INVENTION TITLE

159159

Title: Stabilization of rice for human consumption.

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DESCRIPTION

[Para 1] Detailed Description of the Invention

1. The invention involves a process of stabilizing raw rice with different methods of heat treatment immediately after the husks and/or the bran are removed from rough rice in order to inhibit the activity of lipase enzyme which is responsible for causing the enzymatiic hydrolyzation process of polyunsaturated fatty acid in rice. This will prevent free fatty acid build-up and oxidation, above the level of 5% during storage (because rice which contains free fatty acid at the level of above 5% is considered not suitable for human consumption), and to avoid rancid odor.

2. This is due to the fact that as soon as the husks are removed from rough rice, the auto-oxidation process(attack of polyunsaturated fatty acid by lipase enzyme) starts to take place resulting in the molecular structure of the fatty acids in rice being altered and rapidly deteriorated, thus forming free fatty acids and glycerol, especially the level of free fatty acid that can quickly build up, followed by oxidation above the level of 5% during storage followed by the rancid odor of rice, which make the rice not suitable for human consumption

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3. The aim is to identify the most critical point for denaturing the protein in lipase enzyme so to inhibit its activities in attacking the polyunsaturated fatty acid causing oxidation of the free fatty acid which is responsible for the rapid free fatty acid build-up. Once the protein in the lipase enzyme in rice is denatured, the quality of fatty acid in rice may be preserved during storage and will not be subject to oxidation and further deterioration and will not cause free fatty acid build-up.
4. This rice stabilization process employs different heat treatment methods such as hot air or autoclave, hot steam (with or without using pressure), microwave or any combination of any one of the above treatments under temperature of between 45-180°C(113-356°F), within 1 minute -1 hour. After the rice stabilization process to inhibit the activity of lipase enzyme, which is responsible for causing enzymatic hydrolyzation process of the polyunsaturated fatty acid, the stabilized rice is then retail-packed into normal plastic bags, vacuum-packs, nitrogen-filled packs and/or U.V. protected type of packages for convenience of storage.
5. The purpose of this invention is to assure that communities world wide have an opportunity to conveniently consume rice that is properly right after milling/polishing for their nature-provided rich nutrients which are full of health benefits and free from toxicity. Continuously consuming unhealthy rice may lead rice-consuming communities world wide to poor health and high medical care expenses, especially from degenerative health problems and diseases due to the deteriorated quality of essential nutrients in unstabilized and oxidized rice which may be harmful to health.
6. These essential nutrients include antioxidants(such as gamma oryzanol), polypeptides, essential polyunsaturated fatty acids and phytonutrients which affect the metabolic process, in particular the carbohydrate metabolism which is responsible for converting glucose to cellular energy. The result of which may cause digestive dysfunction, metabolic disorder, degenerative health problems which is also as Syndrome-X such as diabetes, hypertension, heart disease, cancer, allergy, auto-immune disease, Alzheimer's, Multiple Sclerosis(MS) etc.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The following example of tests have been carried out with different methods of the heat treatment:

For Example:

1. The Hot Air Stabilization Method accompanied by example::

i. Remove the husks from rough rice, separate the husks or further polish the rice to remove the bran and immediately thereafter treat the rice with hot air at temperature between 45-180°C(113-356°F) for 1 minute - 1 hour. The stabilized rice are then cooked down by air-blow at temperature between 45 - 90°C(113 - 194°F), for 1 minute - 1 hour until reaching room temperature, in order to inhibit the activity of lipase enzyme which is responsible for causing the enzymatic hydrolyzation process of polyunsaturated fatty acid in rice so to avoid free fatty acid build-up, followed by oxidation, to the level of 5% and above during storage.

ii. Because rice which contains free fatty acid at the level of above 5% are no longer suitable for human consumption and to prevent rice rancid odor before packing the "stabilized rice" in assorted types of packaging such as normal plastic pack, vacuum-pack, nitrogen-filled and/or U.V. protected packages, then stored for human consumption.

Example 1 to Example 5 under drawing section are the examples of the hot air stabilized method.

2. The Hot Steam(with or without pressure) Stabilization Method accompanied by examples

i. Remove the husks from rough rice, separate the husks or further polish the rice to remove the bran and immediately thereafter soak or not soaking the rice in water, then treat the rice with hot steam with or without pressure at temperature between 60 - 120°C (140 - 248°F), for 1 - 20 minutes. The treated rice are then cooled down by air blow at temperature between 60 - 90°C (140 - 194°F), for 1 - 15 minutes in order to reduce the moisture in the "stabilized rice" to the level of 5 - 14% in order to inhibit the activity of lipase enzyme which is responsible for causing enzymatic hydrolyzation process of polyunsaturated fatty acid in rice so to avoid free fatty acid at the level of above 5% and above during storage

ii. Because rice which contains free fatty acid at the level of above 5% are no longer suitable for human consumption to prevent rice rancid odor before packing the "stabilized rice" in assorted types of packaging such as normal plastic pack, vacuum-pack, nitrogen-filled and/or U.V. protected packages, then stored for human consumption.

Example 6 to Example 10 under drawing section are the examples of the hot steam (with or without pressure) stabilization method.

3. The Microwave Stabilization Method accompanied by examples

i. Remove the husks from rough rice, separate the husks or further polish the rice to remove the bran and immediately thereafter, use microwave treatment method to stabilize rice by first soaking rice within the first 24 hours after being de-hulled in room-temperature water for a period of 10 - 45 minutes to increase moisture content of the rice to the level 15-25%, the water is then rinsed away before placing the rice into a microwave compartment at 200 - 600w., frequency of the magnetic field 890 - 6,000 MHz. For 1 - 10 seconds.

ii. Thereafter, the rice are cooled down with 40 - 90°C (104 - 194°F) air-blow until a moisture content of the rice reaches the level of 5 - 14%. The process is to inhibit the activity of lipase enzyme which is responsible for causing the enzymatic hydrolyzation process of polyunsaturated fatty acid in rice so to avoid free fatty acid build-up, followed by oxidation, to the level of 5% and above during storage.

iii. Because rice which contains free fatty acid at the level of above 5% are no longer suitable for human consumption and to prevent rice rancid odor, before packing the "stabilized rice" in assorted types of packaging such as normal plastic pack, vacuum-pack, nitrogen-filled and/or U.V. protected packages, then stored for human consumption.

Example 11 to Example 13 under drawing section are the examples of the microwave stabilization method.

Reference:

FOREIGN PATENT(Thailand)

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Other References

Canadian Food Inspection Agency

Rice Bran, stabilized)or Stabilized rice bran)(IFN--) is rice bran which has been treated, soon after milling by heat treatment or other means, that will substantially reduce the lipase activity. The stabilization process used should be included as part of the product name. Free fatty acid content of the crude fat component shall not exceed 4 percent.

What is claimed is:

[Claim 1] 1. Stabilization of rice with different methods of heat treatment in order to inhibit the enzymatic hydrolyzation process (attack of polyunsaturated acid by lipase enzyme) in rice so to avoid free fatty acid build-up, followed by oxidation, to the level of above 5% during storage. Because when free fatty acid in rice rises above the level of 5% during storage, those rice are considered unsuitable for human consumption.

[Claim 2] 2 The method in accordance with Claim 1, wherein the rice are stabilized or treated within 24 hours from the time the husks and/or brans are removed from rough rice.

[Claim 3] 3. The method in accordance with any of the Claims 1 - 2 or the combination of these claims, wherein the following types of rice are chosen for stabilization treatment; brown rice (cargo rice), wholly or partially de-hulled rice, or rough rice (rice without the husks removed).

[Claim 4] 4. The method in accordance with any of the Claims 1 - 2 or the combination of these claims, wherein the following types are chosen for stabilization treatment; white rice or sticky (glutinous) rice, which are wholly or partially polished to remove the bran on the outer surface.

[Claim 5] 5, The method in accordance with Claims 1 - 4, wherein hot air (auto clave) stabilization method is used on rice for a period of 1 minute - 1 hour with a temperature range of the hot air between 45 - 180°C (113 - 356°F). Thereafter the stabilized rice are then cooled to room temperature for packaging for further storage and consumption.

[Claim 6] 6. The method in accordance with Claims 1 - 4, wherein hot steam (with or without pressure) stabilization method is used on rice, with or without soaking the rice in water, for a period of 1 - 20 minutes with a temperature range of 60- 120°C (140 -248°F). Thereafter the stabilized rice are then cooled to room temperature maintaining moisture content of the rice between 5 - 14% before the rice are packaged for further storage and consumption.

[Claim 7] 7. The method in accordance with Claims 1 - 4, wherein microwave stabilization method is used but first by soaking rice in room-temperature water for a period of 10 - 45 minutes to increase moisture of the rice to the level of 15 - 25%. Thereafter, the water is rinsed away before placing the rice into a microwave compartment at 200 -600 w., with frequency of the magnetic field 890 - 6,000 MHz. For 1 -10 seconds. Thereafter, the rice are dried and cooled until moisture content of the rice reaches the level of 5 - 14% before packaging for further storage and consumption.

[Claim 8] 8. The method in accordance with any of the Claims 1 - 7 or any combination of two or more of these claims, wherein the technique of cooking by boiling, steaming, high-pressure cooking and/or pressure cooking are used to stabilize rice and prevent oxidation of the fatty acid in stabilized rice.

[Claim 9] 9. The method in accordance with any of the Claims 1 - 8 or any combination of two or more of these claims, wherein the technique of coating by atomized spraying method or method of dipping the stabilized rice in edible inert substances to prevent oxidation of the fatty acid in stabilized rice.

[Claim 10] 10. The method in accordance with any of the Claims 1 - 9 or any combination of two or more of these claims, wherein the method of coating uses gelatin or pre-gelatinized starch which includes coating with a thin firm layer both from natural and synthetic origins which may claim preventing fatty acid oxidation of rice.

[Claim 11] 11. The method in accordance with any of the Claims 1 - 10 or any combination of two or more of these claims, wherein the stabilized rice are placed through a process of gamma-ray, pasteurization or sterilization to kill bacterias in order to prolong the shelf life of the stabilized rice during storage.

[Claim 12] 12. The method in accordance with any of the Claims 1 - 11 or any combination of two or more of these claims, wherein the stabilized rice are packed into vacuum packages to prevent oxidation of fatty acids in stabilized rice.

[Claim 13] 13. The method in accordance with any of the Claims 1 - 11 or any combination of two or more of these claims, wherein the stabilized rice are packed into vacuum packages with nitrogen-filled to prevent oxidation of fatty acids in stabilized rice.

[Claim 14] 14. The method in accordance with any of the Claims 1 - 11 or any combination of two or more of these claims, wherein the stabilized rice are packed into vacuum packages with nitrogen-filled and U.V. protected feature to prevent oxidation of fatty acids in stabilized rice.

[Claim 15] 15. The method in accordance with any of the Claims 1 - 11 or any combination of two or more of these claims, wherein the stabilized rice are packed into vacuum packages with U.V. protected feature to prevent oxidation of fatty acids in stabilized rice.

[Claim 16] 16. The method in accordance with any of the Claims 1 - 15 or any combination of two or more of these claims, wherein the "stabilized rice" are either grinded or not grinded into flakes, granules or powder form for industrial further processing use such as snacks, noodles and flour etc., and as table rice or as health food and functional food for preventing and treating digestive dysfunction, metabolic disorder, degenerative health problems which is also known as "Syndrome X" such as diabetes, hypertension, heart disease, cancer, allergy, auto-immune disease, Alzheimer's, Multiple Sclerosis(MS), including the use as anti-free radicals food, and food for improving skin

condition for anti-ageing, energy food and for body weight control. The end product "stabilized rice" can be used as table rice for food purposes and also for preventing and treating degenerative health problems known as "Syndrome X" such as diabetes, hypertension, heart disease, cancer, allergy, auto-immune disease, Alzheimer's, Multiple Sclerosis(MS) including the use for their anti-oxidant characteristic and for improving skin-condition as well as using the stabilized rice as an anti-ageing food.