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Why Is Rice Bran Thrown Away?

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ABSTRACT

Rice bran is the part of brown rice that is shaved off when polished into white rice. Over 90% of the various nutrients in brown rice are found in the outer part; therefore, it is nutritionally a highly valuable by-product. In Japan, rice bran is left outside unmanned rice mills for anyone to take home for free. Because a large amount is produced, most of it ends up being discarded. Rice bran was originally considered unnecessary, largely due to the lack of awareness of its value. Unfortunately, this attitude leads to a waste of a valuable resource that can be used for food and other applications. This paper explains what people who use rice bran do with it, why it is often discarded, and how it can be handled in the future. While rice bran can be obtained for free, it can also be purchased for a fee, and we explain why.

Keywords: Effective use of rice bran, Unmanned rice mills, Nutrient content, Discarding rice bran

INTRODUCTION

Rice bran comprises the outer layer (bran layer) and germ of white rice and is removed by approximately 10% when brown rice is polished to white rice[1)]. More than 90% of the various nutrients in brown rice are found in this outer part; therefore, it is considered a very valuable by-product from a nutritional standpoint.

Rice bran is often available for free in Japan[2)-4)]. Customers who buy unpolished brown rice carry it themselves to the rice mill and operate unmanned rice polishers to polish their rice. Although customers can take both polished rice and rice bran home, most choose to leave the bran behind. Rice bran is left at the mill for anyone to take home, free of charge. The rice mill manager collects any rice bran that has been left for some time. Because the amount collected is very large, most of it is often thrown away[5)]. Many such rice mills are located on roadsides within walking distance throughout the city and operate 24 h a day. There is a fee for using the rice mill, which is approximately $1 per 10 kg of brown rice.

Traditionally, rice bran has been considered unnecessary. This is largely due to the lack of awareness of its value. Because rice mill managers collect so much rice bran, even if they find value in some of it and use it for some purpose, the majority is discarded. This practice is a waste of a valuable resource that can be used as food, among other applications. How can rice bran be utilized effectively? To answer this question, this paper explains what people use rice bran for, why it is often discarded, and how it should be handled in the future. We also explain why rice bran should be sold at a fee rather than being available free of cost[3)].

Characteristics of rice bran

As mentioned above, rice bran is rich in nutrients (Table 1). White rice contains the same types of nutrients as rice bran; however, 80% of white rice is starch (carbohydrates), along with mall amounts of protein, B vitamins, minerals, and dietary fiber. Carbohydrates are primarily a source of energy. They are often used as staple foods in many countries, and in Japan, white rice is the staple food. Proteins contain essential amino acids that contribute to maintaining the skeletal structure, including the muscles[8)]. Among B vitamins, white rice is particularly rich in vitamin B_1 (thiamine), which is important for the metabolism that produces energy in the body. Minerals, including iron, magnesium, manganese, and zinc, support health by regulating the activity of enzymes involved in metabolism. Although it contains less dietary fiber than brown rice, it helps the body absorb B vitamins and minerals and maintain intestinal flora. Rice bran is very low in carbohydrates and rich in other nutrients; therefore, it is thought to be effective for efficiently consuming nutrients that tend to be lacking when consuming only staple foods such as bread and rice, without having to worry about increasing carbohydrate intake. Incorporating it as a food other than a staple can be an effective ingredient for balancing nutrition in the body. Rice bran also contains oil, which white rice lacks. Therefore, rice bran is also used as a source of rice oil.

Rice bran has many other characteristics (Table 2) that make it useful not only as food but also in cosmetics and agriculture (Table 3). This is related to the nutrients it contains, as mentioned above. In the past, rice bran was mainly used for purposes other than human consumption, such as fertilizer and animal feed, but there was a time when most of it was discarded as industrial waste because it could not be utilized[5]. Recently, owing to its high nutritional value, rice bran has been used as is or mixed with other ingredients to create processed foods. The types of nutrients it contains favor the growth of microorganisms such as lactic acid bacteria and yeast, making them suitable for promoting fermentation. This has led to its application in rice bran beds used for pickling vegetables and compost to increase nutrient concentrations in field soil[9]. Rice bran can also contribute to improving the microbial cleaning power of detergents. Because it contains various amino acids and oils, it is used in cosmetics to improve skin quality and as a cleaning and polishing agent for household wood, such as floors and pillars, as it is harmless if ingested.

However, caution should be exercised when using rice bran (Table 3). Because it contains oil, it is prone to deterioration owing to oxidation. Although its inherent components can easily serve as nutrient sources for yeasts and other fungi, it can also serve as a nutrient source for molds present in the environment, supporting their growth. Molds are likely to grow if rice bran is left in the rice polisher for an extended period. Therefore, if people want to use it as a food ingredient, they will need to take measures such as heating it early to prevent it from changing in quality, storing it in an airtight container (e.g., a vacuum pack) or in a refrigerator, or using it as soon as possible. Discoloration and unpleasant odors may occur due to mold growth or changes such as oxidation of the oil and other inherent components. These factors make it difficult to utilize rice bran effectively even if the benefits are known and it is available easily and free of charge.

Why rice bran is thrown away

Table 4 summarizes the reasons why rice bran is often discarded. Although it is believed that the nutrients contained in rice bran are beneficial for consumption, leaving it unattended can lead to problems such as deterioration in quality and unpleasant odors. Unless rice bran is processed immediately after milling, especially under well-managed conditions, it can only be used for limited purposes. Rice is not polished in large quantities in one place by retailers. In Japan, it is often polished in small quantities by consumers using unmanned rice polishers. Similar to roasted coffee beans, white rice tastes better when polished immediately before eating. Rice mills are primarily located on roadsides in various places. This indicates that the produced rice bran is not used promptly, making it difficult to maintain its quality. The product value also decreases if care is not taken in the processing and storage environments. It is difficult to transport the resulting rice bran individually and commercialize it, because it requires excessive effort and incurs transportation costs. Rice bran is sometimes sold by mail order or at supermarkets and home improvement stores; however, unlike unmanned rice mills, these are sold by retailers who mill the rice themselves and immediately process it into the next stage. The rice used for milling can also be managed by the mill; therefore, it is possible to determine whether the rice has been sprayed with pesticides (rice bran used for consumption should be pesticide-free, which is difficult to check in unmanned rice mills). Rice is stored in a low-temperature warehouse, quickly heat-treated, and vacuum-packed to prevent reactions with oxygen in the air, thus ensuring quality[7),9)]. Therefore, it can be assumed that the quality is clearly different from that of rice bran, which is distributed free of charge near rice mills. It may be best to consider using rice bran that is distributed freely only for non-food purposes (mainly as fertilizer or feed).

Despite rice bran being produced in large quantities daily and being distributed for free, the majority is discarded. One reason for this waste is that not many people know its uses. To be used for various purposes, it should be fresh and of good quality. Many consumers do not have this information, which is probably why they not only refrain from buying it but also avoid taking it for free. Given its good nutritional profile, if properly managed and processed, rice bran is highly useful not only as food but also as a resource for agriculture and other purposes. This calls for informing the public about this valuable by-product.

CONCLUSION

In this article, we described the main nutrients in rice bran, its characteristics, precautions to be taken when using it, and why it is often discarded. Considering the global food supply and demand, food shortages relative to the population are predicted, with some arguing that we will run out of food and turn to alternative such as insects. Therefore, we believe that effectively using rice bran for food rather than discarding it could be one way to utilize it and reduce food waste[10]. Rice bran has many other uses besides as a food ingredient. This helps ensure that valuable materials are not wasted, similar to the effective use of timber from thinning forests or fruit thinning and sorting. To achieve this, a system is required to utilize and distribute it, such as by processing it while it is still fresh. If this is the case, the current situation in Japan, where there are many small, unmanned rice mills scattered around the country, is likely to be a disadvantage when it comes to processing rice bran. If the priority is to make effective use of rice without waste, the ideal situation would be for rice retailers to sell white rice polished in large rice mills and simultaneously process the resulting rice bran by-product at the same time. Consequently, it will likely become more difficult to obtain free rice bran. Those who supply rice bran, such as the government, local governments, and retailers, need to explore how much of the rice bran they distribute for

free is being used properly, and how they can manage its quality or make management easier. Simultaneously, consumers should be more aware of the numerous uses of rice bran. This would allow rice bran to be used more effectively as a resource than it is currently.

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Table 1 Major nutrients contained in rice bran

Ingredient	Main function	Solubility
B vitamins	Aids various metabolic processes in the human body.	Water soluble
E vitamins	Antioxidant properties.	Fat soluble
Minerals	Iron, magnesium, etc.	Water soluble
Dietary fiber	Regulates intestinal function and waste excretion. Deficiency can lead to heart disease, colon cancer, diabetes, and other conditions.	Water soluble
Phytic acid	Inositol triphosphate, produced as a result of metabolism, has been shown to prevent various cancers.	Water soluble
Inositol	It is effective in preventing fatty liver and arteriosclerosis, promoting calcium absorption, and improving high cholesterol.	Water soluble
Protein	Rice bran protein has a good balance of amino acids and is expected to help prevent overweight, lower serum cholesterol, and prevent arteriosclerosis.	Water soluble
Ferulic acid	A type of polyphenol, it has antioxidant and UV-absorbing properties and has been shown to prevent colon cancer and kidney dysfunction.	Fat soluble
γ-Oryzanol	In addition to lowering cholesterol, it is also believed to be effective in treating autonomic nervous system disorders, menopausal symptoms, and ulcers, and is used as a therapeutic agent.	Fat soluble
Plant sterols	It inhibits cholesterol absorption and reduces the level of bad cholesterol in the blood, potentially helping to prevent lifestyle-related diseases and urinary disorders.	Fat soluble
Glucosylceramide	Three novel acylated glucoceramides were discovered during oil extraction from rice bran and were reported to enhance the barrier function of each layer of the skin.	Fat soluble

Based on References 2), 4), 6), and 7).

Fat-soluble components are mainly found in rice oil.

After rice bran is defatted, most of the remaining components are water-soluble.

Table 2 Characteristics of rice bran

Property	Description
Highly nutritious	Most of the nutritional value of brown rice, including B vitamins and E, minerals, dietary fiber, and antioxidants, is concentrated in the bran, the outer layer of the rice.
Suitable for fermentation	Like bran pickles, it is a good place for lactic acid bacteria to grow.
Rich in oils	It is used to make rice bran oil. It is also rich in antioxidants and is highly regarded as a healthy oil.
Skin care benefits	It has a good balance of cleansing and moisturizing properties and has long been used in bran bags (rice bran packed in a cloth bag with small holes).
Can be used to improve soil	It serves as food for microorganisms, enriching the soil in agricultural fields.

Based on data from reference 5).

Table 3 Precautions when using rice bran

Usage	Description	Restriction
Pickled vegetables	Raw rice bran is used to make rice bran beds. Rice bran pickles are made by fermenting vegetables and other ingredients with lactic acid bacteria and other microorganisms.	Since it is considered food, it must be fresh. Since it is used for fermentation, it cannot be heat treated.
Beauty	The ingredients in rice bran help prevent skin aging. Rice bran is used in soap and rice bran bags.	It must not be spoiled, as it can affect the skin. If heated beforehand, such as by roasting it, it can be used for a long time.
Floor cleaning	The oil in rice bran gives floors a glossy finish and removes fat-soluble stains. The microorganisms contained in rice bran also break down dirt.	Since it is not edible, it is easy to use regardless of its quality.
Eating as is	It is rich in nutrients and can be eaten as is.	It is usually cooked by roasting or other heating process and then seasoned with seasonings before eating.
Cooking	It can also be cooked as is, or mixed with other ingredients such as soy pulp and hijiki seaweed.	It is usually used in several dishes by mixing it with other ingredients after being heated, such as by roasting.
Feed	It can be used as livestock feed.	It can be used raw and fresh as soon as possible, or heated and dried and used it for a long period of time.
Fertilizer	When mixed with soil, it provides nutrients to fields. When suspended in water and sprayed on vegetables, it can help prevent pests.	When mixed with soil, fermentation progresses, generating high heat (which high enough to affect plants). Thereafter, it is spread on the fields as fertilizer.
Detergent	The microorganisms contained in rice bran break down dirt.	If it is not raw, the microorganisms it contains will die.
Deodorizer	When dried, it can absorb room odors.	Drying it, such as by heating it, will prevent it from rotting and emitting an odor.

Based on references 1), 3), and 5).

Table 4 Why rice bran is thrown away

Reason	Explanation
It oxidizes easily and spoils easily.	Rice bran is high in oil, so it quickly oxidizes and deteriorates when exposed to air.
Supply far exceeds demand.	In Japan, where white rice is a staple, rice bran is always produced when rice is milled. However, the amount used in an average household is very small. As a result, a large amount is left over. Rice polishers produce a large amount of rice bran every day, so if it is left over, it will be expensive to store (it is difficult to handle). It would be more cost-effective to process it quickly, such as by extracting the active ingredients, or to discard it.
It is believed to have limited uses.	Although it can actually be used for a variety of purposes, there is a strong image that it can only be used for making pickles, and demand among ordinary households is not growing.
It is difficult to use without processing.	Raw rice bran is difficult to handle as is (it deteriorates quickly if stored). It requires the effort of roasting, fermenting, and squeezing the oil out. If there is no profit even after incurring the processing costs, the product is discarded.
It is difficult to manage food safety.	Raw bran is high in microorganisms and quickly ferments and spoils when exposed to moisture. Distributing it as a food product requires quality control, something small-scale rice mills cannot handle.

Based on references 3), 5).

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