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**A PRELIMINARY STUDY ON EFFECT OF YEAST DOSAGES ON RICE  
BRAN AS A POTENTIAL FISH FEED INGREDIENT AT 35 °C**

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**ABSTRACT**

Ingredients cost is a major factor affecting the cost of feed and fish production. Rice bran is abundantly produced and mostly becomes a waste, because of its low nutrients that is not easily digested by animals. Thus, protein extraction from it is done using several treatment methods (physical, heat, enzymic and chemical). The need to determine the appropriate dosage of Yeast (*Saccharomyces cerevisiae*) that will improve nutrients availability in Rice bran at 35 °C necessitate this study. The nutrients composition of Rice bran was determined using proximate analysis, the undigested Rice bran crude protein and crude fibre composition are 7.75 % and 26.89 % respectively. Yeast (0 %, 3 %, 4 % and 5 %) was evenly mixed into rice bran and water added to it, then digested at 35 °C in a thermo-regulator. The digestion at 0 %, 3 %, 4 % and 5 % yeast yielded these Crude Protein: 7.75 %, 10.50 %, 8.00 %, and 7.88 % and crude fibre: 26.89 %, 20.21 %, 21.56 % and 22.30 % respectively, which signifies an increase in crude protein and a reduction in crude fibre in all the treatments. Digestion done with 3 % yeast inclusion level produced the highest crude protein and lowest crude fibre at 35 °C. This shows a nutritional composition improvement that may lower cost of production, environmental and waste management, if used as an ingredient in feed production.

**Keywords:** Digestion, Rice bran, Crude protein, Crude fibre, nutrition, improvement

**INTRODUCTION**

Living organisms, human beings to be specific need protein to be healthy (Clifton *et al.*, 2014 and Hoffman and Falvo, 2004). Fish is regarded as a relatively accessible and cheap source of animal protein compare to Chicken and Meat also considering the nutritional composition (Healthy Fish Logo, 2022, Maulu *et al.*, 2021), the amount consumed and the



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level of fish demand is fast increasing in Africa (Iheanacho *et.al.*, 2017). Feeding accounts for 60-80 % of fish production cost in Africa (Adekunle *et al.*, 2012, Jamiu and Ayinla, 2003, Orire and Sadiku, 2014). Fish feed will be a determinant in increasing productivity and profitability of aquaculture (Akinrotimi *et al.*, 2007). The price of foreign fish feed has popped up because of the present economy of the country (Ahmad and Ibrahim, 2016), thus warrant the need for alternative ingredients that are cheaper and readily available.

Cereals bran and offal like rice bran, maize and wheat brans unlike legume seeds are not presently being consumed by man and they are produced in abundance. Rice bran is the dry outer covering of rice grain, which is always removed during the milling of rice. It is of no direct **nutritional value** to man and fish, in most mills, it is often discarded or allowed to rot away, sometimes used as litter material or used in fire making (Olayimika and Abubakar, 2021). Rice production is on the increase, thus, its waste (Rice bran) increases and constituting a nuisance (Olayimika and Salaudeen, 2020), since rice offal makes up to 40 % of parboiled rice. Nigeria has the potential to produce about 200,000 metric tons of Rice annually (Fagade, 2000). Rice bran contains 12 to 15 % protein (Zhang *et al.*, 2012). Rice bran protein is a good source of well-balanced amino acid and contains hypoallergenic protein which is desirable in infant food formulation (Xia *et al.*, 2012). Rice bran protein has enormous health benefits and good potentials in food industry applications (Fabian and Ju, 2011). It has an excellent amino acid profile but its shortcoming is identified in the deficiency of sulphur containing amino acids such as methionine and cysteine with a high content of lysine (Huige, 2006), likewise with high fibre content that is not easily digested by some fish species (Olayimika and Salaudeen, 2021).

Several treatment methods (physical, heat, enzymic and chemical) have been used in the extraction of protein from rice bran, the use of enzyme and subcritical water treatment showed promising protein yield among all the available pre-treatments methods, but the



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relative expensive cost of enzyme and the quality of protein extracted at relatively high temperatures for subcritical water treatment constitutes limitations to the use of the methods due to reduced protein functionality (Fabian and Ju, 2011). Treatment of rice bran by chemical, enzyme and heat methods prior to protein extraction could affect, often adversely, the protein functionality (Shih, 2003).

Yeast (*Saccharomyces cerevisiae*), a microscopic, one-celled organism belonging to the group of organisms called fungi. There are many kinds of yeast, some of them are of great value to human. Yeast is additionally utilized as a part of hereditary building to deliver expansive amounts of specific hormones and chemicals, which are utilized for such restorative purposes as recuperating wounds and diminishing aggravation. A few sorts of yeast, be that as it may, cause illness; candidiasis, a skin disease, is an example. Yeast are found in the dirt, in water, on the surface of plants, and on the skin of people and different creatures. Like other parasites, yeasts acquire nourishment from the natural matter around them; they discharge chemicals that separate the natural matter into supplement they can absorb. The yeast cell is oval or round and has a slim film. Under perfect states of dampness, temperature, and sustenance supply, it recreates agamic ally, by growing. Maturing is a fast process, requiring around 20 minutes to deliver to another living being. Yeast shows up possibly helpful as it has appeared to enhance, nourish edibility and meat shading (Ezema *et al.*, 2009). Yeast as a supplement, is being accounted for as a good quality enhancer, since it is hostile to microbial properties (National Livestock Research institute, 2007) and may be a decent different option for anti-toxin development promoters. Live yeast expends digestibility procedures by starting the procedure aging, and a wellspring of digestive proteins of different sorts.

Yeast has been used extensively in poultry and other animals as a growth promoter and also as additive to enhance fibre utilization. The fermentation of feed dough by yeast has been



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utilized alongside local binders to produce local feed having greater water stability and floatation (Solomon *et.al.*,2017). Yeast addition in broiler chicken diets has been reported to lower Food Conversion Ratio (FCR) (Onifade and Babatunde, 1996).

However, Supplementation of fish feed with yeast has yielded mixed results with lower inclusion levels being favoured for most fish (Solomon *et al.*, 2017). Temperature plays an important role in the quality of the yeast. High temperatures tend to damage the viability of yeast for the beer industry, but this is not of significance in the animal feed industry as autolytic breakdown of yeast which occurs at 50 °C be optimized for extraction of protein and nitrogen contents (Tanguler and Erten, 2008).

Fish feed technology is one of the least developed sectors of aquaculture in Africa and other developing countries of the world (Gabriel *et al.*, 2007). Highly successful Aquaculture in Nigeria depends on good quality and affordable feed, hence the promotion of biotechnological approaches to improve feed quality by using microbial stable digestive enzymes and use of probiotics (Ghosh *et al.*, 2001, Umaru *et al.*, 2016). The application of biotechnology in feed production will take feed and fish production to an advance level (Olayimika and Abubakar, 2021, Olayimika and Salaudeen 2021).

### **MATERIALS AND METHOD**

Homogenous Rice bran was dried, milled to powdery form then subjected to proximate analysis to check for the chemical contents (Crude fibre, moisture, crude protein, ash, lipid and nitrogen free extract). The rice bran was digested using yeast at 0 %, 3 %, 4 % and 5 % composition. Each unit contains 200 g of rice bran and yeast (0 g (0 %), 6 g (3 %), 8 g (4 %) and 10 g (5 %) (Electronic sensitive balance (adventurer ohamaus) was used) with 50 ml of water (measuring cylinder was used) for each at 35 °C in a digitalized thermo-regulated after been thoroughly mixed (to have homogenous mixture), while each product was kept in separate crucibles.



## RESULTS

The results in table 1 shows the undigested rice bran (0 % inclusion level of yeast) to contain crude protein of 7.75 % and crude fibre of 26.89 %, while digested rice bran with 3 % inclusion level of yeast yielded an increase of crude protein from 7.75 % to 10.50 % and decrease in crude fibre from 26.89 % to 20.21 %, 4 % Yeast inclusion yielded increase from 7.75 % to 8.00 % of crude protein and decrease of crude fibre from 26.89 % to 21.56 % and 5 % Yeast inclusion yielded increase from 7.75 % to 7.88 % of crude protein and decrease of crude fibre from 26.89 % 22.30 % when digested at 35 °C.

## DISCUSSION

Nutritional composition improvement occurred in all the Yeast treated Rice bran at 35 °C, which was as a result of the digestion done by Yeast compared to the undigested Rice bran, this is in agreement with Olayimika and Abubakar (2021) also, Olayimika and Salaudeen (2021), that nutritional improvement occurred when non-conventional feeds ingredients were treated with Yeast. The result shows that when 35 °C was used in Rice bran digestion, 3 % yeast is required to produce the highest nutritional improvement of increase in crude protein when compared with 4 % and 5 % Yeast inclusion. Further increment to 4 % and 5 % Yeast inclusion in digestion of Rice bran at 35 °C led to a less yield in crude protein. 3 % yeast used in digestion of Rice bran at 35 °C produced the least fibre content, which was the highest reduction in crude fibre content when compared with 4 % and 5 % Yeast inclusion, increase of yeast from 3 % to 4 % and 5 % for digestion of the Rice bran at 35 °C did not have any positive effect on fibre content reduction. Digestion of Rice bran with yeast dosage of 3 % yielded the highest crude protein of 10.50 % and resulted in crude fibre reduction from 26.89 % to 20.21 % (Table 1), this increase may be due to microbial protein synthesis (Aderolu and Ganiyat, 2008), although the findings of Chinma *et al.*, (2014) shows optimum digestion conditions using yeast was achieved at 30 °C using 3 % concentration. Digestion of Rice bran at 35 °C above 3 % Yeast inclusion level shows a



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decline in nutritional (crude protein and crude fibre) composition improvement. This shows that yeast plays an important role in nutritional improvement of Rice bran.

### CONCLUSION AND RECOMMENDATION

Yeast used in digestion of Rice bran at 35 °C plays a vital role in the nutritional improvement and nutrient availability in rice bran. 3 % yielded the best in fibre and protein improvement when digestion was done at 35 °C, thus 3 % yeast is required to produce the best nutritional improvement for increase in crude protein and decrease in crude fibre. The use of the digested Rice bran in the formulation of fish feed will reduce cost of feed and fish production due to its availability at low or no cost, it will increase availability of digestible nutrients at low cost and improves the management of the environment by reduction in combustions of Rice bran as a waste and environmental nuisance as a result of improper disposal, it will increase profitability, create job and ensuring environmental and food security. Further researches and study on other dosages, temperatures and digestibility should be carried out for improvement and better production.

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### Addendum

TAB 1: Proximate analysis of digested rice bran at 35 °C with different yeast dosages (0 %, 3 %, 4 % and 5 %)

Quantity Used (Yeast	Protein	Fibre	Lipid	Moisture	Ash	Nfe
0 %	7.75	26.89	2.67	5.50	18.85	38.34
3 %	10.50	20.21	3.11	10.89	14.93	40.36
4 %	8.00	21.56	3.36	10.55	15.24	41.29
5 %	7.88	22.30	3.33	10.33	12.55	43.61