.4 to about 6.6, to promote hydrolysis of the flatulence-inducing oligosaccharides.

The composition containing the aqueous fermentable soy composition is simultaneously treated with a source of glycosidase activity and a lactic acid fermenting culture. For purposes of this invention, "simultaneous treatment" required that both glycosidase and lactic acid activities are present and active at the same time for at least a portion of the treatment time and the portion of the treatment time is sufficient to reduce the level of the flatulence-inducing oligosaccharides in the final soy proteinaceous product. Thus the glycosidase activity and the lactic acid culture may be added at the same time. Alternatively, the glycosidase activity may be added first so long as there remains significant glycosidase activity at the time the lactic acid culture is added. Alternatively, the lactic acid culture may be added first so long as there remains significant lactic acid activity at the time the glycosidase activity is added. Preferably the glycosidase activity and the lactic acid culture are added at the same time or the glycosidase activity is added first followed by addition of the lactic acid culture. Where the lactic acid culture is added at a

000710-05494560

3
74

000140-05494560

later time and using a reaction temperature of about 30 to about 45°C, it is generally preferred that the lactic acid culture is added about 0.5 to about 1 hour after the addition of the glycosidase activity. As noted above, the glycosidase activity converts non-fermentable flatulence-inducing oligosaccharides to fermentable mono- and di-saccharides. If only glycosidase activity is present, an equilibrium and/or an end product inhibition effect will be established and a significant amount of unconverted flatulence-inducing oligosaccharides will remain. By using the lactic acid culture to ferment the fermentable mono- and di-saccharides, the glycosidase reactions will be driven to completion or near-completion so that the flatulence-inducing oligosaccharides are reduced to acceptable levels.

The lactic acid culture ferments the fermentable saccharides produced by the action of the glycosidase on the oligosaccharides, as well as on other nutrient sources present in the composition. The culture- and glycosidase-treated composition is maintained at a temperature that simultaneously promote glycosidase action on the oligosaccharides contained in the composition, and fermentation of the nutrient saccharides and other nutrients present in the composition. In general, the temperature is maintained between about 20 and about 45°C. It may be beneficial to control the pH by the addition of a suitable alkaline material to prevent excess acidity from developing. Such substances include, by way of nonlimiting example, sodium hydroxide, calcium carbonate, or ammonium hydroxide. If the pH of the composition were to drop below the favorable range for lactic acid culture metabolism, conversion of available sugars to lactic acid would be slowed. Generally, the optimal pH for the alpha-glycosidase enzyme is about 4 to 6.5. Most lactic acid cultures can operate in this range; a few, however, are known to slow down or stop growing if the pH falls below about 4.5. The alkaline substance may be added either entirely at the beginning of the process, or periodically titrated into the fermenting culture. The treated suspension is furthermore incubated at a temperature that promotes glycosidase activity

27
55

and fermentation. Broadly, the temperature is maintained at about 20 to about 45°C, and preferably at about 32 to about 45°C.

With the pH and the temperature are maintained at values that are effective for glycosidase activity to proceed, and for lactic acid fermentation to occur, the time required for a significant extent of hydrolysis of the oligosaccharides, and for a significant extent of fermentation, to proceed ranges from about 1 to about 24 hours; and preferably from about 2 to about 12 hours. At the conclusion of these operations, the soy food ingredient having reduced levels of the flatulence-inducing oligosaccharides is obtained as an aqueous slurry.

In general, if the solids content of the hydrolyzed and fermented aqueous composition is high enough, it will not be necessary to carry out a separation of any excess aqueous liquid from the fermented soy composition. For these reasons, an additional unit operation related to separating the slurry from excess liquid, a step that is required in many other types of soy protein preparation procedures, is avoided in the present method. This beneficially lowers the cost of carrying out the overall method. Furthermore, since such excess liquid does not have to be removed or separated, the isoflavone components that provide beneficial flavors to the soy food ingredient are retained. Generally the present soy proteinaceous food ingredient is used "as is" (i.e., in the form of the aqueous slurry). Thus, no separation, washing, extraction, or other liquid-based separations or purification are required in the present invention. If a dry soy proteinaceous food ingredient is desired, however, it can be obtained by spray drying.

The lactic acid fermented soy proteinaceous food ingredient prepared as described above is advantageously incorporated into a wide variety of food products. Depending on the food product intended, the soy protein food ingredient may be added to an intermediate or to a final composition employed in the preparation of the product. Examples of such food products include, by way of nonlimiting example, process cheeses, cottage cheese,

000140-05194560

65
56

cream cheese, yogurt, puddings, pasta, meat products, meat substitutes, tofu, cereals, beverages, and the like.

The following examples are intended to illustrate the invention and not to limit it. Unless otherwise noted, all percentages are by weight.

5 **Example 1.** Mechanically defatted soy flour (5-8% fat; about 7.5% stachyose plus raffinose; Iowa Soy Specialties, Des Moines, Iowa) was slurried with water to 20% solids. The pH of this slurry was 6.54. Three aliquots of the slurry were treated with alpha-galactosidase (AGS25, Valley Research, South Bend, Indiana) and a lactic acid-producing dairy culture
10 (*Lactobacillus helveticus* and *Lactobacillus casei* mixture, LH-100, Rhodia, Madison, Wisconsin). The three aliquots were:

Aliquot	Alpha-galactosidase (%)	Lactic Acid-producing Dairy Culture (%)
1	0	0.0526
2	0.05	0.0526
15 3	0.1	0.0526

Each slurry was held for 16 hours at 40°C. At the end of this period, the pH of each slurry with was as follows: (1) Aliquot 1: pH of 4.25; (2) Aliquot 2: pH of 3.94; and (3) Aliquot 3: pH of 3.94. Aliquot 2 had a combined stachyose and raffinose level of about 71 percent less than Aliquot 1; Aliquot 3 had a
20 combined stachyose and raffinose level of about 85 percent less than Aliquot 1.

Example 2. A defatted soy flour (Cargill, Cedar Rapids, Iowa) was mixed with water to obtain a 30% solids slurry. The slurry was simultaneously inoculated with about 5 percent of a lactic acid culture (mixture of *Lactococcus*
25 *lactis* and *Streptococcus cremoris*; Bulk Culture 0765, Kraft Cultures, Morton Grove, Illinois) and about 0.01 percent of alpha-galactosidase enzyme (AGS25, Valley Research Inc., South Bend, Indiana). The inoculated slurry

09546450.041000

56
27
52

was held at 35°C for 4 hours, during which time the pH dropped from 8.6 to 5.3. The combined level of stachyose and raffinose in the treated soy flour was found to have been reduced by about 22 percent relative to the untreated soy flour.

000740.05494560

70
58

CLAIMS

1. A method for preparing a lactic acid fermented soy proteinaceous food ingredient with reduced levels of flatulence-inducing oligosaccharides and conserved levels of isoflavones, said method comprising:

(a) providing an aqueous crude soy material containing soy protein, flatulence-inducing oligosaccharides, and isoflavones; and

(b) simultaneous treating the aqueous crude soy material with (1) a source of glycosidase activity that is effective to hydrolyze the flatulence-inducing oligosaccharides to fermentable saccharides and (2) a lactic acid producing culture that ferments the fermentable saccharides,

wherein the simultaneous treatment is under conditions that promote glycosidase activity and lactic acid fermentation to produce the soy proteinaceous food ingredient having reduced levels of flatulence-inducing oligosaccharides and conserved levels of isoflavones as compared to levels present in the crude soy material.

2. The method described in claim 1, wherein the source of glycosidase activity and the lactic acid producing culture are added to the aqueous crude soy material at essentially the same time.

3. The method described in claim 1, wherein the source of glycosidase activity is added to the aqueous crude soy material before the lactic acid producing culture is added.

4. The method described in claim 1, wherein the flatulence-inducing oligosaccharides comprise raffinose, stachyose, or mixtures thereof.

5. The method described in claim 1, wherein the crude soy composition is soy flour, soy grits, soy milk, or mixtures thereof.

000140-05494560

59

6. The method described in claim 1, wherein the source of glycosidase activity is a source of alpha-galactosidase activity, a source of beta-fructosidase activity, or sources of both alpha-galactosidase and beta-fructosidase activities.

7. The method described in claim 6, wherein the source of alpha-galactosidase activity is an alpha-galactosidase enzyme, and the source of beta-fructosidase activity is a beta-fructosidase enzyme.

8. The method described in claim 7, wherein the alpha-galactosidase enzyme is obtained from an *Aspergillus*, a *Monascus* strain, a *Bacillus* strain, a *Mortierella* strain, a *Penicillia* strain, and a *Saccharomyces* strain.

9. The method described in claim 7, wherein the beta-fructosidase enzyme is obtained from carrots, Jerusalem artichokes, *Saccharomyces cerevisiae*, *Fusarium oxysporum*, or *Bacillus stearothermophilus*.

10. The method described in claim 1, wherein the lactic acid-producing culture is chosen from the group consisting of *Streptococcus cremoris*, *Streptococcus lactis*, *Streptococcus durans*, *Leuconostoc cremoris*, *Streptococcus diacetylactis*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus casei*, *Lactobacillus helveticus*, *Streptococcus faecalis*, *Streptococcus thermophilus*, *Leuconostoc citrovorum*, and mixtures thereof.

11. The method described in claim 1, further comprising the step of incorporating the soy proteinaceous food ingredient in a food composition.

000140-05494560

60

12. The method described in claim 11, wherein the food composition is a process cheese, a cottage cheese, a cream cheese, a yogurt, a pudding, a pasta, a meat product, a meat substitute, a tofu, a cereal, or a beverage.

13. A lactic acid fermented soy proteinaceous food ingredient comprising a composition prepared from a crude soy material and having (1) reduced levels of flatulence-inducing oligosaccharides that lead to abdominal discomfort due to gas production when ingested by a monogastric mammal, wherein the reduced levels are relative to the crude soy material and (2) most or essentially all of the isoflavones present in the crude soy material.

14. The food ingredient described in claim 13, wherein the flatulent-inducing oligosaccharides in the food ingredient are reduced by at least about 20 percent of the level in the crude soy material.

15. The food ingredient described in claim 14, wherein the flatulent-inducing oligosaccharides in the food ingredient are reduced by at least about 50 percent of the level in the crude soy material.

16. The food ingredient described in claim 13, wherein the composition is prepared by a process comprising:

(a) providing an aqueous crude soy material containing soy protein, flatulence-inducing oligosaccharides, and isoflavones; and

(b) simultaneous treating the aqueous crude soy material with (1) a source of glycosidase activity that is effective to hydrolyze the flatulence-inducing oligosaccharides to fermentable saccharides and (2) a lactic acid producing culture that ferments the fermentable saccharides,

wherein the simultaneous treatment is under conditions that promote glycosidase activity and lactic acid fermentation to produce the soy proteinaceous food ingredient having reduced levels of flatulence-inducing

09546450.05494560

31-61

oligosaccharides and conserved levels of isoflavones as compared to levels present in the crude soy material.

17. The food ingredient described in claim 16, wherein the source of glycosidase activity and the lactic acid producing culture are added to the aqueous crude soy material at essentially the same time.

18. The food ingredient described in claim 16, wherein the source of glycosidase activity is added to the aqueous crude soy material before the lactic acid producing culture is added.

19. The food ingredient described in claim 17, wherein the flatulence-inducing oligosaccharides comprise raffinose, stachyose, or mixtures thereof; where the crude soy material is soy flour, soy grits, soy milk, or mixtures thereof; wherein the source of glycosidase activity is an alpha-galactosidase enzyme; and wherein the lactic acid-producing culture is chosen from the group consisting of *Streptococcus cremoris*, *Streptococcus lactis*, *Streptococcus durans*, *Leuconostoc cremoris*, *Streptococcus diacetylactis*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus casei*, *Lactobacillus helveticus*, *Streptococcus faecalis*, *Streptococcus thermophilus*, *Leuconostoc citrovorum*, and mixtures thereof.

20. The food ingredient described in claim 18, wherein the flatulence-inducing oligosaccharides comprise raffinose, stachyose, or mixtures thereof; where the crude soy material is soy flour, soy grits, soy milk, or mixtures thereof; wherein the source of glycosidase activity is an alpha-galactosidase enzyme; and wherein the lactic acid-producing culture is chosen from the group consisting of *Streptococcus cremoris*, *Streptococcus lactis*, *Streptococcus durans*, *Leuconostoc cremoris*, *Streptococcus diacetylactis*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus casei*,

000140-05494560

27-8
62

Docket No. 65512

Lactobacillus helveticus, *Streptococcus faecalis*, *Streptococcus thermophilus*,
Leuconostoc citrovorum, and mixtures thereof.

09546450-041000

33
63

LOW-COST SOY PROTEINACEOUS FOOD INGREDIENTS

ABSTRACT

This invention discloses a method for preparing a lactic acid fermented soy proteinaceous food ingredient having reduced levels of those oligosaccharides that lead to abdominal discomfort due to gas production when ingested by a mammal, compared to the levels present in crude soy materials. The method employs a source of glycosidase activity that is effective to hydrolyze the oligosaccharides to a fermentable saccharide; and a lactic fermentation to provide the ingredient. The invention additionally discloses a process for preparing a food product containing the lactic acid fermented soy proteinaceous food ingredient. Examples of food products which may be provided include process cheeses, cottage cheese, cream cheeses, yogurts, puddings, pastas, meat products, meat substitutes, tofu, cereals, and beverages.

000740 05494560

DECLARATION
FOR UTILITY OR DESIGN
PATENT APPLICATION

☒ Declaration Submitted With Initial Filing ☐ Declaration Submitted After Initial Filing

Attorney Docket No.: 65512
First Named Inventor: Richard S. Silver
Application Number:
Filing Date: Herewith
Group Art Unit:
Examiner Name:

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

LOW-COST SOY PROTEINACEOUS FOOD INGREDIENTS

(Title of Invention)

the specification of which:

(X) is attached hereto, or

() was filed by an authorized person on my behalf on _____ (Date)
as United States Application Number _____
or PCT International Application Number _____
and was amended on _____ (if applicable).
(Date)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below, and I have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or any PCT international application, on this invention filed by me or my legal representatives or assigns and having a filing date before that of the application on which priority is claimed:

4
35

Prior Foreign Application Number(s)	Country	Foreign Filing Date	Priority Not Claimed	Certified Copy Attached	
				Yes	No
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet attached hereto.

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below:

Provisional Application
Number(s)

Provisional Application
Filing Date

☐ Additional provisional application numbers are listed on a supplemental priority data sheet attached hereto.

I hereby claim the benefit under Title 35, United States Code, §120, of any prior United States application(s), or under §365(c) of any PCT international application(s) designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose all information known by me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56, which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

Prior U.S. Application Number	Prior PCT International Application Number	Filing Date of U.S. or PCT International Application	Patent Number (if applicable)
----------------------------------	--	---	----------------------------------

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet attached hereto.

As a named inventor, I hereby appoint the practitioners associated with Customer Number 22242, with full power of substitution and revocation, to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith, and request that all correspondence and telephone calls in respect to this application be directed to FITCH, EVEN, TABIN & FLANNERY, Suite 1600, 120 South LaSalle

66 85
JF

Street, Chicago, Illinois 60603-3406, Telephone No. (312) 577-7000
Facsimile No. (312) 577-7007, CUSTOMER NUMBER 22242.



I hereby declare that all statements made herein of my own knowledge are true, and that all statements made herein on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity or enforceability of the application or any patent issued thereon.

000110.041000
9546450

Full name of sole or one joint inventor:

Richard S. Silver
(Given names first, with Family name last)

Inventor's signature:

Richard S. Silver

Date:

4-5-2000

Residence:

Wilmette, Illinois
(City and State for U.S. Residents;
City and Country for others)

Post Office Address:

828 Leyden Lane
Wilmette, IL 60091

Citizenship:

United States

Full name of sole or one joint inventor:

(Given names first, with Family name last)

Inventor's signature:

Date:

Residence:

(City and State for U.S. Residents;
City and Country for others)

Post Office Address:

Citizenship:

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Richard S. Silver

Appln. No.:

Filed: HEREWITH

For: LOW-COST PROTEINACEOUS
FOOD INGREDIENTS

Group Art Unit:

Examiner:

)
) CERTIFICATE OF MAILING BY "EXPRESS MAIL"
) "Express Mail" Mailing Label Number

) EL528417580M
) Date of Deposit 04-10-2000
) I hereby certify that this paper or fee is
) being deposited with the United States Postal
) Service "Express Mail Post Office to
) Addressee" Service under 37 CFR §1.10 on the
) date indicated above and is addressed to the
) Commissioner of Patents and Trademarks,
) Washington, D.C. 20231.

) EP PRICE
) (Typed or printed name of person mailing)


(Signature of person mailing)

ASSOCIATE POWER OF ATTORNEY

Commissioner of Patents and Trademarks
ATTENTION: Assistant Commissioner
for Patents
Washington, D.C. 20231

Dear Sir:

The undersigned attorney-of-record in the above-identified patent application hereby appoints the following as Associate Attorneys in connection with said application to prosecute said application and to transact all business in the Patent and Trademark Office connected therewith:

<u>Attorney</u>	<u>Registration No.</u>
Thomas R. Savoie	25,259
Joseph T. Harcarik	26,904
Thomas A. Marcoux	29,826
Debbie K. Wright	33,817

All communications with respect to said application should be directed to FITCH, EVEN, TABIN & FLANNERY, 120 South LaSalle Street, Suite 1600, Chicago, Illinois 60603-3406, Telephone No. (312) 577-7000.

April 10, 2000
(Date)


Richard A. Kaba
Registration No. 25,747

68
38
68

REIVINDICACIONES

1. Un método para preparar un ingrediente alimenticio proteínico de soya fermentado con ácido láctico, que tiene niveles reducidos de los oligosacáridos que inducen la flatulencia y niveles conservados de isoflavonas; el método incluye los siguientes pasos:

(a) tomar un material de soya crudo acuoso que contenga proteína de soya, oligosacáridos que inducen la flatulencia e isoflavonas;

(b) tratar simultáneamente el material de soya crudo acuoso con (1) una fuente de actividad de glicosidasa efectiva para hidrolizar los oligosacáridos que inducen la flatulencia en sacáridos fermentables y (2) un cultivo productor de ácido láctico que fermenta los sacáridos fermentables,

en el cual el tratamiento simultáneo se lleva a cabo en condiciones que promuevan la actividad de glicosidasa y la fermentación del ácido láctico para producir el ingrediente alimenticio proteínico de soya con niveles reducidos de los oligosacáridos que inducen la flatulencia y niveles conservados de isoflavonas, en comparación con los niveles presentes en el material de soya crudo.

2. El método descrito en la Reivindicación 1, en el cual la fuente de actividad de glicosidasa y el cultivo productor de ácido láctico se agregan al material de soya crudo acuoso esencialmente al mismo tiempo.

3. El método descrito en la Reivindicación 1, en el cual la fuente de actividad de glicosidasa se agrega al material de soya crudo acuoso antes de agregar el cultivo productor de ácido láctico.

4. El método descrito en la Reivindicación 1, en el cual los oligosacáridos que inducen la flatulencia incluyen la rafinosa, la estaquiosa y/o mezclas de las mismas.
5. El método descrito en la Reivindicación 1, en el cual la composición de soya cruda es harina de soya, soya semimolida o mezclas de las mismas.
6. El método descrito en la Reivindicación 1, en el cual la fuente de actividad de glicosidasa es una fuente de actividad de alfa-galactosidasa, una fuente de actividad de beta-fructosidasa o mezclas de las mismas.
7. El método descrito en la Reivindicación 6, en el cual la fuente de actividad de glicosidasa es una enzima de alfa-galactosidasa, y la fuente de actividad de beta-fructosidasa es una enzima de beta-fructosidasa.
8. El método descrito en la Reivindicación 7, en el cual la enzima de alfa-galactosidasa se obtiene de una cepa de *Aspergillus*, de *Monascus*, de *Bacillus*, de *Mortierella*, de *Penicillia* y de *Saccharomyces*.
9. El método descrito en la Reivindicación 7, en el cual la enzima de beta-fructosidasa se obtiene de zanahorias, alcachofas de Jersualén, *Saccharomyces cerevisiae*, *Fusarium oxysporum* o *Bacillus stearothermophilus*.
10. El método descrito en la Reivindicación 1, en el cual el cultivo productor de ácido láctico se selecciona entre el grupo formado por *Streptococcus cremoris*, *Streptococcus lactis*, *Streptococcus durans*, *Leuconostoc cremoris*, *Streptococcus diacetylactis*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus casei*, *Lactobacillus helveticus*, *Streptococcus faecalis*, *Streptococcus thermophilus*, *Leuconostoc citrovorum* y mezclas de los mismos.

20
18
70

11. El método descrito en la Reivindicación 1, el cual comprende, además, el paso de incorporar el ingrediente alimenticio proteínico de soya a una composición alimenticia.

12. El método descrito en la Reivindicación 11, en el cual la composición alimenticia es un queso procesado, un queso campesino, un queso crema, un yogurt, un pudín, una pasta, un producto cárnico, un sustituto de la carne, un tofu, un cereal o una bebida.

13. Un ingrediente alimenticio proteínico de soya fermentado con ácido láctico que comprende una composición preparada a partir de un material de soya crudo que tiene (1) niveles reducidos de los oligosacáridos que inducen la flatulencia y que producen incomodidad abdominal debido a la producción de gases al ser ingerido por un mamífero monogástrico, en el cual los niveles son reducidos en comparación con los niveles presentes en el material de soya crudo y (2) la mayor parte o esencialmente todas las isoflavonas presentes en el material de soya crudo.

14. El ingrediente alimenticio descrito en la Reivindicación 13, en el cual los oligosacáridos que inducen la flatulencia presentes en el ingrediente alimenticio se reducen en por lo menos un 20 por ciento del nivel presente en el material de soya crudo.

15. El ingrediente alimenticio descrito en la Reivindicación 13, en el cual los oligosacáridos que inducen la flatulencia presentes en el ingrediente alimenticio se reducen en por lo menos un 50 por ciento del nivel presente en el material de soya crudo.

16. El ingrediente alimenticio descrito en la Reivindicación 13, en el cual la composición se prepara mediante un proceso que comprende:

(a) tomar un material de soya crudo acuoso que contenga proteína de soya, oligosacáridos que inducen la flatulencia e isoflavonas; y

4/1/71

(b) tratar simultáneamente el material de soya crudo acuoso con (1) una fuente de actividad de glicosidasa efectiva para hidrolizar los oligosacáridos que inducen la flatulencia en sacáridos fermentables y (2) un cultivo productor de ácido láctico que fermenta los sacáridos fermentables,

y en el cual el tratamiento simultáneo se lleva a cabo en condiciones que promuevan la actividad de glicosidasa y la fermentación del ácido láctico para producir el ingrediente alimenticio proteínico de soya con niveles reducidos de los oligosacáridos que inducen la flatulencia y niveles conservados de isoflavonas, en comparación con los niveles presentes en el material de soya crudo.

17. El método descrito en la Reivindicación 16, en el cual la fuente de actividad de glicosidasa y el cultivo productor de ácido láctico se agregan al material de soya crudo acuoso esencialmente al mismo tiempo.

18. El método descrito en la Reivindicación 16, en el cual la fuente de actividad de glicosidasa se agrega al material de soya crudo acuoso antes de agregar el cultivo productor de ácido láctico.

19. El ingrediente alimenticio descrito en la Reivindicación 17, en el cual los oligosacáridos que inducen la flatulencia incluyen rafinosa, estaquiosa o mezclas de las mismas, en el cual el material de soya crudo es harina de soya, soya semimolida, leche de soya o mezclas de las mismas, en el cual la fuente de actividad de glicosidasa es una enzima de alfa-galactosidasa, y en el cual el cultivo productor de ácido láctico se selecciona entre el grupo formado por *Streptococcus cremoris*, *Streptococcus lactis*, *Streptococcus durans*, *Leuconostoc cremoris*, *Streptococcus diacetylactis*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus casei*, *Lactobacillus helveticus*,

72
72

Streptococcus faecalis, *Streptococcus thermophilus*, *Leuconostoc citrovorum* y mezclas de los mismos.

20. El ingrediente alimenticio descrito en la Reivindicación 18, en el cual los oligosacáridos que inducen la flatulencia incluyen rafinosa, estaquiosa o mezclas de las mismas, en el cual el material de soya crudo es harina de soya, soya semimolida, leche de soya o mezclas de las mismas, en el cual la fuente de actividad de glicosidasa es una enzima de alfa-galactosidasa, y en el cual el cultivo productor de ácido láctico se selecciona entre el grupo formado por *Streptococcus cremoris*, *Streptococcus lactis*, *Streptococcus durans*, *Leuconostoc cremoris*, *Streptococcus diacetylactis*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus casei*, *Lactobacillus helveticus*, *Streptococcus faecalis*, *Streptococcus thermophilus*, *Leuconostoc citrovorum* y mezclas de los mismos.

2do. EXAMEN DE FORMA PATENTE DE INVENCION

Folio ~~73~~

Radicación No 01 -27893

Concepto Técnico no 1712 Clasificación Internacional de Patentes: A23 L 1/20

Practicado el examen de acuerdo a lo establecido en el Art. 38 de la Decisión 486 se determinó que esta solicitud de **Patente de Invención**:

- | | |
|--|--|
| SI ☒] NO ☐] | Contiene un resumen de la invención (Art.26-e). |
| SI ☒] NO ☐] | Contiene el título o nombre de la invención (Art.27-d). |
| SI ☒] NO ☐] | Contiene la descripción de la invención (Art.26-b). |
| SI ☐] NO ☐] | NO ES APLICABLE ☒ Contiene los dibujos necesarios para comprender la invención (Art.26-d) |
| SI ☒] NO ☐] | Contiene una o más reivindicaciones. (Art.26-c). |
| SI ☐] NO ☒] | NO ES APLICABLE ☐ Han sido desarrollados los productos y/o procedimientos a partir de recursos genéticos o de sus productos derivados de los que cualquiera de los Países Miembros es país de origen. (Art. 26- h). |
| SI ☐] NO ☒] | NO ES APLICABLE ☐ Los productos y/o procedimientos han sido obtenidos o desarrollados a partir de los conocimientos tradicionales de las comunidades indígenas, afroamericanas, o locales de los países miembros, de acuerdo a lo establecido en la Decisión 391 y sus modificaciones y reglamentaciones vigentes.(Art.26-i). |
| SI ☐] NO ☒] | La Invención se refiere a un producto relativo a un material biológico. (Art.26-j). |
| SI ☒] NO ☐] | NO ES APLICABLE ☐ La prioridad coincide con la materia reivindicada. |
| SI ☒] NO ☐] | CUMPLE LOS REQUISITOS TÉCNICOS |

OBSERVACIONES Y OTROS:

EXAMINADOR TÉCNICO
202043

Bogotá D. C., 2002- 08-27

2020
Bogotá D.C.

Doctor
JERÓNIMO CASTILLO BONILLA
Apoderado

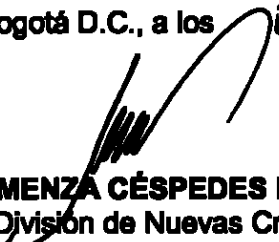
REFERENCIA:	Radicación No.	01-27893
	Trámite	002
	Evento	001
	Actuación	416
	Oficio No.	1712
	Folios	001

Teniendo en cuenta que la solicitud de privilegio de patente que se tramita bajo el expediente indicado en la referencia, reúne los requisitos de forma establecidos en los artículos 26 y 27 de la Decisión 486 de la Comisión de la Comunidad Andina, y en las demás disposiciones vigentes sobre la materia, se envía el extracto de la solicitud a la Oficina de Comunicaciones para efecto de su publicación en la Gaceta de Propiedad Industrial, conforme lo establece el artículo 40 de la misma Decisión.

Siendo manifestación expresa del interesado, la solicitud no será publicada antes de los 18 meses contados a partir de la fecha de presentación de la solicitud, esto es a partir del día 9 de octubre de 2002.

Cúmplase

Dado en Bogotá D.C., a los 09 de SET. de 2002


ALIX CARMENZA CÉSPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones

Bogotá, DC, Dic - 2002. El extracto de esta solicitud fue publicado en el número 522 de la Gaceta de Propiedad Industrial, de fecha 28-11-2002. El término hábil señalado por la ley expiró el y SI NO se presentaron oposiciones por parte de terceros.

3