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dans le fascicule de brevet.

Europäisches Patent Nr.

European patent No.

Brevet européen n°

2378899

Patentinhaber

Proprietor of the patent

Titulaire du brevet

Holista Biotech Sdn. Bhd.
Unit 1201, 12th Floor
Amcorp Trade Centre
PJ Tower
No.18 Persiaran Barat
Off Jalan Timur
Petaling Jaya, Selangor 46200/MY

München, den
Munich,
Fait à Munich, le

27.03.13



Benoît Battistelli

Präsident des Europäischen Patentamts
President of the European Patent Office
Président de l'Office européen des brevets

(19)



(11)

EP 2 378 899 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
27.03.2013 Bulletin 2013/13

(51) Int Cl.:
A23L 1/29^(2006.01) A21D 2/36^(2006.01)
A23L 1/10^(2006.01)

(21) Application number: **09836435.9**

(86) International application number:
PCT/MY2009/000001

(22) Date of filing: **02.01.2009**

(87) International publication number:
WO 2010/077127 (08.07.2010 Gazette 2010/27)

(54) PRODUCT TO REDUCE GLYCEMIC RESPONSE OF CARBOHYDRATE BASED FOODS

PRODUKT ZUR MINDERUNG DER GLYKÄMISCHEN REAKTION AUF NAHRUNGSMITTEL AUF DER BASIS VON KOHLENHYDRATEN

PRODUIT POUR REDUIRE LA REPOSE GLYCEMIQUE D'ALIMENTS A BASE D'HYDRATE DE CARBONE

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR

(74) Representative: **Dilg, Haeusler, Schindelmann Patentanwalts-gesellschaft mbH Leonrodstraße 58 80636 München (DE)**

(43) Date of publication of application:
26.10.2011 Bulletin 2011/43

(56) References cited:
WO-A1-2008/047873 CN-A- 1 973 682

(73) Proprietor: **Holista Biotech Sdn. Bhd. Petaling Jaya, Selangor 46200 (MY)**

- **PATENT ABSTRACTS OF JAPAN & JP 2006 212025 A (AMIKKU GROUP KK) 17 August 2006**
- **PATENT ABSTRACTS OF JAPAN & JP 11 000128 A (ASUZATSUKU FOODS KK) 06 January 1999**
- **DATABASE CAPLUS XP008156982 Database accession no. 2009:54368 & CN 101 341 946 A (PEOP. REP CHINA) 14 January 2009**
- **DATABASE CAPLUS LIU, FANG ET AL.: 'Carbohydrate digestion rate of Adzuki bean-rice mixed food in vitro', XP008158955 Database accession no. 2008:565083 & ZHONGGUO SHIPIN XUEBAO. vol. 7, no. 2, 2007, pages 42 - 47**

(72) Inventors:
• **HENRY, Christiani, Jeya, Kumar Oxford OX2 8EN (GB)**
• **MANICKAVASAGAR, M., Rajendran, V. Selangor 47300 (MY)**

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Description

FIELD OF INVENTION

5 [0001] This invention relates to a pre-mixed flour containing carbohydrate rich source of edible parts of plants to lower the glycemic response in humans when the mixture is incorporated into any carbohydrate based food.

BACKGROUND OF INVENTION

10 [0002] The excessive consumption of refined grains and grain extracts has been reported to increase blood sugar and deteriorate glucose tolerance. The inability of the human body to maintain normal glucose levels or to require excessive levels of insulin to do so has been called glucose intolerance, impaired glucose tolerance and insulin resistance. Insulin resistance is a condition in which the body insulin receptors are insensitive to insulin. These conditions are associated with obesity and may be preliminary steps in the progression to type-2 diabetes mellitus. It has also been

15 linked to alteration in blood lipid and part of a wide syndrome of metabolic disorders called "Syndrome X".
 [0003] The Glycemic Index or GI is a measure of the effects of carbohydrates on blood glucose levels. It can be used, in conjunction with information about food composition, to guide food choices. Carbohydrates that break down rapidly during digestion releasing glucose rapidly into the bloodstream have a high GI; carbohydrates that break down slowly, releasing glucose gradually into the bloodstream, have a low GI. Foods with a low GI have significant health benefits.
 20 The concept was developed by Dr. David J. Jenkins and colleagues in 1980-1981 at the University of Toronto in their research to find out which foods were best for people with diabetes. A lower GI suggests slower rates of digestion and absorption of the sugars and starches in the foods. The GI of a food is defined by the Area Under the Blood Glucose Response Curve (AUC) following the ingestion of a fixed portion of carbohydrate (usually 50 g). The AUC of the test food is divided by the AUC of a standard (either glucose or white bread, giving two different definitions) and multiplied

25 by 100.
 [0004] For practical application, the GI is useful to rank foods by developing exchange lists of categories of low glycemic index foods, such as legumes, pearled barley, lightly refined grains (e.g. whole grain pumpernickel bread, or breads made from coarse flour), pasta, etc. Specific local foods could be included in such lists where information is available (e.g. green bananas in the Caribbean and specific rice varieties in Southeast Asia).

30 [0005] The current validated methods use glucose as the reference food, giving it a GI value of 100 by definition. This has the advantage that it is universal and it results in maximum GI values of approximately 100. White bread can also be used as a reference food, giving a different set of GI values. A low GI food will release glucose more slowly and steadily. A high GI food causes a more rapid rise in blood glucose levels and is suitable for energy recovery after endurance exercise or for a person with diabetes experiencing low blood sugar. The glycemic effect of food depends
 35 on a number of factors, such as the type of starch (amylose vs. amylopectin), physical entrapment of the starch molecules within the food, fat and protein content of the food and organic acids or their salts in the meal. Adding vinegar, for example, will lower the GI. The presence of fat or soluble dietary fibers can slow the gastric emptying rate thus lowering the GI. Unrefined breads with higher amounts of fiber generally have a lower GI value than white breads. Many brown breads, however, are treated with enzymes to soften the crust, which makes the starch more accessible and thus more
 40 acceptable to consumers. This raises the GI, with some brown breads even having GI values over 100.

[0006] Meals containing low GI foods reduce both postprandial blood glucose and insulin responses. Animal studies suggest that incorporating slowly digested starch into the diet delays the onset of insulin resistance. Some epidemiologic studies suggest that a low GI diet is associated with reduced risk of developing non-insulin diabetes in men and women. Clinical trials in normal, diabetic and hyperlipidemic subjects show that low GI diets reduce mean blood glucose concentrations, reduce insulin secretion and reduce serum triglycerides in individuals with hypertriglyceridemia.
 45

[0007] Okra is occasionally referred to by the synonym, *Abelmoschus esculentus* L. or formerly known as *Hibiscus esculentus*. It is commonly consumed as vegetable and is often called lady's finger. Urad, also referred to as urad dhal, urd bean, urd, urid, black matpe bean, black gram, or white lentil (*Vigna mungo*), is a bean grown in southern Asia.

50 [0008] Patent number DE202004017554U discloses an antidiabetic dietetic nutritional supplement comprising processed *Hibiscus* species plant material. Independent claims are also included for aqueous preparations obtained by boiling fresh okra provided in unit packaging with indication of suitability for therapy of diabetes diseases. The unit packaging also contains the processed plant material. The disadvantages of the invention can be seen in the aqueous form of the supplement in which the taste and colour of Okra makes the dietetic nutritional supplement not suitable for daily consumption.

55 [0009] Patent number CN101341946 discloses a pulverised vigna blend to produce noodles with an altered glycemic response.

[0010] The publication from Liu, Fang et al., ("Carbohydrate digestion rate of Adzuki bean-rice mixed food in vitro", Zhongguo Shipin Xuebao, 2007, n°2, pages 42-47 discloses a blended rice and vigna (adzuki bean) food effective in

the altering of glycemic response.

[0011] The present invention discloses a preparation of pre-mixed flour consisting edible Okra plant in combination with carbohydrate rich cereal and carbohydrate based food to reduce the glycemic index (GI) of carbohydrate based food which shows significant GI value after consumption. A ready to eat mixture of edible Okra plant and carbohydrate rich cereal incorporated in human daily diet could comply to the needs and current trend for consumption of organic based supplementary products. One of the problems in producing a GI reducing food is the preparation of food which is acceptable for personal consumption in respect of taste, texture, colour and aroma. If any of these characteristics are unacceptable, then the food preparation likely is not well received by the public. The present invention has been prepared for daily consumption and is suitable for human of all age group.

SUMMARY OF THE INVENTION

[0012] The invention relates to the use of a pre-mixed flour containing mixture of pulverized edible parts of edible Okra plant species with pulverized edible parts of edible *Vigna* plant species and one or more types of food based carbohydrate selected from cereals or non-cereals or a mixture of both, for the preparation of food to reduce glycemic response of humans who consume the food.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 shows the Incremental Area Under the Blood Glucose Response Curve (IAUC). The curve shows the glycemic response of a typical wheat based food for example, Chapatti* in a controlled meal (without Okra and Urad dhal) and one meal used as treatment containing Okra and Urad dhal. The trial was performed on 6 subjects, according to the protocol from the Food and Agricultural Organization of the United Nations (FAO) The response was monitored for 120 minutes in which the glucose level decreased in the patient after 45 minutes.

Fig. 2 shows the comparison between the GI value of Chapatti with Okra and Urad dhal (treatment) and Chapatti without the formulation (Control). The GI value for the controlled chapatti is almost 90.0 and the GI for the formulated chapatti is 50.0.

*Chappati is an unleavened thin and round Indian bread made of wheat flour.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0014] The Okra seeds and pods as well as Urad dhal contain mainly polysaccharides comprising sugars such as galactose, galactomannan, rhamnose and galacturonic acid. The presence of galactomannan in edible and non-edible Okra plant contributes to the mucilage in its fruits. The mucilage in edible Okra plant is one of the important factor in reducing the GI in carbohydrate based food.

[0015] The glycemic index is defined as the Incremental Area Under The Blood Glucose Response Curve ($\Delta\text{IAUC}_{\text{food}}$) of a 50 g carbohydrate portion of a test food expressed as a percent of the response to the same amount of carbohydrate from a standard food taken by the same subject.

[0016] The invention relates to the use of pulverized edible parts of edible Okra plant, especially the fruit in combination with pulverized edible parts of edible Urad (*Vigna*) plant species especially the seed or the pod or a mixture of both by incorporating into food based carbohydrate selected from cereal based foods and non-cereal based foods. The Okra plant used in the invention belongs to one or more types of the commonly edible *Abelmoschus* species such as *Abelmoschus esculentus* and *Abelmoschus caillei*, in combination with Urad dhal or black gram (*Vigna mungo*) or other types of edible *Vigna* species such as green gram (*Vigna radiata*) and red bean (*Vigna angularis*). The edible parts of edible Okra plant preferably the fruit and seed which has been either sun-dried or oven-dried are pulverized to form its flour. Similar to Okra, the edible parts of edible Urad plant preferably the leguminous pod and seed or commonly called as dhal is sun-dried or oven-dried and will be deskinning or skinned before being pulverized to form its flour. The edible Okra flour and edible Urad flour will then be combined with cereal based food such as rice flour, wheat flour and corn flour or with non-cereal based food such as potato, cassava and sago to prepare a pre-mixed flour. The pre-mixed flour will then be a ready-to-cook food such as chappati, bread, pizza, noodles and cake in order to reduce the glycemic response upon consumption. The low glycemic index will reduce the speed at which the blood glucose level will increase and there is consequently no sugar surge which leads to weight gain or increase of blood lipids which in turn leads to high cholesterol and reduction of alertness.

[0017] Cereal based flour such as rice flour, corn flour and wheat flour and non-cereal based flour such as potato

flour, cassava flour and sago flour which has high glycemic value are added with 1.5 % by weight of edible Okra flour in combination with 3% by weight of edible Urad flour. The mixture of pulverized edible parts of edible Okra plant especially the fruit and the pulverized edible parts of edible Urad plant can be prepared separately as an intermediate product which is incorporated with a ready-to-cook cereal based or non-cereal based product. Nevertheless, the food based carbohydrate from cereal based flour should have less than 10% by weight of pulverized edible parts of edible Okra plant in combination of pulverized edible parts of edible Urad dhal flour and food based carbohydrate from non-cereal based flour should have less than 30% by weight of pulverized edible parts of edible Okra plant in combination of pulverized edible parts of edible Urad dhal flour for the preparation of the pre-mixed flour. The carbohydrate based cereal or non-cereal food which incorporates with edible Okra flour and edible Urad dhal flour will minimally change the original taste, aroma, texture and colour of the finished product. The carbohydrate based food used in the embodiment is Chappati which is produced from cereal based flour. Such combination has been used to test the glycemic index of wheat based bread. The formulation has reduced the wheat based food from a GI value of 90 to a GI value of 50.

[0018] The average GI value is calculated from data collected in 6 human subjects. Both the standard and test food must contain an equal amount of available carbohydrate. The result gives a relative ranking for each tested food. The 6 human subjects were served with chappati (a carbohydrate based food made of wheat flour) **without** pulverized edible Okra fruit and pulverized deskinnd Urad dhal and were taken as a control study to monitor the Area Under the Blood Glucose Response Curve (AUC) and Glycemic Index (GI) in each individuals. The AUC and GI of the subjects are shown as below in Table 1 and 2.

20

Table 1

Subject	1			2			3		
	Time (Mins)	Glucose Level (mmol/l)	Deviation	Time (Mins)	Glucose Level (mmol/l)	Deviation	Time (Mins)	Glucose Level (mmol/l)	Deviation
	0	5.0		0	4.9		0	5.0	
	15	5.2	0.2	15	4.7	0.2	15	5.0	0.0
	30	6.8	1.8	30	6.6	1.7	30	6.8	1.8
	45	7.3	2.3	45	6.9	2.0	45	7.9	2.9
	60	7.2	2.2	60	7.3	2.4	60	8.2	3.2
	90	5.6	0.6	90	6.8	1.9	90	6.2	1.2
	120	5.5	0.5	120	5.0	0.1	120	4.3	0.7
	AUC		139.5	AUC		166.7	AUC		171.9
	GI		72.4	GI		89.0	GI		118.3

35

Table 2

Subject	4			5			6		
	Time (Mins)	Glucose Level (mmol/l)	Deviation	Time (Mins)	Glucose Level (mmol/l)	Deviation	Time (Mins)	Glucose Level (mmol/l)	Deviation
	0	5.2		0	5.1		0	5.0	
	15	5.5	0.3	15	5.5	0.4	15	4.5	0.5
	30	6.7	1.5	30	7.4	2.3	30	5.7	0.7
	45	6.1	0.9	45	7.6	2.5	45	7.1	2.1
	60	5.3	0.1	60	7.3	2.2	60	7.0	2.0
	90	5.7	0.5	90	5.1	0.0	90	6.8	1.8
	120	5.4	0.2	120	5.6	0.5	120	5.9	0.9
	AUC		60.8	AUC		135.0	AUC		152.3
	GI		43.309	GI		132.5	GI		79.1

55

[0019] The AUC of the subjects who consumed chappati without pulverized edible Okra fruit and pulverized deskinnd Urad dhal (controlled study) is shown in Table 3.

Table 3

Subject	AUC
1	139.5
2	166.7
3	171.9
4	60.8
5	135.0
6	152.3
Mean	137.7
SD	40.4
SEM	16.8

[0020] The Incremental Area Under the Blood Glucose Response Curve (IAUC) value of the subjects who consumed chappati **without** pulverized edible Okra fruit and pulverized deskinnd Urad dhal (controlled study) is shown in Table 4. The mean value IAUC against time for the controlled study is shown in the graph in Fig. 1.

Table 4

Controlled (Chappati without pulverized Urad dhal and pulverized Okra fruit)									
Time (mins)	Subject						IAUC		
	1	2	3	4	5	6	Mean	SD	SE
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.2	-0.2	0.0	0.3	0.4	-0.5	0.0	0.3	0.1
30	1.8	1.7	1.8	1.5	2.3	0.7	1.6	0.5	0.2
45	2.3	2.0	2.9	0.9	2.5	2.1	2.1	0.7	0.3
60	2.2	2.4	3.2	0.1	2.2	2.0	2.0	1.0	0.4
90	0.6	1.9	1.2	0.5	0.0	1.8	1.0	0.8	0.3
120	0.5	0.1	-0.7	0.2	0.5	0.9	0.3	0.5	0.2

[0021] The GI value of the subjects who consumed chappati **without** pulverized edible Okra fruit and pulverized deskinnd Urad dhal (controlled study) is shown in Table 5. The mean value of GI for the **controlled study** is shown in the graph in Fig. 2.

Table 5

Subject	GI value
1	72.4
2	89.0
3	118.3
4	43.3
5	132.5
6	79.1
Mean	89.1
SD	32.3

(continued)

Subject	GI value
SEM	13.5

5

[0022] After an interval of 2 to 3 days after conducting the controlled study, the same 6 human subjects as used previously were served with chappati added with pulverized edible Okra fruit and pulverized deskinning Urad dhal and were taken as treatment study to monitor the AUC and GI in each individuals. The AUC and GI of the subjects are shown as below in Table 6 and 7.

10

Table 6

Subject	1			2			3		
	Time (Mins)	Glucose Level (mmol/l)	Deviation	Time (Mins)	Glucose Level (mmol/l)	Deviation	Time (Mins)	Glucose Level (mmol/l)	Deviation
	0	5.0		0	4.9		0	5.0	
	15	5.2	0.2	15	4.8	0.1	15	5.3	0.3
	30	5.3	0.3	30	5.9	1.0	30	6.9	1.9
	45	6.8	1.8	45	6.4	1.5	45	8.3	3.3
	60	7.0	2.0	60	5.8	0.9	60	7.3	2.3
	90	5.7	0.7	90	4.5	0.4	90	6.0	1.0
	120	5.5	0.5	120	5.3	0.4	120	5.5	0.5
	AUC		108.0	AUC		55.9	AUC		171.8
	GI		49.8	GI		27.2	GI		82.4

30

Table 7

Subject	4			5			6		
	Time (Mins)	Glucose Level (mmol/l)	Deviation	Time (Mins)	Glucose Level (mmol/l)	Deviation	Time (Mins)	Glucose Level (mmol/l)	Deviation
	0	5.3		0	4.9		0	5.0	
	15	5.3	0.0	15	4.5	0.4	15	4.8	0.2
	30	6.5	1.2	30	5.7	0.8	30	6.3	1.3
	45	7.1	1.8	45	6.6	1.7	45	6.8	1.8
	60	6.6	1.3	60	6.0	1.1	60	7.2	2.2
	90	5.8	0.5	90	5.4	0.5	90	6.9	1.9
	120	6.3	1.0	120	4.7	0.2	120	6.5	1.5
	AUC		104.3	AUC		73.1	AUC		174.2
	GI		54.1	GI		50.3	GI		55.4

50

[0023] The AUC of the subjects who consumed chappati with pulverized edible Okra fruit and pulverized deskinning Urad dhal (controlled study) is shown in Table 8.

Table 8

55

Subject	AUC
1	108.0
2	55.9
3	171.8

(continued)

Subject	AUC
4	104.3
5	73.1
6	174.2
Mean	114.5
SD	49.3
SEM	15.6

[0024] The Incremental Area Under the Blood Glucose Response Curve (IAUC) value of the subjects who consumed chappati **with** pulverized edible Okra fruit and pulverized deskinned Urad dhal (treatment study) is shown in Table 9. The mean value of IAUC against time for the treatment study is also shown in the graph in Fig. 1.

Table 9

Treatment (Chappati with pulverized Urad dhal and pulverized Okra fruit)									
Time (mins)	Subject						IAUC		
	1	2	3	4	5	6	mean	SD	SE
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.2	-0.1	0.3	0.0	-0.4	-0.2	0.0	0.3	0.1
30	0.3	1.0	1.9	1.2	0.8	1.3	1.1	0.5	0.2
45	1.8	1.5	3.3	1.8	1.7	1.8	2.0	0.7	0.3
60	2.0	0.9	2.3	1.3	1.1	2.2	1.6	0.6	0.3
90	0.7	-0.4	1.0	0.5	0.5	1.9	0.7	0.8	0.3
120	0.5	0.4	0.5	1.0	-0.2	1.5	0.6	0.6	0.2

[0025] The GI value of the subjects who consumed chappati added **with** pulverized edible Okra fruit and pulverized deskinned Urad dhal (treatment study) are shown in Table 10. The mean value of GI for the **treatment study** is shown in the graph in Fig. 2.

Table 10

Subject	GI value
1	49.8
2	27.2
3	82.4
4	54.1
5	50.3
6	55.4
Mean	53.2
SD	17.6
SEM	7.3

[0026] The study was conducted in using chapatti, a carbohydrate based food made of wheat flour. Besides that, the pulverized edible part of Okra plant and edible part of *Vigna* plant species can also be added into carbohydrate based food such as bread, cake, pizza and noodles selected from cereal or non-cereal based plant source.

Claims

1. A use of a pre-mixed flour containing mixture of pulverized edible parts of edible Okra plant species with pulverized edible parts of edible *Vigna* plant species and one or more types of food based carbohydrate selected from cereals or non-cereals or a mixture of both, for the preparation of food to reduce glycemic response of humans who consume the food.
2. The use of a pre-mixed flour as claimed in claim 1 wherein the pulverized edible parts of edible Okra plant species is fruit.
3. The use of a pre-mixed flour as claimed in claim 1 wherein the pulverized edible Okra plant species is *Abelmoschus esculentus* or *Abelmoschus caillei* or a mixture of two or more.
4. The use of a pre-mixed flour as claimed in claim 1 wherein the pulverized edible *Vigna* plant species is *Vigna mungo*, *Vigna radiata* or *Vigna angularis* or a mixture of two or more.
5. The use of pre-mixed flour as claimed in claim 1 wherein the pulverized edible parts of *Vigna* plant species are pods or seeds or any combination thereof.
6. The use of pre-mixed flour as claimed in claim 5 wherein the seeds are deskinned.
7. The pre-mixed flour as claimed in claim 1, containing less than 10% by weight of pulverized edible parts of edible Okra plant species in combination pulverized edible part of edible *Vigna* plant species.
8. The pre-mixed flour as claimed in claim 1, wherein the pre-mixed flour with non-cereal based flour has less than 30% by weight of pulverized edible parts of edible Okra plant species in combination pulverized edible part of edible *Vigna* plant species.
9. A ready-to-cook food made from pre-mixed flour as claimed in claim 1 wherein the cooked food has minimal change in texture, taste, aroma and colour.
10. A use of a mixture of pulverized fruits of *Abelmoschus esculentus* or *Abelmoschus caillei* or a mixture of both or more, and pulverized seeds of *Vigna mungo* or *Vigna radiata* or *Vigna angularis* or a mixture of two or more, and wheat flour in preparation of a pre-mixed flour utilized in preparation of food to reduce glycemic response of humans who consume the food.
11. A pre-mixed flour for preparation of food to reduce glycemic response of humans who consume the food which pre-mixed flour includes pulverized fruits of *Abelmoschus esculentus* or *Abelmoschus caillei* or a mixture of two, and pulverized seeds of *Vigna mungo* or *Vigna radiata* or *Vigna angularis* or a mixture of two or more.
12. A preparation of a mixture of at least 1.5 % by weight of pulverized fruits of *Abelmoschus esculentus* or *Abelmoschus caillei* or a combination of two, and at least 3% by weight of pulverized seeds of *Vigna mungo* or *Vigna radiata* or *Vigna angularis* or a combination of two or more, wherein the mixture is separately used as an intermediate product incorporated into a carbohydrate based flour to produce a ready-to-cook food.
13. Food prepared from pre-mixed flour as claimed as in claims 1 to 9, 11 to 12.

Patentansprüche

1. Eine Verwendung eines vorgemischten Mehls, das eine Mischung von pulverisierten verzehrbaren Teilen einer verzehrbaren Okra Pflanzensorte mit pulverisierten verzehrbaren Teilen einer *Vigna* Pflanzensorte und einer oder mehrerer Arten von nahrungsbasierten Kohlenhydraten enthält, ausgewählt aus Getreide oder Nicht-Getreide oder einer Mischung aus beiden, für die Zubereitung von Nahrung, um glykämische Reaktion von Menschen, die die Nahrung konsumieren, zu reduzieren.
2. Die Verwendung eines vorgemischten Mehls wie in Anspruch 1 beansprucht, wobei die pulverisierten verzehrbaren Teile der verzehrbaren Okra Pflanzensorte Früchte sind.

3. Die Verwendung eines vorgemischten Mehls wie in Anspruch 1 beansprucht, wobei die pulverisierte verzehrbare Okra Pflanzensorte *Abelmoschus esculentus* oder *Abelmoschus caillei* oder eine Mischung von zweien oder mehreren ist.
- 5 4. Die Verwendung eines vorgemischten Mehls wie in Anspruch 1 beansprucht, wobei die pulverisierte verzehrbare *Vigna* Pflanzensorte *Vigna mungo*, *Vigna radiata* oder *Vigna angularis* oder eine Mischung von zweien oder mehreren ist.
- 10 5. Die Verwendung eines vorgemischten Mehls wie in Anspruch 1 beansprucht, wobei die pulverisierten verzehrbaren Teiler der *Vigna* Pflanzensorte Schalen oder Samen oder eine beliebige Kombination daraus sind.
6. Die Verwendung eines vorgemischten Mehls wie in Anspruch 5 beansprucht, wobei die Samen entschält sind.
- 15 7. Das vorgemischte Mehl wie in Anspruch 1 beansprucht, enthaltend weniger als 10 Gewichtsprozent von pulverisierten verzehrbaren Teilen der verzehrbaren Okra Pflanzensorte in Kombination pulverisierter verzehrbarer Teile der verzehrbaren *Vigna* Pflanzensorte.
- 20 8. Das vorgemischte Mehl wie in Anspruch 1 beansprucht, wobei das vorgemischte Mehl mit Nicht-Getreide basierendem Mehl weniger als 30 Gewichtsprozent von pulverisierten verzehrbaren Teilen der verzehrbaren Okra Pflanzensorte in Kombination pulverisierter verzehrbarer Teile der verzehrbaren *Vigna* Pflanzensorte hat.
- 25 9. Eine kochfertige Nahrung aus vorgemischtem Mehl wie in Anspruch 1 beansprucht hergestellt, wobei die gekochte Nahrung minimale Änderungen in Beschaffenheit, Geschmack, Aroma und Farbe hat.
- 30 10. Eine Verwendung einer Mischung aus pulverisierten Früchten der *Abelmoschus esculentus* oder *Abelmoschus caillei* oder eine Mischung von beiden oder mehreren, und pulverisierten Samen der *Vigna mungo* oder *Vigna radiata* oder *Vigna angularis* oder eine Mischung von zweien oder mehreren, und Weizenmehl in Zubereitung eines vorgemischten Mehls, verwendet in Zubereitung von Nahrung, um eine glykämische Reaktion von Menschen, die die Nahrung konsumieren, zu reduzieren.
- 35 11. Ein vorgemischtes Mehl zur Zubereitung von Nahrung um eine glykämische Reaktion von Menschen, die die Nahrung konsumieren, deren vorgemischtes Mehl pulverisierte Früchte der *Abelmoschus esculentus* oder *Abelmoschus caillei* oder eine Mischung von zweien enthält, und pulverisierte Samen der *Vigna mungo* oder *Vigna radiata* oder *Vigna angularis* oder eine Mischung von zweien oder mehreren, zu reduzieren.
- 40 12. Eine Zubereitung einer Mischung von zumindest 1,5 Gewichtsprozent von pulverisierten Früchten der *Abelmoschus esculentus* oder *Abelmoschus caillei* oder einer Kombination von zweien, und zumindest 3 Gewichtsprozent von pulverisierten Samen der *Vigna mungo* oder *Vigna radiata* oder *Vigna angularis* oder einer Kombination von zweien oder mehreren, wobei die Mischung separat als ein Zwischenprodukt in ein Kohlenhydrate basiertes Mehl inkorporiert benutzt wird, um eine kochfertige Nahrung herzustellen.
13. Nahrung, zubereitet aus vorgemischtem Mehl wie in Ansprüchen 1 bis 9, 11 bis 12 beansprucht.

45 **Revendications**

- 50 1. Utilisation d'une farine pré-mélangée contenant un mélange de parties comestibles pulvérisées d'une espèce végétale de gombo comestible avec des parties comestibles pulvérisées d'une espèce végétale de *Vigna* et un ou plusieurs types d'aliments à base d'hydrate de carbone choisis parmi des céréales ou aliments non céréaliers ou un mélange des deux, pour la préparation d'un aliment pour réduire la réponse glycémique des humains qui consomment l'aliment.
- 55 2. Utilisation d'une farine pré-mélangée selon la revendication 1, dans laquelle les parties comestibles pulvérisées de l'espèce végétale de gombo comestible sont des fruits.
3. Utilisation d'une farine pré-mélangée selon la revendication 1, dans laquelle l'espèce végétale de gombo comestible pulvérisée est l'*Abelmoschus esculentus* ou l'*Abelmoschus caillei* ou un mélange de deux ou plus.

4. Utilisation d'une farine pré-mélangée selon la revendication 1, dans laquelle l'espèce végétale de *Vigna* comestible pulvérisée est la *Vigna mungo*, la *Vigna radiata* ou la *Vigna angularis* ou un mélange de deux ou plus.
- 5 5. Utilisation de farine pré-mélangée selon la revendication 1, dans laquelle les parties comestibles pulvérisées de l'espèce végétale de *Vigna* sont des cosses ou des graines ou n'importe quelle combinaison de celles-ci.
6. Utilisation de farine pré-mélangée selon la revendication 5, dans laquelle les graines ont leur peau retirée.
- 10 7. Farine pré-mélangée selon la revendication 1, contenant moins de 10 % en poids de parties comestibles pulvérisées d'une espèce végétale de gombo comestible en combinaison avec la partie comestible pulvérisée d'une espèce végétale de *Vigna* comestible.
- 15 8. Farine pré-mélangée selon la revendication 1, dans laquelle la farine pré-mélangée avec une farine sans céréales comprend moins de 30 % en poids de parties comestibles pulvérisées d'une espèce végétale de gombo comestible en combinaison avec la partie comestible pulvérisée d'une espèce végétale de *Vigna* comestible.
- 20 9. Aliment prêt à cuisiner composé de la farine pré-mélangée selon la revendication 1, dans lequel l'aliment cuisiné présente une modification minimale de texture, de goût, d'arôme et de couleur.
- 25 10. Utilisation d'un mélange de fruits pulvérisés d'*Abelmoschus esculentus* ou d'*Abelmoschus caillei* ou d'un mélange des deux ou plus, et de graines pulvérisées de *Vigna mungo* ou *Vigna radiata* ou *Vigna angularis* ou d'un mélange de deux ou plus, et de farine de blé dans la préparation d'une farine pré-mélangée utilisée dans la préparation d'un aliment pour réduire la réponse glycémique d'humains qui consomment l'aliment.
- 30 11. Farine pré-mélangée pour la préparation d'un aliment pour réduire la réponse glycémique d'humains qui consomment l'aliment, laquelle farine pré-mélangée comprend des fruits pulvérisés d'*Abelmoschus esculentus* ou d'*Abelmoschus caillei* ou un mélange des deux, et des graines pulvérisées de *Vigna mungo* ou *Vigna radiata* ou *Vigna angularis* ou un mélange de deux ou plus.
- 35 12. Préparation d'un mélange d'au moins 1,5 % en poids de fruits pulvérisés d'*Abelmoschus esculentus* ou d'*Abelmoschus caillei* ou d'une combinaison des deux, et d'au moins 3 % en poids de graines pulvérisées de *Vigna mungo* ou *Vigna radiata* ou *Vigna angularis* ou d'une combinaison de deux ou plus, dans lequel le mélange est utilisé séparément comme produit intermédiaire incorporé dans une farine à base d'hydrate de carbone pour produire un aliment prêt à cuisiner.
- 40 13. Aliment préparé à partir de farine pré-mélangée selon les revendications 1 à 9 et 11 à 12.
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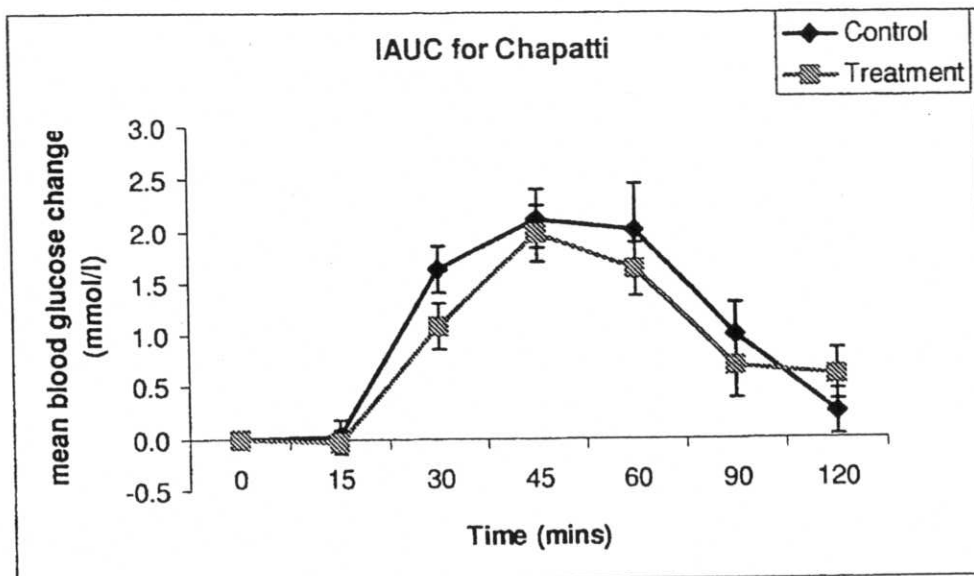


Fig. 1

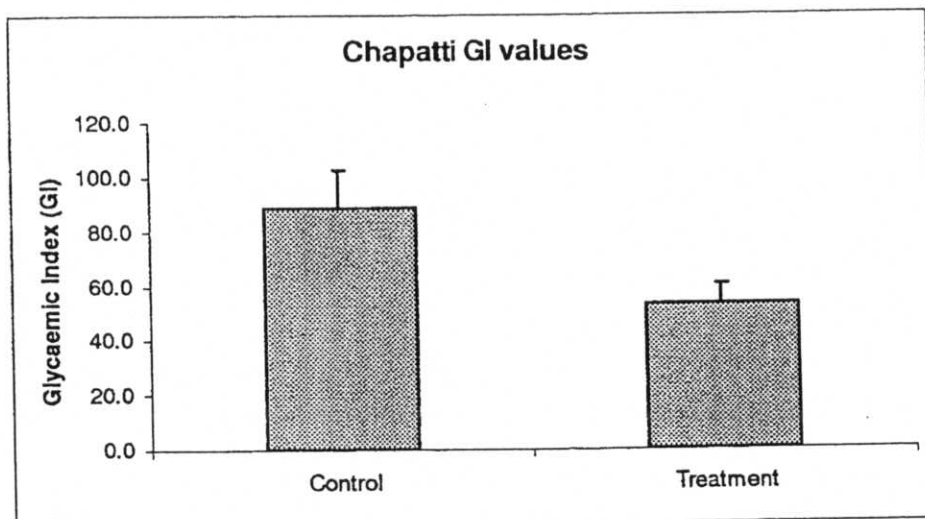


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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