

A REVIEW ON GOLDEN RICE WITH SPECIAL REFERENCE TO REDUCING VITAMIN A DEFICIENCY IN HUMAN POPULATION

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ABSTRACT : Rice is a staple food source of many Asian countries such as India, Japan and China. Rice is the third-highest worldwide production after sugarcane and maize. Milled rice is produced annually about 480 million metric tons approximately. Mainly two kind of rice is seen. One is brown rice and another is white rice. The name of the milled rice is white rice. WHO says, By consuming white rice, some effects on human health can be seen like increased BMI, hyperlipidemia, and type 2 diabetes are more common. In white rice very small amount of vitamin A is present. This low amount of vitamin A can cause vision problem among children specially. Approximately half of the world population take daily energy from rice grains which have not sufficient levels of micronutrients and vitamins. Normally, they are deficient in iron, zinc and vitamin A. Vitamin A deficiency (VAD) is major health problem among children and pregnant woman. Night blindness and xerophthalmia are more common among children and pregnant woman due to vitamin A deficiencies in white rice. It is one of the main cause of the childhood blindness and morbidity and mortality also occur from infection in children and pregnant woman. Approximately 250 million preschool children suffer for vitamin A deficiencies and higher risk of death is seen due to malaria, measles, and diarrhea. Yearly 250,000 to 500,000 children with vitamin A deficiency become blind half of children die within a year of losing their vision. Golden rice that is genetically modified are contain sufficient amount of vitamin A which is needed for decrease the prevalence of night blindness in children specially. Globally spreading of golden rice is very slow. Asia is also suffered by insufficient spreading of golden rice. Due to insufficient spreading of golden rice across the world, blindness and another vision related problem is seen among pre-school children and pregnant woman specially. The existence, adaptation and cultivation of golden rice is very low. Golden rice 1 and golden rice 2 are sticky and grow specially in the dry land. This two varieties can be modified genetically so easily but this types of genetically modified rice can not perform well in Asian fields. Golden rice is very needed for the general population because it gives supplementary vitamin A and beta carotene which can fulfill the vitamin A requirement. Specially vitamin A deficiencies is related to blindness, premature death, and xerophthalmia (thickening on conjunctiva). Golden rice is a kind of rice that is genetically modified and it can be very useful to reduce the vitamin A deficiency globally. New allergen is produced by introducing a gene into a plant of golden rice and can cause an allergic reaction to susceptible individuals. Although besides possible allergy scientists believe that GM foods is good for health. Misconception about golden rice is also present in peoples. For many different factors golden rice has not found onto the market still.

KEYWORDS - Golden Rice, vitamin A deficiency, public health.

I. INTRODUCTION

Rice is the staple food source of many Asian countries such as India, Japan and China. The scientific name of rice grass is *Oryza sativa* (Asian rice) or *Oryza glaberrima* (African rice). Rice is the commodity of agriculture. Rice is the third-highest worldwide production after sugarcane and maize. Milled rice is produced annually about 480 million metric tons approximately. Approximately two-thirds of the World's population consume rice as their staple food. It has been estimated that 75% of the daily calorie intake of the people in some Asian countries comes from rice^[1]. A rice grain is made up of three parts include endosperm rich in starchy carbohydrate; second one is germ rich in antioxidants; and third one is the outer coating that is bran which is full of vitamins and fibre. It is used for many kind of dishes. The varieties of rice basically are classified into short, medium and long grained. In most cases, Short grain rice is needed for rice pudding. In sweet dishes, medium grain rice are required. Medium grain rice are used in sweet dishes like risotto in Italy, arros negre in Spain. One of the rice dish of northern Italian is risotto which is cooked like a broth and its consistency is so creamy. Valencian and Catalan dish made with cuttlefish (or squid) and *rice is arros negre*. A sticker medium grain rice is needed to prepare sushi. Medium grain rice is highly used in Japan. The grains of long grain rice stay intact after cooking. Instant rice are different kind of rice from parboiled rice. They are totally cooked and dried. In case of instant rice, significant degradation of taste and texture can be seen. Rice flour and starch often are used to increase crispiness. Mainly two kind of rice is seen. One is brown rice and another is white rice. Through rice processing paddy rice is converted into well milled silky-white rice. Good cooking quality is found in case of white rice^[2]. Most of the people consume well milled rice (WWR). The Japanese like to consume well milled sticky rice^[3] but Americans like to consume semi-milled long grain or brown rice even whereas people live in the India like to consume well milled parboiled rice^[4].

II. WHITE RICE AND ITS IMPACT ON HUMAN HEALTH

The name of the milled rice is white rice. It is needed to remove husk, bran, and germ in case of white rice. It changes the flavor, texture, and outlook of the rice and helps to prevent spoilage and enhance its storage life. The rice is polished after milling. The result of polishing the rice is bright, white, and shiny appearance. WHO says, By consuming white rice, some effects on human health can be seen like increased BMI, hyperlipidemia, and type 2 diabetes are more common, vision problem, etc [5].

III. WHITE RICE AND ITS RELATIONSHIP WITH BLINDNESS

White rice or polished rice consist starch primarily. White rice is produced by mechanized processes. Mechanized processes by which white rice is produced are hulling and milling^[6]. This type of rice is consumed mostly in world^[7-9]. White rice increase the dietary glycaemic load for populations who consume rice as a staple food^[7-9].

Glycemic index(GI) value is greater than those of whole grains^[10]. Amylose content, degree of processing and cooking time increase the glycemic index values of white rice^[10]. Increased risk of developing type 2 diabetes is associated with high glycaemic index diet intake which indirectly cause blindness^[9,11-13]. Even high amount of white rice intake is very harmful for our vision.

IV. POSSIBLE REMEDY OF BLINDNESS BY REPLACING WHITE RICE WITH THE GOLDEN RICE

Approximately half of the world population take daily energy from rice grains which have not sufficient levels of micronutrients and vitamins. Normally, they are deficient in iron, zinc and vitamin A. Minerals and essential vitamins deficiencies are normally called "hidden hunger" are very high in human population all over the world^[14]. Vitamin A deficiency(VAD) is major health problem among children and pregnant woman. Night blindness and xerophthalmia are more common among children and pregnant woman due to vitamin A deficiencies in white rice. It is one of the main cause of the childhood blindness and morbidity and mortality also occur from infection in children and pregnant woman. Approximately 250 million preschool children suffer for vitamin A deficiencies and higher risk of death is seen due to malaria, measles, and diarrhea. Yearly 250,000 to 500,000 children with vitamin A deficiency become blind half of children die within a year of losing their vision^[15]. Mainly two types of rice is seen. One is white rice and another is golden rice. White rice is deficient in Vitamin A but golden rice that is genetically modified are contain sufficient amount of vitamin A which is needed for decrease the prevalence of night blindness in children specially^[16].

V. GOLDEN RICE

Golden rice is a genetically modified rice which is produced through genetic engineering to biosynthesis beta-carotene, a precursor of vitamin A^[17]. This kind of rice is needed specially in the area where vitamin A deficiency is found^[18]. Golden rice is a kind of rice that differs from standard rice. Golden rice contain extra genes. Modification of normal rice to golden rice is done by genetic engineering. This modification make the production of vitamin A in the rice grains. The colors of the grains become yellow-orange due to provitamin A, that is why, it is called 'Golden Rice'. Pro-vitamin A is converted to vitamin A after absorption into the body. Provitamin A is generally found in many vegetables and fruits. The color of the carrots is orange due to provitamin A. Lycopene in golden rice is converted to beta-carotene by the endogenous cyclase. Then beta-carotene is converted to retinal and subsequently into retinol which is known as vitamin A.

VI. GOLDEN RICE AND ITS SPREADING ACROSS THE WORLD AND THE ASIA

Globally spreading of golden rice is very slow. Asia is also suffered by insufficient spreading of golden rice. Due to insufficient spreading of golden rice across the world, blindness and another vision related problem is seen among pre-school children and pregnant woman specially.

VII. EXISTENCE, ACCLIMATIZATION, AND CULTIVATION OF GOLDEN RICE IN INDIA

The existence, adaptation and cultivation of golden rice is very low. Golden rice 1 and golden rice 2 are sticky and grow specially in the dry land. This two varieties can be modified genetically so easily but this types of genetically modified rice can not perform well in Asian fields.

VIII. ADVANTAGES OF GOLDEN RICE

Golden rice is very needed for the general population because it gives supplementary vitamin A and beta carotene which can fulfill the vitamin A requirement. High intake of vitamin A, beta carotene, and carotenoids rich diet reduce the risk of macular degeneration, coronary artery disease and specific cancer^[19]. Specially vitamin A deficiencies is related to blindness, premature

death, and xerophthalmia(thickening on conjunctiva)^[19]. Beta carotene work as an antioxidant. One of the important function of beta carotene is to protect the body from free radicals reactions^[20]. Malnutrition is the major public health problem. Even vitamins and minerals deficiencies are found in industrialized country due to poor diet^[21]. That is why a staple food such as rice is needed to fulfill the requirement of vitamin A. Golden rice is a kind of rice that is genetically modified and it can be very useful to reduce the vitamin A deficiency globally.

IX. DISADVANTAGE OF GOLDEN RICE

Some of the demerits of golden rice despite all the benefits include-it is the fear of people that it will crossbreed and it may contaminate the wild rice, GM rice may be expensive, some environmental organizations are against with golden rice. This type of organization said that GM rice contains *Bacillus thuringiensis*(Bt) strain which is not good for human consumption and it is believed that golden rice with high levels of vitamin A can cause hypervitaminosis or Vitamin A toxicity that leads to nausea, vomiting, abdominal pain, poor appetite irritability, drowsiness, dizziness, confusion, blurry vision, increased pressure on the brain, bone pain, bones swelling, sensitive to sunlight, hair loss, respiratory infection dry or rough skin, jaundice(yellow skin), mouth ulcers and many others. Some complication of excess vitamin A are damage of the liver, osteoporosis- a condition where bone become weak and go to breaks, due to osteoporosis excess amount of calcium is build up into the body, kidney damage due to excess amount of calcium build up in the body. New allergen is produced by introducing a gene into a plant and can cause an allergic reaction to susceptible individuals^[22]. Although besides possible allergy scientists believe that GM foods is good for health.

X. Conclusion

Half of the world's population consume rice as a staple food. Rice grains are high in carbohydrate and contain a good source of energy. But lack of essential nutrient is seen in rice such as vitamins and minerals. To resolve this problem genetically modified rice have been produced by scientists. The name of this GM rice is "Golden Rice". This type of rice contains provitamin A. Provitamin A is the substance that is converted to vitamin A by the human body. Golden rice is a very good type of rice that offers great potential against vitamin A deficiencies in developing countries. Many variety of this rice already exist. Misconception about golden rice is also present in peoples. For many different factors golden rice has not found onto the market still.

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