

Development and physico-chemical evaluation of spaghetti enriched with jackfruit seed flour

H. Mandave Prajakta, K. P. Babar and D. T. Bornare

Spaghetti (Pasta, Noodles) is the type of pasta. It is mostly consumed in Poland and in other countries. Jackfruit (*Artocarpus heterophyllus* L.) trees belong to the family Moraceae. The seeds of this can be ground to make flour, which is blended with wheat flour and used in extruded product like spaghetti for increases the nutritional composition. This study was done to prepare spaghetti by using jackfruit seed flour. Jackfruit seed flour is used in proportion *i.e.* 5, 10, 15, 20, 25 with whole wheat flour. Name given to this sample is T₀ for control, T₁, T₂, T₃, T₄ and T₅. All samples are acceptable by panel members from department. Packaging material study for powder done by using high density polyethylene and Aluminium laminated pouches by storing at ambient and refrigeration temperature, then observes that Aluminium laminated pouches at refrigeration temperature is suitable for jackfruit seed flour. Cooking characteristics determined in which cooking time, cooked weight, cooking loss and water absorption capacity increases when incorporation level get increased. Finally concluded that when jackfruit seed flour is used blending with wheat flour then increases nutrition composition of product.

Key Words : Blending, Extruded, Jackfruit, Nutritional, Spaghetti

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INTRODUCTION

Spaghetti (Pasta, Noodles) is the type of pasta. It is mostly consumed in Poland and in other countries. Quality of spaghetti is depend on raw material is used (D'Egidio *et al.*, 1990). In India spaghetti is commonly known as Savat. It is cereal based product now this type of product is occupying major proportion in breakfast, lunch and dinner also (Manjula *et al.*, 2014).

Jackfruit (*Artocarpus heterophyllus* L.) trees

belong to the family Moraceae. They grows in India in abundant quantity and also in Bangladesh and in many parts of Southeast Asia (Swami *et al.*, 2012). The name derives from the Greek words 'artos' means bread and 'karpos' means fruit this fruit are commonly called breadfruit. The name, 'heterophyllus', in Latin, means leaves of different sizes and shapes. The word jackfruit comes from Portuguese Jaca, which convert into Chaka from Malayalam Language (Sreeletha *et al.*, 2017). The jackfruit tree produces a long taproot. All taproots produces milky and sticky latex. The jackfruit flowers are borne on short shoots, both male and female flowers present on the aged branches. The thick, rubbery rind has short, blunt spines and the one fruit can have upto 500 seeds (Ken and Paull, 2011). The seeds are used in several culinary operations. They are eaten after boiling

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or roasting or dried and salted as table nuts. They can also be ground to make flour, which is blended with wheat flour (Eke-Ejiofor *et al.*, 2014).

Jackfruit seeds are good source of protein and starch. Jackfruit seed contains lignans, isoflavones, saponins, that are called phytonutrients and this have many health benefits as like anti-cancer, anti-ageing and antioxidant (Noor *et al.*, 2014). When Jackfruit flour is used in value added product then increases chemical composition.

METHODOLOGY

Procurement of material:

The jackfruit seed was collected from local market of Aurangabad during season, local name of this is Koozha Chakka.

Preparation of jackfruit seed flour:

The jackfruit seeds were manually cleaned also, defected and germinated seeds were removed off. Then washing of seeds by using cleaned water is done. Roasting of seeds at 160 °C for 1 hour in microwave oven. Seeds were lye peeled by using 3 per cent sodium hydroxide for 3-5 min, to remove the thin brown spermoderms which covered the cotyledons. Wet milling of seeds is done before drying at 70 °C for 24 hours, then dry milling of flour. After that sieving of flour. Finally packaging in polythene pouches and stored at below 10 °C for further use.

Chemical composition:

The chemical analysis was done of Jackfruit seed flour by using AOAC (2005) methods in which analysis done of ash, moisture, protein, fibre and fat. Mineral also determined by using method of (Tondon, 2017). The total carbohydrate was determined by the difference that is by subtracting the measured moisture, protein, fat, crude fibre and ash content from 100 (Gayas *et al.*, 2012).

Packaging material study for jackfruit seed flour:

Packaging material study was done by using two types of packaging material *i.e.* high density polyethylene and Aluminium laminated pouches. Which is stored at ambient temperature and refrigeration temperature at below 10°C. Comparative packaging material study was done in four packaging material *i.e.* HDPE at ambient temperature, HDPE at refrigeration temperature, ALP

at ambient temperature and ALP at refrigeration temperature for 60 study in which analysis done of proximate characteristics at 0 days, 20 days, 40 days and at 60 days.

Treatments used for product making:

Table A: Proportion used of jackfruit seed flour and wheat flour for spaghetti making

Treatments	Jackfruit seed flour (%)	Whole wheat flour (%)
T ₀	-	100
T ₁	5	95
T ₂	10	90
T ₃	15	85
T ₄	20	80
T ₅	25	75

Spaghetti development:

Spaghetti were prepared in laboratory. The jackfruit seed flour and Whole wheat flour is mixed according on composition then sufficient water added for dough preparation. Prepared dough extruded then drying of spaghetti is done at 40 °C. Packaged in polythene pouches and stored for further analysis.

Chemical analysis of spaghetti:

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Sensory analysis:

The prepared spaghetti were cooked in boiling water and kept for organoleptic evaluation. Quality attributes of prepared spaghetti were determined by a panel member (10 semi trained judges) including teachers and PG scholar students from department of agricultural engineering, MIT, Aurangabad. The quality attributes *viz.*, appearance, colour, taste, texture, flavour and overall acceptability of dried jackfruit seed flour and whole wheat flour spaghetti were evaluate by using 9 point hedonic scale.

Cooking characteristics of spaghetti:

Cooking characteristics of spaghetti was determined.

Cooking time:

Cooking time of spaghetti was analysed according to Ojure and Quadri's (2012). On unripe banana noodles.

Cooked weight:

Cooked weight of a spaghetti were analysed according to Omeire *et al.* (2015) on cassava noodles.

Cooking loss:

Cooking loss of spaghetti was analysed according to Ojure and Quadri (2012) on unripe banana noodles and applying the formula:

$$\text{Cooking loss (\%)} = \frac{\text{Dried residue in cooking water}}{\text{Weight of noodles before cooking}} \times 100$$

Water absorption:

Water absorption of spaghetti was analysed according to Ojure and Quadri's (2012) on unripe banana noodles and applying the formula:

$$\text{Water absorption (\%)} = \frac{\text{Final weight} - \text{Initial weight}}{\text{Initial weight}} \times 100$$

Statistical analysis:

Value obtained from sensory analysis subjected to statistical analysis (ANOVA) and analysis is carried out.

OBSERVATIONS AND ASSESSMENT

The data were analysed and discussed with the appropriate supportive findings from literature. The seeds are the main produce of a plant containing large number of nutrients. These nutrients interact with each other during product development and play an important role in determining the final quality of the products. Protein, fat, carbohydrates, calcium, potassium and fibre are the major constituents of seeds (Ocloo *et al.*, 2010).

Chemical composition:

Proximate analysis of jackfruit seed flour is done for determining the it's suitability for excluded product *i.e.* spaghetti in which moisture content is determined *i.e.* 6.52 ± 0.02 % is important in shelf-life because shelf-life is depend on moisture content of product and this value is higher than (Eke-Ejiofor *et al.*, 2014). Total ash content is 4 ± 0 that is total organic matter this is higher than (Eke-Ejiofor *et al.*, 2014).

Protein and fibre content is lower than (Eke-Ejiofor *et al.*, 2014), also calcium content is higher and potassium content is determined which is lower in quantity than

(Ocloo *et al.*, 2010). According on my study it is lower than reference because roasting is done with seeds due to this reson decreases the some chemical content.

Packaging material study for jackfruit seed flour:

Packaging material study was also done in which two types of packaging material used that is high density polyethylene and Aluminium laminated pouches (Deshmukh, 2014). Study was done for 60 days at 20 days interval in which analysis is done at 0 day, 20 day, 40 day and at 60 days.

High density polyethylene at ambient temperature:

On the evident of Fig. 1 protein, ash, moisture content decreased also slightly calcium and potassium content reduced. Here high density polyethylene at ambient temperature are not suitable for jackfruit seed flour.

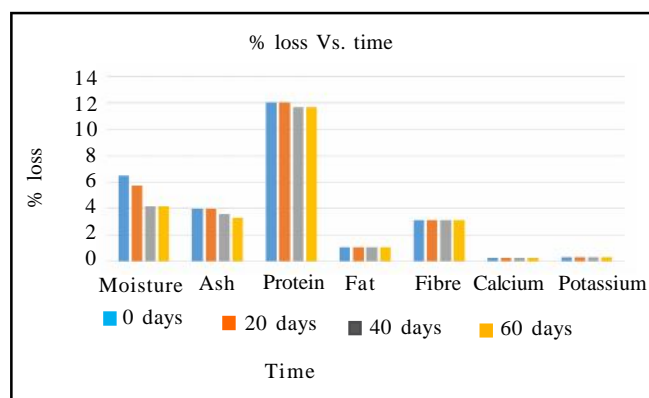


Fig. 1: Effect of HDPE on chemical composition of JSF at ambient temperature

High density polyethylene at refrigeration temperature:

Fig. 2 shows the effect on chemical compositions of jackfruit seed flour of high density polyethylene at refrigerated temperature. Here the negligible changes seen in chemical composition but only moisture content slightly increases when moisture content increases then it affects the shelf-life.

Aluminium laminated pouches at ambient temperature:

Fig. 3 have effect on chemical composition of jackfruit seed flour of Aluminium laminated pouches at ambient temperature. Here aluminium laminated pouches is moisture and air barrier so no chances of effect on

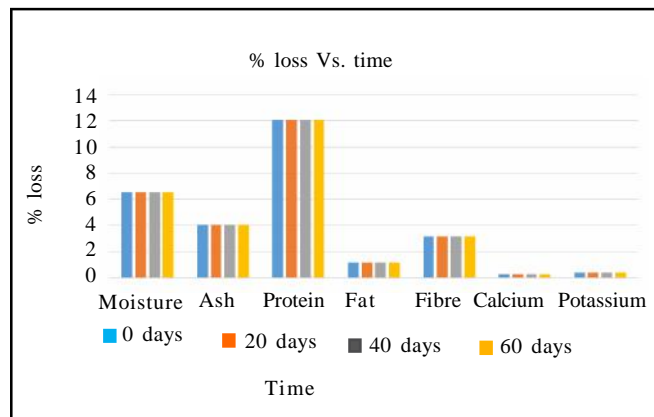


Fig. 2: Effect of HDPE on chemical composition JSF at refrigeration temperature

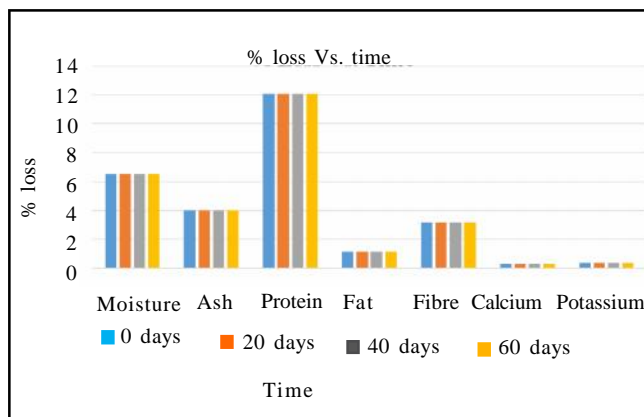


Fig. 3: Effect of ALP on chemical composition JSF at ambient temperature

moisture but protein and mineral content of seed flour is highly heat sensitive so it need to cold temperature and here slightly or minor changes in some parameters *i.e.* protein, fibre, calcium and potassium.

Aluminium laminated pouches at refrigeration temperature:

Fig. 4 shows the effect on chemical compositions of jackfruit seed flour of Aluminium laminated pouches at refrigeration temperature this material is suitable for storage of jackfruit seed flour because no any changes occurs (Deshmukh,2014 and Swain *et al.*, 2013).

Chemical analysis of spaghetti:

Fig. 5 shows when incorporation level increased of jackfruit seed flour then increases nutritive value of product (Nandkule *et al.*, 2015).

Sensory analysis:

On this study conclusion is occur that is when incorporation of JSF is increases then slightly decreases appearance, colour, taste, texture, flavour and overall acceptability (Sultana *et al.*, 2014 and Nandkule *et al.*, 2015). But all samples are acceptable.

Table 1: Sensory evaluation by 9 hedonic scale

Sample code	Parameter					
	Appearance	Colour	Taste	Texture	Flavour	Overall acceptability
Control	9	9	9	10	9.5	9.4
T ₁	8.9	9	9	9.8	9.2	9.2
T ₂	8.7	9	8.9	9.5	9.1	9
T ₃	8.5	8.9	8.9	9.4	9	8.8
T ₄	8	8.9	8.8	8	9	8.8
T ₅	8	8.8	8.7	7	8.9	8.5
S.E. ±	0.045	0.049	0.045	0.034	0.052	0.023
C.D. (P=0.05)	0.139	0.154	0.142	0.105	0.163	0.073

*Each value is average of three determinations

Table 2 : Cooking characteristics of spaghetti

Treatments	Cooking time (In min)	Cooked weight (In %)	Cooking loss (In %)	Water absorption (In %)
Control	9-11	12.22	7	122.2
T ₁	9-11	14.56	7	145.6
T ₂	10-12	15.12	8	151.2
T ₃	11-13	16.02	9	160.2
T ₄	12-14	16.78	9	167.8
T ₅	13-15	16.98	10	169.8

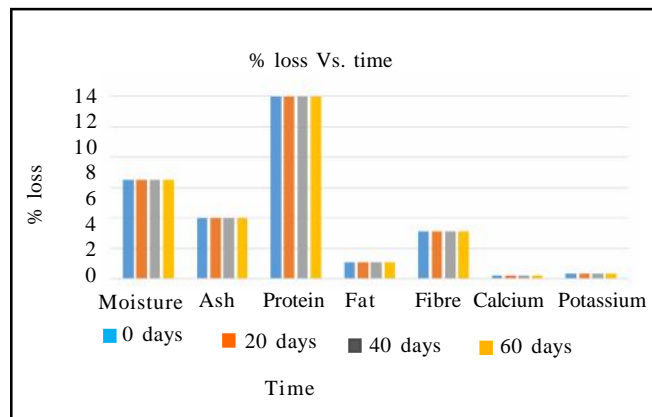


Fig. 4: Effect of ALP on chemical composition JSF at refrigeration temperature

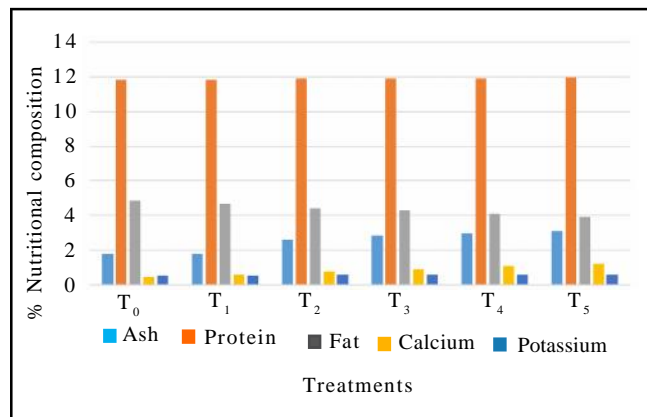


Fig. 5: Effect of incorporation of JSF on chemical composition of spaghetti

Cooking characteristics of spaghetti:

On the evident of Table 3 when incorporation level increases of jackfruit seed flour in spaghetti, then cooking time, cooked weight, cooking loss and water absorption capacity increases.

Conclusion:

The jackfruit seeds have higher nutritional characteristics, but lower shelf-life. When we stored in Aluminium laminated pouches by making seed flour then increases shelf-life.

Use of jackfruit seed flour with whole wheat flour for making extruded product then new product development is occur also increases the marketability and side by side chances waste minimization.

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