

Study on the effect of jackfruit pancake implementation in combating malnutrition among the tribes of Bargarh district

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Nutritional status of children is a proxy indicator for assessing the entire population health status and one of the major predictors of child survival. India is considered as the motherland of jackfruit. Pancakes is another popular wheat-based product. The aim of this study was to plot the nutritional deficiency in the tribal community, prepare a Nutritional food supplements by conducting nutritional and sensory evaluation for the acceptance of the product and to compare the initial health status with the post implemented supplied pancake. The study was carried out in Lahanda villages under Attabira Block of Bargarh district with a sample size 45 (6-58 months). In laboratory condition pancake was prepared from jack fruit seed paste combined with rice paste in a proportion of 0, 15, 30 and 45%, respectively. Nutritional and its sensory evaluation has been done keeping in mind for the nutritional enhancement. The study revealed that after three months of counseling the variation in weight was increased to 26.44% Green and decreased 2.4%, 22% in yellow and red, respectively according to the WHO growth Chart.

Key Words : Health status, Nutritional food, Tribal, Jackfruit, Pancake, Sensory evaluation

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INTRODUCTION

Nutrition is a major factor in bringing out the maximum potential that one is endowed with both physically and mentally. Good nutrition depends on adequate food supply. The social, cultural, economic and agricultural factors are the basic etiological factors causing nutritional disease and they are closely linked with excessive increase in the population. Wide spread malnutrition is largely a result of dietary inadequacy and unhealthy life styles. Others contributing factors are poor

purchasing power, faulty feeding habits, large family size, frequent infections, poor health care, inadequate sanitation, and low agricultural production. Population living in the backwards and drought-prone rural areas and urban slums, and those belonging to the socially backward groups like scheduled castes and tribal communities are highly susceptible to under nutrition.

In developing countries, malnutrition, with the different spectrum of diseases that it comprises, is highly prevalent and contributes significantly to the premature death of children. Malnutrition is believed to play a key role in upto a third of the 88 million annual deaths occurring in children under the age of 5 years, and malnourished children have a fourfold increased risk of death (Black *et al.*, 2010). Wasting or acute malnutrition is a major contributor to the global disease burden and to child mortality. In 2011, >50 million or 8% of all children

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<5y (years) were affected (Black *et al.*, 2013). Acute malnutrition can be divided into severe acute malnutrition, being defined as a weight-for-height Z-score (WHZ) < -3 or a mid-upper arm circumference of <11.5 cm, or moderate acute malnutrition, with a WHZ between -2 and -3 Z-scores or a MUAC (mid-upper-arm circumference) between 11.5 and 12.5 cm. Severe acute malnutrition affected 19 million children in 2011, causing an estimated 500,000 deaths, which represents ~7.5% of all <5y mortality. In the revised (2013) guidelines for the management of severe acute malnutrition, the World Health Organization (WHO) recommends using 11.5cm and 12.5cm as cut-offs for admission and discharge criteria for severe and moderate acute malnutrition in children under 5y, respectively (WHO, 1995).

Complementary feeding is the process starting when breastmilk is alone no longer sufficient to meet the nutritional requirements of an infant, complementary foods should be added to the diet of the child and when other foods and liquids along with breast milk are needed. The age range for complementary feeding is generally 6-24 months of age, and is a very vulnerable period.

Interpretation of Mid-Upper Arm Circumference MUAC indicators

- MUAC less than 11.5cm, Red colour, indicates Severe Acute Malnutrition (SAM). The child should be immediately referred for treatment.

- MUAC of between 11.5cm and 12.5, Yellow colour, indicates that the child is at risk for acute malnutrition and should be counseled and followed-up for Growth Promotion and Monitoring (GPM).

- MUAC over 12.5cm, Green colour, indicates that the child is well nourished.

Food habits of the people vary from place to place according to culture of the inhabitants. Local products of the region are one of the determining aspects for the people what they eat. The people of tribal areas get food mainly from agriculture and forest products, depending upon their local availability. Food is the main source of nourishment for the body. Food availability, production and distribution influence the food preferences. Religion, custom, tradition decides its utilization of an individual as a culture. Being so, the relationship of people with food produced by the individual and society determines the extent of malnutrition. Food habit are adopted early in childhood and this become firmly imbedded they become taboos. These food taboos may somehow cause adverse

affect on the health of individuals. Food habit varies from season to season and also depends upon the availability of the food-stuffs. Traditional food habits and poverty are the main cause responsible for an unbalanced diet. Their diets includes seasonal foods which to some effects a balance in the diet, but infect do not eat sufficient amounts of seasonal food to make more than a marginal difference. They eat meat in the festive season not from the nutritional point of view but because it is their custom (Rizvi, 1986).

Jackfruit (*Artocarpu sheterophyllus* L.) is a shrub belonging to the family moraceae and is widely distributed in tropical countries such as Brazil, Thailand, Indonesia, India, the Philippines and Malaysia (Chowdhury *et al.*, 1997). India is the second biggest producer of the fruit in the world and is considered as the motherland of jackfruit. The jackfruit is native to parts of South and Southeast Asia and is believed to have originated in the rainforests of Western Ghats of India and is cultivated throughout the low lands in South and Southeast Asia. Seeds make up around 10 to 15% of the total fruit weight (30-65/ fruit) and have high carbohydrate and protein contents. The jackfruit seeds are high protein, fibre and carbohydrate contents (Ocloo *et al.*, 2010). Jackfruit seed contains lignans, isoflavones, saponins, all phytonutrients and their health benefits are wide ranging from anticancer to antihypertensive, antiaging, antioxidant, antiulcer, and so on (Omale and Friday, 2010). Seeds contain two lectins namely jacalin and artocarpin. Jacalin has been proved to be useful for the evaluation of the immune status of patients' infected with human immunodeficiency virus 1 (Haq, 2006).

Mostly the seeds are discarded as waste, except sometimes they are boiled or roasted for consumption. As the seeds are recalcitrant and germinate immediately after maturity. Therefore, it is quite tough to store fresh seeds for long time. Due to the lack of processing and preservation techniques, huge amount of jackfruit seeds are destroyed every year. As a result, a large amount of jackfruit seeds remains unused.

Rice is naturally gluten-free and contains proteins that are known to be nutritious and hypoallergenic (Helm and Burks, 1996). Pancakes are another popular wheat-based product that can be reformulated to be non-wheat and gluten-free. Conventional wheat pancakes have been studied extensively on processing conditions for the improvement of texture and flavour (Seguchi, 1990 and

1993; Seguchi *et al.*, 1998). Essentially, the studies found that treatments of wheat flour (starch), such as chlorination and heating, increased its hydrophobicity and, as a result, pancakes prepared with the modified flour showed improvements in springiness. Rice flour has the potential to be a wheat flour substitute in pancakes. However, little information is available on the use of rice flour for gluten-free products such as pancakes. Hence, jackfruit seed can be used with rice to develop nutritious bakery products and such uses will reduce the postharvest loss of jackfruit seeds. Therefore, a study was designed to utilize low cost jackfruit seed to develop a value added fortified pancake and to determine its nutrient composition.

Objectives of the study :

- To plot the nutritional deficiency in the tribal community.
- To prepare a nutritional food supplement to enhance health status.
- To study the nutritional and sensory evaluation for the acceptance of the product.
- To compare the initial health status with the post implemented supplied pancake.

METHODOLOGY

Selection of study area:

The study was conducted in Lahanda village under Attabira Block in Bargarh district of Odisha. Lahanda is a large village located in Attabira of Bargarh district, Orissa with total 1493 families residing. The Lahanda village has population of 6183 of which Schedule Tribes are 2119, child (0-6) 728 3126 are males while 3057 are females as per Population Census 2011. In the village near about 20% children were found to be mal-nourished out of which 75 families were convinced through the counseling but while the survey was carried out they didn't show any potential for which only a sample of 45 children were reached.

A number of 45 respondents were selected for conducting the study. The survey method was through an interview schedule and counseling through home visits. The primary tool used for collecting data was anthropometry measurement *i.e.* Height, weight and MUAC. In the initial phase the height, weight and MUAC of the respondents were taken and according to the WHO Growth chart the analysis was done categorising them into Green Zone (Good nutrition), Yellow Zone (Prone to under nutrition) and Red Zone (Severely malnourished). In the second phase counselling was given on how to prepare a nutritional supplementary feeding made up of rice batter and Jack fruit seed paste. Further in the later phase three round home with the Anthropometry measurements were taken to find the difference in the health status.

Formulation of Pancake in laboratory :

The study was conducted in Department of Food Science, CFST, Sambalpur University, Odisha in the year 2016-17. The raw materials were purchased from local market and jackfruit seeds were collected from the selected sample area. Three blends were prepared by mixing rice batter with jackfruit seed paste in the proportions of 85:15(A), 70:30(B) and 55:45(C), while 100% rice batter was used as control. The standard AOAC methods were implemented for proximate composition estimation and sensory test. The readings were taken in triplicate. The statistical one-way ANOVA analysis was conducted with SPSS 20 at 0.05% significance.

Preparation of jackfruit seed paste:

The jackfruit seeds were cleaned manually and white arils (seed coat) were manually peeled off. Seeds were soaked in water for 30 45 minutes to remove the thin off-white layer which covered the cotyledons. The layer was removed by peeling of the outer layer by hands and washing thoroughly under running water. Further with

Ingredients	Control	Sample A	Sample B	Sample C
Rice batter (g)	100	85	70	55
Jackfruit seed paste(g)	0	15	30	45
Jaggery (g)	10	10	10	10
Salt (g)	2	2	2	2
Water (ml)	25	25	25	25

the help of grind stones (*Silbatta*) a paste was made and mixed with the rice batter. Later this batter was kept aside for 15-20 minutes and after that pancakes were prepared.

Pancake preparation :

The rice batter was then mixed with varying inclusions of 0, 15, 30 and 45% of the jackfruit seed flour as shown in Table A. The composite flours were mixed with water and jaggery; and mixed for 5 min into consistent batter. Ninety milliliters of the batter was poured on the preheated *Tawa* that had been lightly sprinkled with cooking oil. The pancakes were cooked for 2.5 min in medium flame until the upper surface bubbled and it was cover with a lid to cook, and then turned to cook the other side, which browned in another 2–3 min.

OBSERVATIONS AND ASSESSMENT

The mothers of the children enrolled in the study were informed about the study, the nature of the study, its objectives, the expected outcomes, and the benefits and risks associated with the study. Out of total 45 samples, initial weight under red line, yellow line and green line were found to be 18, 11 and 16, respectively. MUAC cut-off of less than 11.5 cm for referral were found to be 21, 15 and 18 under red, yellow and green zone, respectively out of 45 samples as shown in the Fig. 1.

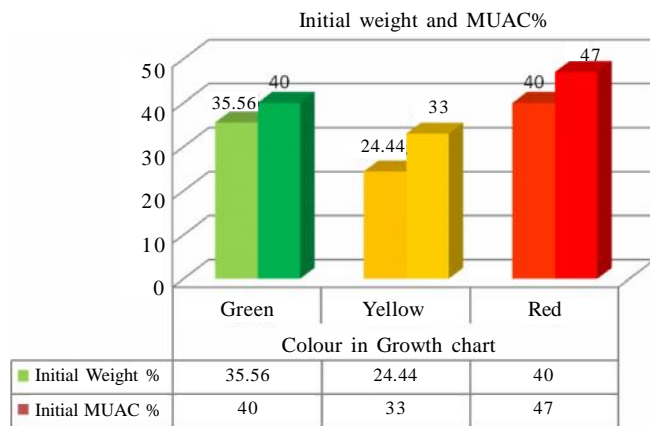


Fig. 1 : Weight and MUAC result in % at initial condition

Jackfruit seed qualitative characters:

Various seed qualitative characters *viz.* seed coat colour, seed shape, and seed consistency after boiling have been observed. The seed coat colour belonged to only two categories *i.e.*, off white and creamish. The different jackfruit types separated in almost equal proportion in respects of this character. Seed shape was divided to six types. Seed consistency after boiling mainly belonged to two categories *i.e.*, floury and waxy. However, in the present investigation the seed consistency after boiling were found to be floury.

Proximate analysis of pancake:

The moisture, protein, fat, and crude fibre content were determined for the control (100% rice batter) and the pancakes supplemented with different levels of jackfruit seed paste as indicated in formulation. Fortification of pancake resulted in increased protein, carbohydrate and crude fibre content, while as fat content was decreased, as compared to control as shown in Table 1.

The graph in Fig. 2 represents that there was increase in carbohydrate, protein and ash content as incorporation of jackfruit seed paste increased, whereas the moisture and fat content get decreased. The values were found to be significant at all the different proportions

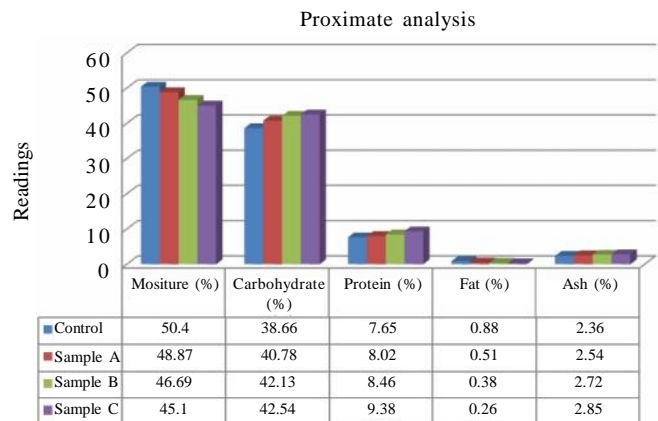


Fig. 2 : Proximate composition of pancake

Table 1 : Proximate composition of pancake

Sample	JSF (%)	Moisture (%)	Carbohydrate (%)	Protein (%)	Fat (%)	Crude Fibre (%)
Control	0	50.40±2.5d	38.66±1.25a	7.65±0.10a	0.88±0.05d	2.36±0.38a
Sample A	15	48.87±2.78c	40.78±1.7b	8.02±0.08b	0.51±0.12c	2.54±0.25b
Sample B	30	46.69±1.42b	42.13±1.45c	8.46±0.17b	0.38±0.18b	2.72±0.56c
Sample C	45	45.10±1.5a	42.54±1.05c	9.38±0.12c	0.26±0.08a	2.85±0.30d

Values reported as mean ± SD.

at $p < 0.05$

Sensory analysis:

The products obtained after baking was subjected for sensory evaluation. The formulated pancakes were compared with the control sample *i.e.* without jack fruit seed paste. The score record sheet was prepared based on the nine point hedonic scale. The average sensory scores for different parameters in control and treated sample of jackfruit seed clearly indicates that Sample A (7.55) had the highest score followed by Sample B (7.02) and Sample C (6.53) as shown in Fig. 3.

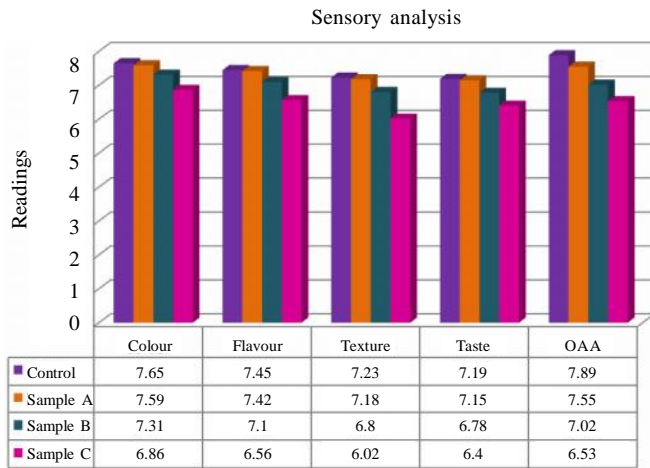


Fig. 3 : Sensory evaluation of Pancake

The calculated value of F is greater than the tabulated value of F at 5% probability level. Therefore, it can be concluded that there was significant difference between treatments regarding the overall acceptability of jackfruit seed fortified pancakes. Thus, the flavour, appearance and overall acceptability increased at the amount of 15 per cent of jackfruit seed fortification. The sensory evaluation revealed that sample A (rice batter: jackfruit seed paste = 85:15) was only acceptable like control sample. In Sample B and C the Pancakes found to have less soothing texture as compared to the control sample.

There was no significant difference ($p > 0.05$) in taste of control sample and sample A, where 7.19 and 7.15 was recorded for control sample and sample A, respectively. Results showed significant differences ($p < 0.05$) in taste of pancake with more substitution of jackfruit seed paste. On overall acceptability, there is no significant difference ($p > 0.05$) between control sample and sample A and marked with score 7.89 and 7.55,

respectively, whereas sample D scored lowest score (6.53) among the prepared samples.

Anthropometric characteristics of the population:

The study revealed that before getting the knowledge; 35.56 % infants of 6-58 months were found to be in Green (Good Nutrition) zone, 24.44% in Yellow (Prone to under nutrition), 40% Red (Severely malnourished) zone (based on WHO Growth Chart. After three months of counseling by home visit this condition was improved to 62% Green, 20% Yellow and 18% Red, respectively. The improvement in MUAC from 40% to 62% under green zone and reduced under yellow and red zone from 33 to 20 and 47 to 18%, respectively based on WHO Growth chart. The data depicted there was increase about 8-10% in weight and 12-15% in MUAC of tribal infants between the ages of 6-58 months as shown in Fig. 4 and 5.

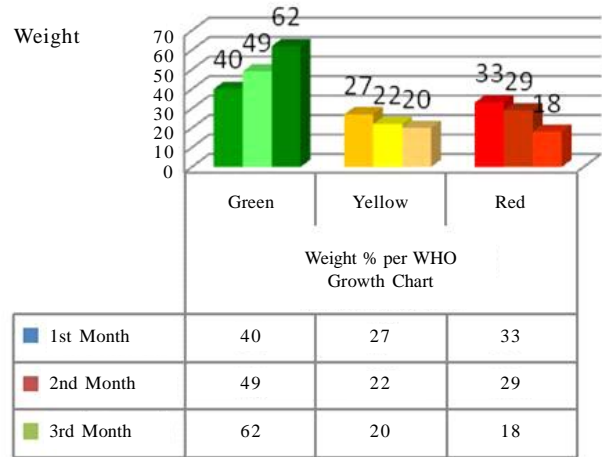


Fig. 4 : Weight % at final condition

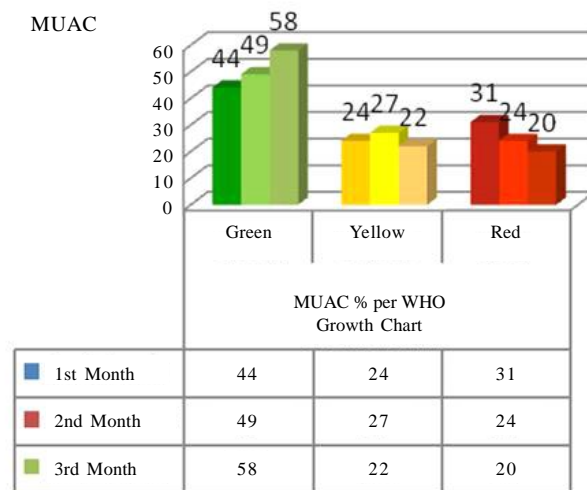


Fig. 5 : MUAC % at final condition

Conclusion :

The incorporation of jackfruit seed paste in the formulation of rice pancakes was found to improve the physico-chemical properties and sensory behaviour of the product. The tribal women mostly give infants carbohydrate based food during weaning period which results in lack of protein diet. The supplemented food found to be appreciated among the sample age group. The diet improvement also showed good results on nutritional health condition for preventing malnutrition. Thus, the study revealed that after three months of counseling the variation in weight was increased to 26.44% Green and decreased 2.4%, 22% in yellow and red, respectively according to the WHO growth Chart.

LITERATURE CITED

- Black, R.E., Allen, L.H., Bhutta, Z.A., Caulfield, L.E., de Onis, M., Ezzati, M., Mathers, C. and Rivera, J. (2008).** Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet*, **371** (9608) : 243–260.
- Black, R.E., Cousens, S. and Johnson, H. (2010).** Global, regional, and national causes of child mortality in 2008: a systematic analysis. *Lancet*, **375** : 1969–1987.
- Black, R.E., Victora, C.G., Walker, S.P., Bhutta, Z.A., Christian, P. and de Onis M. (2013).** Maternal and child undernutrition and overweight in low-income and middle-income countries, *Lancet*, **382** : 427–51.
- Cato, L., Gan, J.J., Rafael, L.G.B. and Small, D.M. (2004).** Gluten free breads using rice flour and hydrocolloid gums. *Food Aust.*, **56**(3) : 75–88.
- Chen, L.C., Chowdhury, A.K.M.A. and Huffman, S.L. (1980).** Anthropometric assessment of Energy-Protein malnutrition and subsequent risk of mortality among pre-school aged children. *American J. Clinical Nutri.*, **33** : 1836-1845.
- Chowdhury, F. A., Raman, Md. A. and Mian, J. (1997).** Distribution of free sugars and fatty acids in jackfruit (*Artocarpus heterophyllus*). *Food Chem.*, **60** : 25–28.
- Haq, N. (2006).** Jackfruit *Artocarpusheterophyllus*. Southampton Centre for Underutilised Crops, University of Southampton. Southampton, UK.
- Helm, R.M. and Burks, A.W. (1996).** Hypoallergenicity of rice protein. *Cereal Food. World*, **41** : 839–843.
- Li, H.C., Risch, S.J. and Reineccius, G.A. (1994).** Flavour formation during frying and subsequent losses during storage and microwave reheating in pancakes. In *Thermally Generated Flavours: Maillard, Microwave, and Extrusion Processes* (T.H. Parliment, M.J. Morello and R.J. McGorin, eds.) pp. 467–475, American Chemical Society, Washington, DC.
- Nutrition Science New Age International (P) Limited Publishers. By B.Srilakshmi
- Ocloo, F.C.K., Bans, D., Boatin, R., Adom, T. and Agbemavor, W.S. (2010).** Physico-chemical, functional and pasting characteristics of flour produced from Jackfruits (*Artocarpus heterophyllus*) seeds. *Agric. Biol. J.N. Am.*, **1** (5) : 903-908.
- Omale, J. and Friday, E. (2010).** Phytochemical composition, bioactivity and wound healing potential of Euphorbia heterophylla (Euphorbiaceae) leaf extract. *Internat. J. Pharmaceu. & Biomed. Res.*, **1**(1) 54–63.
- Rizvi, S.N.H. (1986).** Health Practices of the Jaunsars – A Socio-Cultural Analysis.
- Seguchi, M. (1990).** Effect of heat-treatment of wheat flour on pancake springiness. *J. Food Sci.*, **55** : 784–785.
- Seguchi, M. (1993).** Contribution of wheat starch granule hydrophobicity to pancake texture. *Cereal Food. World*, **38**(7) : 493–497.
- Seguchi, I.M., Hayashi, M., Kanenaga, K. and Noguchi, S. (1998).** Springiness of pancake and its relation to binding of prime starch to tailings in stored wheat flour. *Cereal Chem.*, **75**(1) : 37–42.
- WHO (1995). *Physical status: the use and interpretation of anthropometry*. Report of a WHO Expert Committee.
- WHO (2006). Multicentre Growth Reference Study Group, “WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index for- age: Methods and development,” Geneva, Switzerland, World Health Organization.
- WHO (2013). “Guideline: Updates on the management of severe acute malnutrition in infants and children.” World Health Organization, Geneva.

■ WEBLIOGRAPHY

www.censusindia.gov.in.

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