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## Assessment of nutritional value of rice products before and after fermentation

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### ABSTRACT

Fermentation also sometimes increases the nutritional value of the food products. The advantages of maturation of nourishment make them simpler to process, make hazardous substances or unpalatable things eatable and make nourishments more nutritious. The purpose of this study is to assess the nutritional value of rice products before and after fermentation. Rice batter was prepared and an aliquot from the rice batter was made to ferment. Both the unfermented rice batter and fermented rice batter was subjected to further analysis. The two samples were checked for the following biomolecule such as carbohydrate, protein, fat, fibre and calcium content. The energy value of fermented and non-fermented are 134 kcals/g and 130 kcals/g. From the above study we proved that fermentation results in increase of crude fibre, protein and calcium. There was a decrease in fat and carbohydrate value after fermentation which makes the food healthier. The non-fermented rice sample has decreased fibre, protein, calcium and increased carbohydrate and fat content. So as the results conclude those fermented foods are healthier than unfermented food. On a daily basis consumption of fermented rice gives more nutrition and has more energy content as well.



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### INTRODUCTION

Fermented foods, such as cheeses, rice, bread, various soybean, ragi, vegetables, have made an incredible imperative commitment to human weight control plans for some number of years. Unquestionably the most huge part of maturation in human sustenance has been to help make the supplements normally display in the beginning nourishment materials more tasteful and more generally accessible than would be conceivable

without aging (Wizna *et al.*, 2012). Rice items are overwhelmed by or without aging (Hesseltine, 1979). Maturation is done to safeguard the sustenance for longer term. Maturation additionally here and there expands the dietary estimation of the sustenance items. The advantages of maturation of nourishment are last more, make them less demanding to process, make dangerous sustenances or unpalatable things palatable and make sustenances more nutritious. Amid time of sustenance lack, things that are not ordinarily eaten can be aged to make them more tasteful (Tamang, 2010a, Onwurafor *et al.*, 2014). Probiotics are likewise found in numerous matured sustenances, so these nourishments can bring down the hazard for looseness of the bowels. The solid taste of matured nourishments is helpful in adding flavor to diets that may somehow be dull (Mensa *et al.*, 1990, Kiplamai and Tuitoek, 2010, Adams, 1990).

Aged sustenance assumes a noteworthy part in keeping up great wellbeing. Aged nourishment keeps a sound oral cleanliness. Pits, gingivitis,

periodontitis, and halitosis (terrible breath) are altogether caused by the expansion of destructive microscopic organisms in our mouths. By eating fermented foods rich in lactic acid bacteria and other beneficial bacteria's makes human beings healthier (Suresh *et al.*, 2010). This also falls in line with the belief that good dental health starts with good overall diet and health – that is, teeth are made strong from the *inside* (Gopinath, 2010). Obviously, brushing and flossing is still a very healthy practice, but the beneficial bacteria are part of the overall picture.

Rice is one of the most important cereal foods in the world. The botanical name of the plant is *Oryzae sativa*. Rice is one of the most abundantly cultivated plants in Indian subcontinent. It is consumed as staple food in southern part of India due to its rich content of carbohydrates and energy. In this manner, regardless of whether maturations had no immediate impact upon the supplement substance and nature of nourishments, these procedures would be essential to the sustenance supply (Gopinath, 2010). The aging procedures can have huge direct impacts on the nutritive characteristics of foods (Liang *et al.*, 2008). The reason for this investigation was to evaluate the nourishing estimation of rice items when maturation.

## MATERIALS AND METHODS

### Rice batter preparation

Rice batter was prepared and an aliquot from the rice batter was made to ferment. Both the unfermented rice batter and fermented rice batter was subjected to further analysis. The two samples were checked for the following biomolecule such as carbohydrate, protein, fat and fibre content. The mineral content such as calcium was also checked. The energy values in calories were also determined.

### Analysis of carbohydrate

Nutrient databases may give esteems to "add up to starch" or for "accessible sugar." Add up to carbohydrate values in the tables are ascertained by contrast utilizing the accompanying recipe for 100 g of sustenance.

Carbohydrate = 100g – (g protein + g fat + g alcohol + g ash + g water)

Starch computed in this way incorporates dietary fibre, and in addition different parts of a nourishment that are not protein, fat, liquor, slag, or water. The total carbohydrate can be calculated from sugars, starch, oligosaccharides and dietary fibre.

### Determination Of Crude Protein

Ten grams of the sample was weighed and transferred into a Kjeldahl flask. Four tablets of Kjeldahl catalysts (Tablet consists of 1g Na<sub>2</sub>SO<sub>4</sub> and 0.5g of selenium) were added. Concentrated H<sub>2</sub>SO<sub>4</sub> (20ml) and glass beads were added to avoid any bumping on heating. The flask was set in the fume cupboard and heated gently until the mixture becomes colourless. The heating process was approximately one hour after which it was allowed to cool down to room temperature slowly and washed. 20 ml of distilled water is then added into 500ml distillation flask.

Pieces of hot cleats were added into the flask and connected up to the splash head and water cooled condenser. NaOH solution (5%, 4ml) was added in the dropping funnel and 50 ml of 2% boric acid into the 250 ml receiving flask with methyl red indicator. The dropping funnel tap was opened slowly to allow the NaOH to enter the boiling flask. The distillation flask was heated to boiling with water passing through the condenser. Distillation continues until about 150ml was collected in the receiving flask. The content of the flask was titrated with 0.5 M HCl until pink end point. The reading was recorded and blank was run along the same treatment.

### Determination of fat / oil

Ten grams of powdered sample was weighed and transferred to soxhlet extractor containing 250 ml of oil ether. The thimble and the substance were set in a 100 ml container and dried in a broiler for 30 mins at 105 – 110°C. The sample was removed for 7 hrs at a build-up rate of 240 drops for every moment. After extraction the example was moved to an weighed dissipating dish and flushed 2-3 times with the extractant (Indrayan *et al.*, 2005). The dish was put in a smoke chamber to make dissolvable product. The sample was dried in a stove at 105<sup>o</sup>-110<sup>o</sup>C for an hour and after that cooled in a desiccator and weighed.

$$\% \text{ crude fat} = \frac{\text{Dish weight} + \text{dried contents} - \text{wt. of empty dish} \times 100}{\text{Wt. of sample}}$$

### Determination of fibre content

Two grams of ground test was weighed and put in a funnel shaped jar. The sample was extracted by mixing with oil ether. 200 ml of 1.25% H<sub>2</sub>SO<sub>4</sub> solution was warmed till bubbling and exchanged to the dried example. The sample was permitted to settled, bubbled tenderly for 30 mins and blended. The jar was expelled and separated utilizing a channel paper held in a pipe and washed with bubbling water until its no longer acidic to litmus paper. 200 ml of 1.25% NaOH was conveyed to

bubbling under a reflux condenser this alkaline arrangement was utilized to wash the sample once more and after that bubbled for 30 mins under condenser and then transferred to the sintered pot utilizing bubbling water. The build-up was washed first with bubbling water, 1% HCl and bubbling water to render the insoluble issue free of corrosive. The deposit was washed three times with liquor and diethyl ether and after that dried in an oven at 150 °C to a consistent weight (Van de kamer and Van ginkel, 1952). The dried sample was placed in a muffle furnace at 500°C for an hour. The crucible was then cooled in a desiccator and weighed.

$$\% \text{ crude fiber} = \frac{\text{@A.BC DBEFGHEH IIAHK} - \text{@A.BC IDL M NOO}}{\text{PA.BC DJ IQEH}}$$

## RESULTS AND DISCUSSION

The results show (table 1) that carbohydrate value of non-fermented sample is higher (28g) when compared to fermented sample (27.1g/100g). The fat value is quite high in fermented sample of about (0.3g/100g) and the non-fermented sample has a lower fat value when compared to the former

**Table 1: Energy value of white rice flour/100g**

	Non-fermented	Fermented
Carbohydrate (g)	28.0	27.1
Fat (g)	0.3	0.23
Protein (g)	5.9	7.60
Calcium (µg)	104	120
Fibre (g)	0.3	2.46
Calories (kcal/g)	130	134

(0.23g). The protein value of the non-fermented food is about 5.9g/100g and the protein value of fermented food is 5.9g/100g and the non-fermented samples have a high protein content of 7.60g/100g. The calcium levels of non-fermented and fermented sample are 104 µg/100g and 120 µg/100g. The fibre content of non-fermented food sample is 0.3g/100g and the fermented sample has a very high fibre value when compared to non-fermented of about 2.46g/100g. The energy value of fermented and non-fermented are 134 kcal/g and 130 kcal/g. From the results it is evident that the rice after fermentation contains less fat when compared to non-fermented rice. The fermented rice product is healthier than the non-fermented rice (Adel *et al.*, 1980). The fermentation does not affect the total fibre content of the food. Previous study concluded that after fermentation of rice by *B. amyloliquefaciens* there is a decrease in fibre content by about 21.20% which is contrast to our study. By the results of study done by Onwura *et al* proved that there was an increase in crude fibre after fermentation.

Fermentation leads to increase in calcium content. A study done on mung bean by Onwura *et al.*, depicted the same results. There was an increase in calcium level after fermentation. The unfermented mung bean has calcium level of about 21.50 mg/100 g and the calcium level after fermentation becomes 49.30 mg/100 g. The result of this study is similar to our study. There is a significant difference in the value of protein between the fermented and non-fermented rice (Wang and Fields, 1978, Osman, 2004). The non-fermented rice sample has protein value of about 5.9g and the protein value of fermented rice sample is 7.60 g. Fermentation increases the protein content of the rice sample. A similar result was seen in a study done by Osman, 2011 where the carbohydrate value decreases after the fermentation of millets. The decrease in carbohydrate content of fermented flours could be attributed to the use of carbohydrate as a source of energy by microorganism. Onwurafor *et al.*, (2004) reported the same results similar to our study. There is a decrease in fat content of fermented rice sample when compared to the non-fermented rice sample. The fermented millets showed decrease in

fat value when compared to unfermented millet which was done by Osman, 2011. (Onwurafor *et al.*, 2004) reported that mung bean shows decrease in fat value after fermentation. The same concomitant results obtained in the fermented rice sample. Supriyati *et al.*, (2015) reported an increase in energy value of the fermented rice sample which is concomitant with the present study. The energy value of non-fermented sample is 130kcal/g and the energy content of fermented rice sample is about 134kcal/g. Hence fermentation increases the energy content of the rice sample.

## CONCLUSION

From the above study, we concluded that fermentation results in increased crude fibre, protein and calcium. There is a decrease in fat and carbohydrate value after fermentation which makes the food healthier. The non-fermented rice sample has decreased fibre, protein and calcium and there is increase in carbohydrate and fat. So as the results says fermented foods are healthier than unfermented food. So, on a daily basis consumption of fermented rice gives more

nutrition. The fermented rice sample has more energy content as well.

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