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Rice Produced as a By-Product during the Milling

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Introduction

Rice bran was divided into three samples: whole rice bran or crude, microwaved rice bran and roasted rice bran. Microwaved rice bran was treated in a microwave oven set at level for medium power for minutes and manually mixed every minute. The roasted rice bran was heated on a conventional six-flame stove by filling a pre-heated diameter stainless steel with sample. In this case, stabilization was performed at approximately for minutes, and samples were homogenized with a wooden spoon throughout the process. The heat treatments were performed in three repetitions and analyses were performed in triplicate for each heat treatment, including the untreated control sample. Final results were expressed as means for each treatment. The evaluation of rice bran composition subjected to two different stabilization procedures in comparison to untreated samples, showed significant differences, indicating that the stabilization technique used modified bran composition. The roasting technique yielded samples with the lowest moisture content, suggesting that this procedure may be effective for samples with longer shelf life and less microbial contamination and some nutrient preservation [1] . Similar results were reported by researchers from Embrapa Rice and Beans evaluating the microbiological quality of rice bran samples subjected to thermal processing methods with similar conditions and stored at room temperature. The group observed that less or complete absence of fungi contamination at lower moisture content, which improved their storage time under ambient conditions, while untreated rice bran had a greater microbial load than all the homemade treated samples. Given the importance of rice as a food source, research has been conducted to increase the concentration of minerals in the grain, particularly iron and zinc, two essential minerals for human health [2]. These minerals are generally more concentrated in the outer layers of rice grain, being mainly distributed between rice bran and rice endosperm or white rice. It is well known that mineral content is strongly influenced by cultivation conditions, including soil structure condition and fertilization, as well as by rice processing. Furthermore, the present work appears to indicate that different stabilization techniques may also alter rice bran mineral content. However, the possibility of interaction between the pot composition and the rice bran during toasting has not been ruled out [3]. Previous work for instance, reported that an enrichment of iron into the product could occur during rice bran extrusion due to friction of raw material rich in fibre with some extruder components. Other reasons for the observed mineral differences may be related to contamination sources during processing or methodological uncertainty. On the other hand, total mineral content remained statistically the same between control and roasted rice bran samples. Further studies on mineral bioavailability to check the effects of the stabilization methods are warranted. Fatty acid results obtained in this study were in agreement in which more than the fatty acids present in the bran oil were unsaturated, with oleic predominating acid. The others detected were saturated fatty acids, mainly palmitic and stearic [4]. The results presented indicate that different heat treatments can significantly change the fatty acid profile. The roasted rice bran samples showed losses of palmitic and stearic fatty acids. Rice bran is a natural source of lipids, and can contain more than its weight in oil, especially unsaturated fatty acids, besides having bioactive phytochemical content such as oryzanol and tocotrienols known for their functional properties with proven health benefits. On this aspect, studies developing methods of stabilization of the bran that improve the efficiency of oil extraction and preservation of the compounds present have been conducted. Analysed the effect that ohmic heating for enzymatic inactivation exerted on rice bran oil. In the cited study, ohmic heating was applied to stabilize rice bran in order to improve the production of oil extraction compared to microwave heating and a control sample. Their results showed that ohmic heating and microwave heating were both successful methods for stabilizing rice bran.

Discussion

Samples seemed to have more fatty acid liberation due to heating and might need greater attention to its storage conditions in order to avoid or reduce the development of rancidity. The results obtained in this study allow distinct rice bran stabilization procedures can change the content of some nutrients by varying degrees. In general, the nutritional quality was practically fully preserved in both treated rice bran samples, with a few exceptions for some components. The roasting process reduced the bran moisture more efficiently but appears to constitute a more severe treatment for the conservation of some fatty acids. Microwave oven treatment represents a practical tool for rice bran heat stabilization and reaps more advantage of oil compounds considered beneficial to human health. Rice bran is a by-product of the rice processing industry. In India and other countries, approximately one million tons of bran are produced annually and used predominantly for animal feed. Recently, the use of rice bran is gaining importance in many studies due to the fact that, during the processing of whole rice, large amounts of the grain's outer layers are removed, raising the concentration of nutrients in the bran and rendering it an important source of nutrients for the food industry and human consumption. However, its utilization is limited due to enzymatic activity after rice dehulling. Rice bran is rich in lipids and intense lipase activity in the presence of endogenous lipoxygenase causes rapid deterioration of these lipids by rancification [5]. Because of lipid susceptibility, the commercial use of rice bran requires enzymatic inactivation immediately after bran separation to avoid fatty acid liberation, extend its shelf life and allow its commercialization for human consumption. Enzymatic inactivation can be achieved by heating to high temperatures for a short period. Some industries extrude the defatted rice bran for use mainly as animal feed. In countries such

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as Brazil, stabilized rice bran for human consumption is not widely available at supermarkets. Consequently, consumers looking for the product have to acquire it raw directly from rice processing companies and subject it to heat treatment in a conventional stove or microwave oven. These treatments are known as homemade stabilization methods. The rice bran has been introduced into a multi-mixture of toasted flour consisting of food industry waste, as part of a Brazilian social program to restore the health of malnourished children. However, little is known about the influence of these processes on the nutritional value of rice bran. Therefore, this work was conducted to evaluate the effect of two different stabilization procedures on the level of preservation of the nutritional composition of rice bran, and to provide further information about a potential food ingredient for the human diet [6]. From a commercial perspective, when there is a growing market for rice bran with added value and more scientific information available about its benefits, industries are expected to show more interest in processing the product for human consumption besides its current use as animal feed. In order to inactivate enzymatic deterioration, whole rice bran samples were subjected to two stabilization methods. Changes in nutritional value in terms of, concerning chemical composition, minerals and fatty acid content, were evaluated to supplement existing data and promote the utilization of rice bran in the human diet. Rice bran along with the germ is an inherent part of whole grain which consists of phytonutrients like oryzanols, ocopherols, tocotrienols, phytosterols and importantly dietary. The complete exploitation of its potential has not been realized due to problems associated with rancidity. However, owing to umerous stabilization procedures, it has been possible to derive an array of health promoting value-added products [7]. The applications span over a wide range starting from cholesterol reduction, combating cancer, alleviating menopausal and postmenopausal symptoms, masking the signs of ageing to production of PHA substitutes and treating water from agricultural run-off. The most commonly used form is its oil that has exceptional properties which makes it unparalleled when compared with other vegetable oils. Until recently, rice bran as a source of value-added food product was under-utilized due to lipase enzyme which is endogenously present or produced as a result of microbial activity which is activated during the milling process [8]. These lipases hydrolyze the oil into glycerol and free fatty acids which give the product a rancid smell and bitter taste that renders the bran unsuitable for consumption [9]. Under normal milling conditions rice bran will degrade in approximately six hours into an unpalatable material making it unsuitable as human food. Because of the problem with rancidity, most rice bran is used as a high protein feed additive for animals or as fertilizer or fuel. Since oxidative changes affect the oil quality adversely and are not very rapid in their manifestation, stabilization becomes a pre-requisite. These efforts are aimed at destruction or inhibition of lipase the enzyme that causes development of free fatty acid. This is done so as to reduce oil losses which are directly proportional to the content [10]. Rice bran can be stabilized by a variety of methods like cold storage, sun-drying, steaming and expelling. Chemical stabilizers like sodium meta-bi-sulphate can also be used.

Conclusion

Properly processed extrusion stabilized rice bran from rough rice can be safely stored for up to one year in gas-permeable packaging. But the maximum safe storage life for par-boiled rice bran is estimated at less than 3-4 months.

Acknowledgement

None

Conflict of Interest

None

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