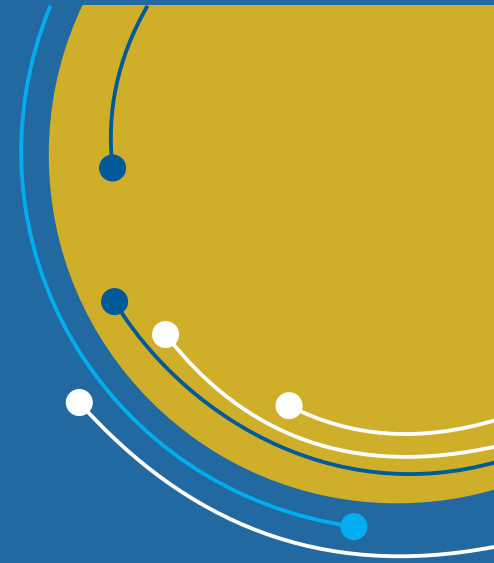
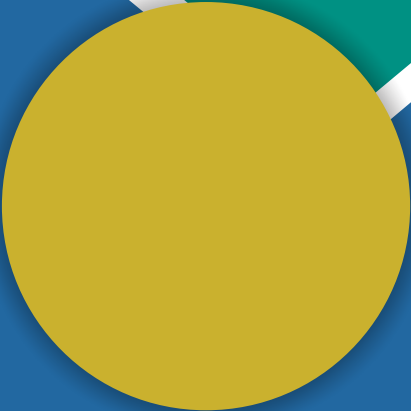


# Utilization of Rice Industrial Waste for Oil Extraction and Value Added Products



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Rice bran holds significant nutritional value containing about 18-20% oil and 14-18% protein. In Pakistan, millions of children, less than five years old, are malnourished and about 38% are underweight. To curtail these challenges there is an urge to explore unconventional nutritional sources like rice bran, bran oil, protein and allied supplemented products. Rice bran oil contains both essential and non-essential fatty acids like oleic acid (38.4%), linoleic acid (34.4%), and linolenic acid (2.2%) unsaturated essential fatty acids while palmitic (21.5%) and stearic (2.9%) acids are non-essential saturated fatty acids. It is extensively used in Japan, Korea, China, Taiwan and Thailand and called as "Premium Edible Oil" whilst in Japan famous as "Heart Friendly Oil". Now, the trend of utilization of rice bran oil is increasing in Asian countries like India and Sri Lanka. Furthermore, defatted rice bran is also a rich source of protein with tendency to supplement cereal based products like cookies. It can be used to alleviate protein energy malnutrition in the public. Rice bran protein is easily digestible and hypoallergenic food ingredient. For this reason, supplementation of wheat flour with defatted rice bran holds potential to uplift the nutritional status of cookies with special reference to lysine and dietary fiber thus used to address protein energy malnutrition.

Our core agenda was to utilize food industrial waste effectively and promote value addition to ensure better nutrition of the dietary staples. Accordingly, rice bran was analyzed for various quality parameters. The oil was extracted from the bran that was further employed for the development of baked items with special reference to cakes and cookies. Moreover, the frying performance of the rice bran oil was also ascertained. Finally, the defatted bran was used for the development of fiber enriched bread.

## Rice Bran Oil (RBO)

The oil was extracted from the bran using soxhlet technique then the crude oil was refined to obtain the high quality edible oil through several refining steps like dewaxing, degumming, neutralization and bleaching. After the refining process, 14-16% refined oil was obtained from the bran. The refined oil samples were analyzed for different quality parameters *i.e.* specific gravity, smoke point, fire point, free fatty acids, iodine value, saponification value and rancidity test.

The RBO contains high levels of naturally occurring components such as phytosterols, gamma-oryzanol, tocotrienols and tocopherols that impart resistance to thermal oxidation and deterioration of the oil. The high oxidative stability of RBO makes it preferred oil for baking and frying applications.



## Rice Bran Oil Supplemented Cookies and Cakes

To evaluate the baking performance of RBO, cookies and cakes were prepared by replacing normal shortening with RBO and stored at room temperature. During storage, chemical and sensory evaluation of cookies was carried out at predefined intervals. The results revealed that there is a possibility of up to 25% and 50% replacement of RBO with normal shortening in the production of cookies and cakes, respectively.

## Chicken Nuggets Fried in Rice Bran Oil

In order to assess the frying performance of RBO, chicken nuggets were fried in various combinations of RBO with commercial oil. The fried chicken nuggets were analyzed for different sensory attributes like appearance, color, flavor, texture and overall liking and observed non-significant differences between the nuggets prepared from 100% commercial oil and that prepared from 100% RBO. It is worth mentioning that chicken nuggets fried in RBO absorbed about 33% less oil than that of fried in commercial oil.

## Fiber Enriched Bread

Defatted bran left after oil extraction was further used for the preparation of value added products like fiber enriched bread that was analyzed further for its eating and keeping quality. The results indicated that there is possibility of 6% replacement of defatted bran with white flour for the preparation of enriched bread without substantially affecting the quality.

