



US009820500B2

(12) **United States Patent**  
**Kumazawa et al.**

(10) **Patent No.:** **US 9,820,500 B2**  
(45) **Date of Patent:** **Nov. 21, 2017**

(54) **AMINO ACID CONTAINING  
GLYCOSYLATION COMPOSITION DERIVED  
FROM RICE, AND A METHOD OF  
PRODUCING THE SAME**

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(\* ) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 27 days.

(21) Appl. No.: **14/894,247**

(22) PCT Filed: **Jul. 7, 2014**

(86) PCT No.: **PCT/JP2014/068050**

§ 371 (c)(1),  
(2) Date: **Nov. 25, 2015**

(87) PCT Pub. No.: **WO2015/005281**

PCT Pub. Date: **Jan. 15, 2015**

(65) **Prior Publication Data**

US 2016/0106129 A1 Apr. 21, 2016

(30) **Foreign Application Priority Data**

Jul. 10, 2013 (JP) ..... 2013-144946

(51) **Int. Cl.**  
**A23F 3/16** (2006.01)  
**A23L 1/23** (2006.01)  
**A23L 7/104** (2016.01)  
**A23L 27/21** (2016.01)  
**A23L 27/24** (2016.01)  
**A23L 27/50** (2016.01)

(52) **U.S. Cl.**  
CPC ..... **A23L 1/23** (2013.01); **A23L 7/107**  
(2016.08); **A23L 27/21** (2016.08); **A23L 27/24**  
(2016.08); **A23L 27/50** (2016.08); **A23V**  
**2002/00** (2013.01)

(58) **Field of Classification Search**  
CPC ..... **A23L 1/23**; **A23L 1/1055**; **A23L 1/227**  
USPC ..... **426/28**, **18**, **622**  
See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,282,319 A \* 8/1981 Conrad ..... A21D 13/02  
426/18  
2010/0009032 A1 1/2010 Kageyama et al.

**FOREIGN PATENT DOCUMENTS**

JP 2003-250485 A 9/2003  
JP 2009-225709 A 10/2009  
WO WO 2004/008836 A2 1/2004  
WO WO 2007/072747 A1 6/2007

**OTHER PUBLICATIONS**

Hagenimana et al., "Evaluation of rice flour modified by extrusion cooking," *Journal of Cereal Science*, vol. 43, 2006, pp. 38-46.  
Hayakawa et al., "Studies on the Production of Hydrolyzable Starchy Material in High Concentrated Substrate by Two-Stage Extrusion Cooking Method," *Nippon Shokuhin Kogyo Gakkaishi*, vol. 38, No. 10, 1991, pp. 945-953.  
Li et al., "Design and optimization of an efficient enzymatic extrusion pretreatment for Chinese rice wine fermentation," *Food Control*, vol. 32, 2013, pp. 563-568.  
Tomás et al., "Influence of Operating Conditions on the Extent of Enzymatic Conversion of Rice Starch in Wet Extrusion," *Lebensmittel-Wissenschaft & Technologie*, vol. 30, No. 1, 1997, pp. 50-55.  
Akdogan, "High moisture food extrusion," *International Journal of Food Science and Technology*, vol. 34, No. 3, Jun. 30, 1999, pp. 195-207.  
Kamara et al., "Variation in free amino acid profile among some rice (*Oryza sativa* L.) cultivars," *Breeding Science*, vol. 60 No. 1, Mar. 17, 2010, pp. 46-54 (10 pages total).  
Singaporean Office Action and Search Report, dated Oct. 12, 2016, for Singaporean Application No. 11201510272R.  
Steel et al., "Chapter 13: Thermoplastic Extrusion in Food Processing," *Thermoplastic Elastomers*, Mar. 28, 2012, pp. 265-290 (27 pages total).  
Tomás et al., "Rheological Modelling of Enzymatic Extrusion of Rice Starch," *Journal of Food Engineering*, vol. 32, No. 2, May 31, 1997, 11 pages.

\* cited by examiner

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(57) **ABSTRACT**

The purpose of the present invention is to continuously and inexpensively provide an amino acid containing glycosylation composition from rice. The method for producing an amino acid containing glycosylation composition derived from rice according to the present invention is characterized by comprising:

- a step for compressing and kneading rice powder or rice grains within a cylinder by using an extruder to break an  $\alpha$ -1,4 bond in starch, and,
- a step for breaking the  $\alpha$ -1,4 bond in starch and/or an  $\alpha$ -1,6 bond in starch by adding an enzyme into the cylinder. Furthermore, in a preferable embodiment of the method for producing an amino acid containing glycosylation composition derived from rice according to the present invention, a step for adding water to the rice powder (or rice grains) is further carried out as preparation.

**5 Claims, 1 Drawing Sheet**