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Development of Nutri snacks using jackfruit pulp

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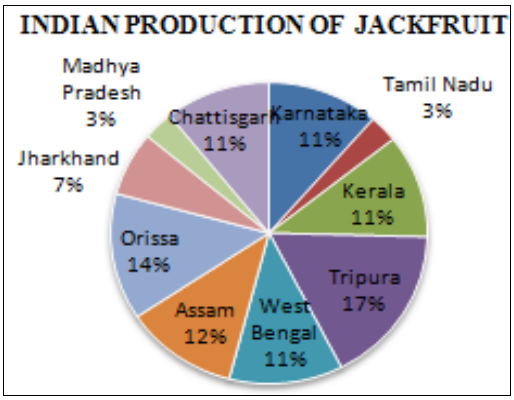
Abstract
Jackfruit is a wide spread fruit which is found in most parts of the world and is used as a staple food in few parts of India and Sri-lanka. Diverse variety of Jackfruit are available in market which differ in the physical and nutritional properties, however the locally grown variety is desirable. The goodness of Jackfruit pulp is gaining popularity but the skill required to clean it sets a drawback. This study is an attempt to process jackfruit bulb, making it convenient for use and storage and thereby incorporating it into nutri-snacks. Locally grown Tubgere variety of Jackfruit from Doddaballapur was selected and processed into pulp and incorporated into two nutri-snacks. The snacks developed were Jackfruit milkshake and Jackfruit ice-cream, Sensory evaluation of nutri-snacks was done using 9 point hedonic scale and Food Action Rating Scale (FACT). Descriptive and inferential statistical analysis showed that ice-cream was the best accepted nutri-snack. Proximate analysis was done for jackfruit pulp. Shelf life study of Jackfruit pulp was done at room, refrigerator and freezer temperature. Nutritional and sensory assessment of Jackfruit pulp suggests that it can be used in various value added products and as functional food.

Keywords: jackfruit pulp, nutri- snacks, value addition

1. Introduction
Jackfruit is a dicotyledonous compound fruit of the jack tree (*Artocarpus heterophyllus L*) which belong to the family Moraceae [1] Jackfruit has been cultivated since prehistoric times and it is well suited in tropical lowland and widely cultivated throughout tropic regions found in many parts of Southeast Asia [2] It is organically grown in southwestern parts of India such Goa, Kerala, Tamil Nadu, Karnataka and Maharashtra.



Source: National Horticulture Board 2015-16

Fig 1

Jackfruit is generally consumed in raw form as vegetable or in the ripe form as fruit, the ripe fruit contains sweet, aromatic and bright yellow or orange colour bulb, the edible bulb is mostly consumed fresh or processed into canned products.The bulb of jackfruit contains simple sugars (fructose and sucrose). Thus when eaten, it replenishes energy and revitalizes the body instantly[4] Jackfruit contains functional compounds, abundant amount of minerals and essential vitamins which provides therapeutic and health benefits. Jackfruit has been traditionally used to cure ulcers, prevent nightblindness and bone loss[4]Jackfruit contains a wide range of phytonutrients such as carotenoids that can act as antioxidants[5]and the phenolic coumpound isolated from jackfruit exhibit anti-inflammatory effect[6] dietary fiber present in jackfruit makes it a good bulk laxative which maintains smooth bowel movement and prevents constipation[5] Jackfruit has been used in various recipes like side dishes, bhajis, curries, cakes, burfi, or processed into candies, jams, chips, chutney, syrups, concentrates, jellies. However due to its high perishability large amount of jackfruit is wasted every year, value addition and processing is thus the best way to reap maximum benefits of the locally available fruit.

2. Materials and method
Tubgere variety of Jackfruit from Doddaballapur was selected for the study. This variety was selected as it is a local variety which is widely and easily available, known for its sweet, firm and juicy yellow bulb. To incorporate it into familiar snack, a quick and easy way of value addition. Table 1 shows the composition of Nutri-snacks

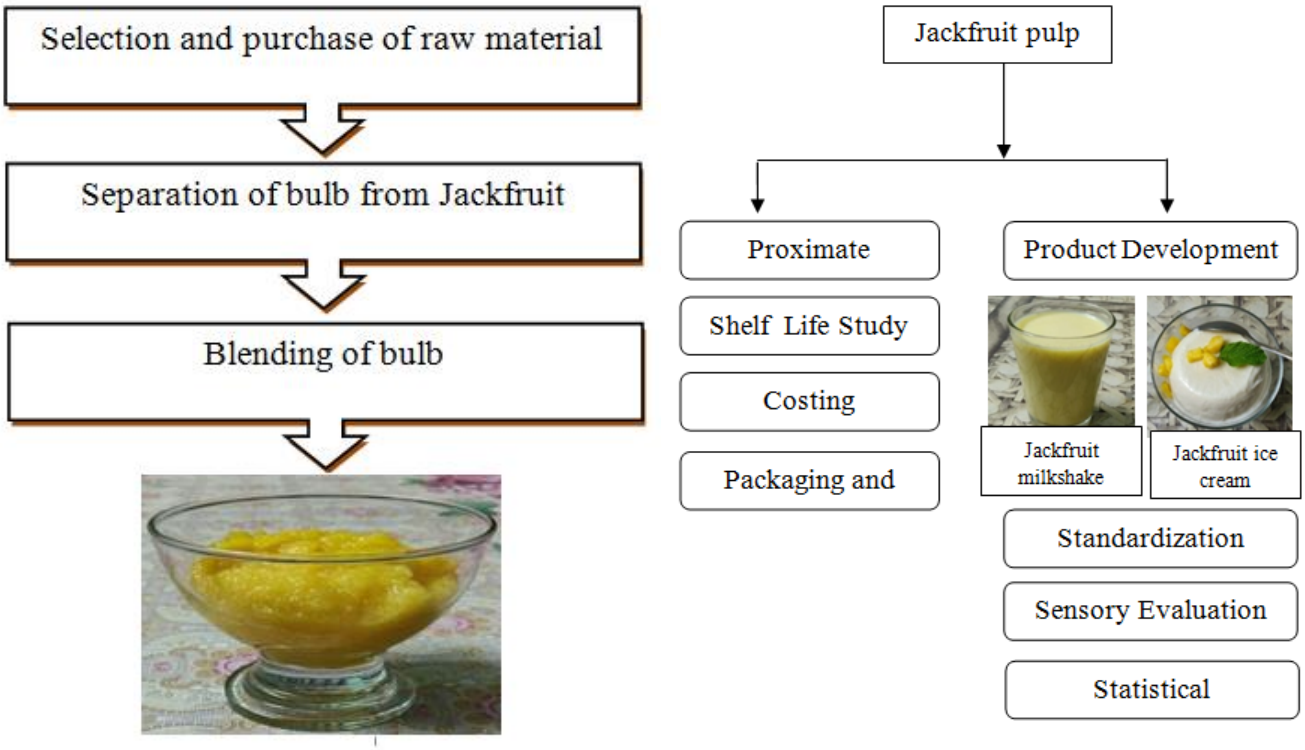
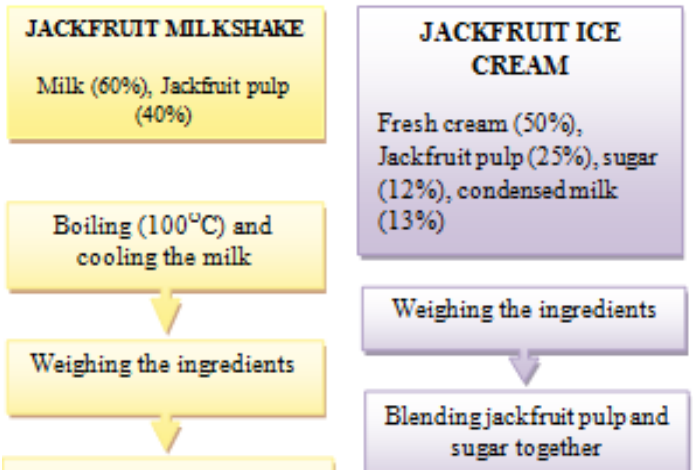


Fig 1: Flow chart of Processing of Jackfruit pulp and development of Nutri snacks

Table 1: Composition of Nutri-snacks

	Percentage composition	
	Milkshake	**Ice-cream**
Jackfruit pulp	40%	25%
Milk	60%	-
Fresh cream	-	50%
Condensed milk	-	13%
Powdered sugar	-	12%

Nutritional composition of Jackfruit pulp was determined by conducting proximate analysis (moisture, carbohydrates, ash, fiber, fat, protein and energy) and estimating Vitamin A using AOAC 20th edition 2016 test method, shelf life study was conducted at room temperature (30°C), refrigerator (0-5°C) and freezer (-8°C) for jackfruit pulp. Trails were carried out for standardization of Nutri-snacks. The following figures show the standardization Jackfruit milkshake and ice-cream.



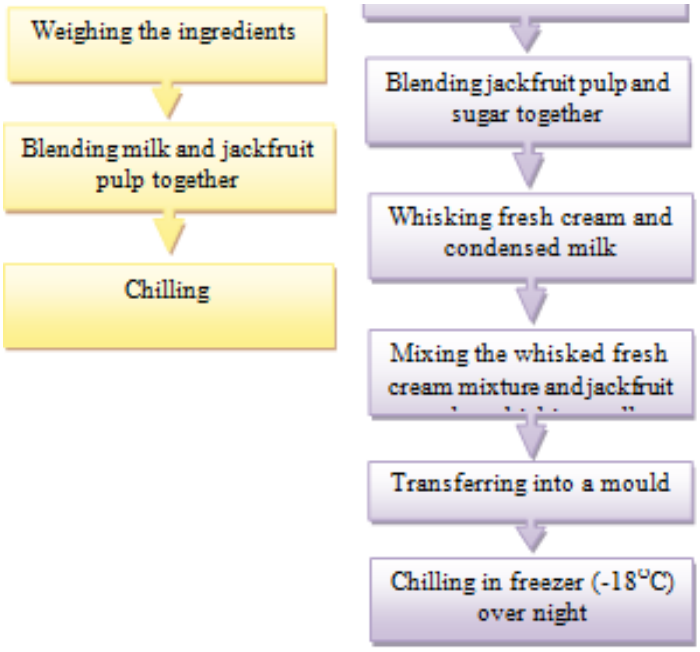


Fig 2: Standardization of Nutri- snacks

The nutri-snacks developed using jackfruit pulp was evaluated by performing sensory evaluation using 9 point hedonic scale. Descriptive and inferential statistical analysis has been carried. One way ANOVA was applied to check the overall difference between the groups. Least Significant Difference (LSD) post hoc test was applied to check pair-wise difference between the groups.Food graded plastic containers were used as packaging materials for jackfruit pulp

3. Results and Discussion

Trails were carried out for standardization of Nutri-snacks with inclusion of different ingredients. The standardized Nutri-snacks were subjected to sensory evaluation followed by statistical analysis. Table 2 shows the mean scores of each attribute of the nutri-snacks. One way ANOVA has been used for the comparisons.

Table 2: One way ANOVA (analysis of variance) and Post hoc comparison (pair wise T test)

Samples	Appearance Mean±SD (Range)	Colour Mean±SD (Range)	Texture Mean±SD (Range)	Taste Mean±SD (Range)	Odour Mean±SD (Range)	Overall acceptability Mean±SD (Range)
Ice-cream	8.81±0.40	9.00±0.0	8.62±0.50	8.71±0.46	8.62±0.50	8.75±0.23
	(8-9)	(9-9)	(8-9)	(8-9)	(8-9)	(8.4-9)
Milkshake	8.71±0.46	8.81±0.40	8.81±0.40	8.57±0.68	8.62±0.67	8.70±0.43
	(8-9)	(8-9)	(8-9)	(7-9)	(7-9)	(7.6-9)
T test	-0.095, 0.137	-0.19, 0.161	0.19, 0.176	-0.143,0.234	0, 0.226	-0.048, 0.119
P values	0.958	0.76	0.816	0.974	1	0.995

(Note- Any p value less than 0.05 are considered statistically significant)

Themean judge responses for appearance, color, texture, taste and odour and overall acceptability with (P value being >0.05) is statistically insignificant for all the parameters. Hence there is no statistically significant difference between appearance, color, texture, taste and odour and overall acceptability. From the above inference it is evident that mean value for all parameters seen in Jackfruit ice-cream is closest to Jackfruit milkshake.Table 3 unfold the nutritional content of Jackfruit pulp.Jackfruit pulp was good for 2 days at room temperature, 5 days atrefrigerator temperatureand 60 days in freezer without any signs of infestation and change in organoleptic properties (table 4)

Table 3: Nutritional Composition of Jackfruit pulp

Nutritional facts	Value per 100g
Energy(kcal)	97.77
Carbohydrates(g)	21.03
Protein(g)	2.4
Fat(g)	0.45
Crude fiber(g)	<0.1
Moisture(g)	73.5
Total Ash(g)	2.62
Vitamin A (IU)	312
Flavonoid (%)	<0.10

Table 4: Shelf life study of Jackfruit pulp

Physical Examination	**At room temperature (30 c)**		
Days	1 day		2 days
Appearance	Bright yellow		Dull yellow
Texture	Smooth		Smooth
Odour	No off odour		No off odour
Presence of infestation	Absent		Absent
Days	1 day		5 days
Appearance	Bright yellow		Dull yellow
Texture	Smooth		Smooth
Odour	No off odour		No off odour
Presence of infestation	Absent		Absent
Days	30 days	45 days	60 days
Appearance	Bright yellow	Bright yellow	Dull yellow
Texture	Smooth	Smooth	Smooth
Odour	No off odour	No off odour	No off odour
Presence of infestation	Absent	Absent	Absent

4. Conclusion

Jackfruit is a locally grown fruit that is packed with many nutrients and benefits. It is a rich source of vitamins, minerals, phytonutrients, carbohydrate, electrolytes, fiber, fat and protein. It strengthens the immune system, maintains blood pressure, improves digestion, eyesight, bone health, promotes hair growth, fights wrinkles and makes the skin flawless with good complexion. Jackfruit is widely used in its raw form as a vegetable in the northern parts of India, and as a ripe fruit in south India. However, it is gaining more popularity now and is being used in various ready to use products like jams, jellies and pickles. Jackfruit is highly perishable but it can be processed to improve the shelf life, this study attempts to make use of locally available variety of Jackfruit by processing it into Jackfruit pulp making it convenient for use and storage; and utilizing it in value addition of snacks and thereby enriching them. The snacks developed can be an ideal choice to overcome nutritional problems in near future and to reap maximum benefits of the locally grown fruit. Children and adolescents are mostly attracted by the packed ice-creams, cakes, biscuits and other junk available in market that highly processed. Nutri-snacks are healthy alternatives which are easy to prepare and were developed keeping the need of the hour in mind

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