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## Studies on preparation of ice-cream from jackfruit (*Artocarpus heterophyllus*) seed powder

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### Abstract

The experiment was laid out in Completely Randomized Design with six treatments namely T<sub>1</sub> (5% skim milk powder + 95% constant ingredients), T<sub>2</sub> (1% jackfruit seed powder + 4% skim milk powder + 95% constant ingredients), T<sub>3</sub> (2% jackfruit seed powder + 3% skim milk powder + 95% constant ingredients), T<sub>4</sub> (3% jackfruit seed powder + 2% skim milk powder + 95% constant ingredients), T<sub>5</sub> (4% jackfruit seed powder + 1% skim milk powder + 95% constant ingredients) and T<sub>6</sub> (5% jackfruit seed powder + 95% constant ingredients) which were replicated four times. The treatment T<sub>4</sub> recorded maximum score for colour and appearance as well as flavour. Whereas, Treatment T<sub>5</sub> recorded maximum score for body and texture as well as overall acceptability. Treatment T<sub>5</sub> also recorded highest B C ratio. on the basis of sensory evaluation treatment T<sub>5</sub> (4% jackfruit seed powder + 1% skim milk powder + 95% constant ingredients) was found to be best and recorded highest B C ratio among six treatments. However, during the storage of five weeks this treatment has shown best results with respect to changes in chemical composition, sensory evaluation and even in microbial count.

**Keywords:** Jackfruit, Jackfruit seed powder, Ice-cream, B:C ratio, Skim milk powder

### Introduction

The jackfruit (*Artocarpus heterophyllus* Lam.) is one of the important tropical fruits grown in the world and is believed to be native to India. Jackfruit belongs to the family Moraceae and to the genus *Artocarpus* which includes evergreen or deciduous trees.

In India, the major area under jackfruit is in Kerala state and it was regarded as heavenly fruit in the ancient periods. It is grown in an area of 156000 ha with annual production of 1826000 MT and productivity of 12 MT per ha (Anonymous, 2017).

The edible bulbs of ripe jackfruit are usually consumed fresh or processed into canned products; 10-15 per cent of the total fruit weight is considered as its seed weight. Though the seeds are rich in carbohydrate and protein, jackfruit seed is used occasionally as a minor supplement in culinary recipes but are mostly wasted. The jackfruit seed flour is not only a rich source of protein, starch and dietary fibres but can also be regarded as an abundant yet cheap source of nutrients. Lectin, a class of glycoprotein found in jackfruit seed, has been reported to possess antibacterial, antifungal and anticarcinogenic properties. (Chowdhury *et al.*, 2012) [2].

A number of products have been developed from raw, tender and ripe fruits and seeds. Now a days, the consumer's trend has been moved towards the foods with more natural antioxidants, dietary fibers, natural colourants, minerals, vitamins, low calories, low cholesterols and low fat and free of synthetic additives etc.

Looking to the large postharvest losses in jackfruit, it is necessary to do research on innovative processed product from jackfruit. Hence, experiment of preparation of jackfruit seed powder ice-cream was conducted.

### Material and Methods

The experiment was conducted during the period May, 2018 to Jan, 2019. Study was conducted at Pomology laboratory, Fruit processing unit of Department of Horticulture, College of Agriculture, Dapoli and Fruit Beverage Research Centre of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, District- Ratnagiri. The experiment was laid out in

Completely Randomized Design with six treatments namely T<sub>1</sub> (5% skim milk powder + 95% constant ingredients), T<sub>2</sub> (1% jackfruit seed powder + 4% skim milk powder + 95% constant ingredients), T<sub>3</sub> (2% jackfruit seed powder + 3% skim milk powder + 95% constant ingredients), T<sub>4</sub> (3% jackfruit seed powder + 2% skim milk powder + 95% constant ingredients), T<sub>5</sub> (4% jackfruit seed powder + 1% skim milk powder + 95% constant ingredients) and T<sub>6</sub> (5% jackfruit seed powder + 95% constant ingredients) which were replicated four times. The experiment had a two phases i.e. Phase 1- Sensory qualities of fresh ice-cream and phase 2- Changes in organoleptic score, chemical composition and microbial count of most optimum level of ice-cream (T<sub>5</sub>) during storage.

The recommended standards of ice-cream were maintained in a preparation of ice-cream. The seeds were removed from the ripe bulbs of soft flesh jackfruit and washed with 100 ppm chlorinated water. The seeds were dried in tray dryer at 60±2°C and then used for preparation of powder as given in The jackfruit seed powder ice cream having standard composition (10% fat, 36% total solids and 15% sugar) was prepared as per the standard procedure, narrated by De (2011) with slight modifications.

## Result and Discussion

### Phase 1: Sensory qualities of fresh ice-cream

The data pertaining to sensory score for colour and appearance at different treatments are given in Table 1. The colour and appearance of ice-cream differs significantly with respect to different treatments. Highest colour and appearance score was recorded by treatment T<sub>4</sub> (7.60) which was at par with T<sub>6</sub> (7.46) and T<sub>5</sub> (7.42). Highest colour and appearance score recorded by treatment T<sub>4</sub> might be due to obtaining proper colour balance of white (milk) and brown (jackfruit seed powder).

**Table 1:** Sensory qualities of fresh ice-cream

Treatments	Colour and appearance	Flavour	Body and texture	Overall acceptability
T <sub>1</sub>	7.13	7.15	7.12	7.13
T <sub>2</sub>	7.35	7.11	6.99	7.15
T <sub>3</sub>	7.28	7.51	7.18	7.32
T <sub>4</sub>	7.60	7.76	7.18	7.51
T <sub>5</sub>	7.42	7.54	7.65	7.54
T <sub>6</sub>	7.46	7.17	7.48	7.37
Mean	7.37	7.37	7.26	7.34
S.Em±	0.064	0.123	0.114	0.100
C.D. at 1%	0.207	0.398	0.367	0.324

The flavour of ice-cream differs significantly with respect to different treatments. Highest flavour score was recorded by treatment T<sub>4</sub> (7.76) which was at par with T<sub>5</sub> (7.54) and T<sub>3</sub> (7.51). Highest flavour score recorded by treatment T<sub>4</sub> might be due to obtaining balanced taste of milk fat and jackfruit seed powder flavour.

The body and texture of ice-cream differs significantly with respect to different treatments. Highest body and texture score was recorded by treatment T<sub>5</sub> (7.65) which was at par with T<sub>6</sub> (7.48). Highest body and texture score was recorded by treatment T<sub>5</sub> might be due to addition of high amount of jackfruit seed powder, which also might have helped in maintaining equilibrium of emulsion.

The overall acceptability of ice-cream differs significantly with respect to different treatments. Highest overall acceptability score was recorded by treatment T<sub>5</sub> (7.54) which

was at par with T<sub>4</sub> (7.51), T<sub>6</sub> (7.37), T<sub>3</sub> (7.32). Highest overall acceptability score was recorded by treatment T<sub>5</sub> may be the comprehensive effect of different sensory attributes as discussed above.

### Phase 2: Changes in organoleptic score, chemical composition and microbial count of most optimum level of ice-cream (T<sub>5</sub>) during storage

#### Changes in organoleptic score of most optimum level of ice-cream (T<sub>5</sub>) during storage

The data pertaining to sensory score for ice-cream (treatment T<sub>5</sub>) during storage is given in Table 2. All the four parameters viz. colour and appearance, flavour, body and texture and overall acceptability were slightly decreased from week 1(W<sub>1</sub>) to week 5(W<sub>5</sub>).

**Table 2:** Changes in organoleptic score of most optimum level of ice-cream (T<sub>5</sub>) during storage

No. of interval	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	W <sub>5</sub>
Colour and appearance	7.40	7.40	7.35	7.32	7.30
Flavour	7.50	7.45	7.45	7.45	7.40
Body and Texture	7.65	7.65	7.60	7.60	7.60
Overall Acceptability	7.54	7.50	7.50	7.48	7.45

Colour and appearance score recorded was 7.40, 7.40, 7.35, 7.32 and 7.30 from W<sub>1</sub> to W<sub>5</sub>. Similarly, flavour and body and texture scores were recorded as 7.50, 7.45, 7.45, 7.45, 7.40 and 7.65, 7.65, 7.60, 7.60, 7.60 respectively. The overall acceptability score was recorded as 7.54, 7.50, 7.50, 7.48 and 7.45 from W<sub>1</sub> to W<sub>5</sub>. Changes in sensory parameters may be due to microbial growth. Similar results were reported by Naik (2017) while working on spirulina powder ice-cream and Mule (2018) in probiotic ice-cream enriched with ginger and aloe vera.

#### Changes in chemical composition of most optimum level of ice-cream (T<sub>5</sub>) during storage

The data pertaining to chemical score for ice-cream (treatment T<sub>5</sub>) at different weeks are given in Table 3.

**Table 3:** Changes in chemical composition of most optimum level of ice-cream (T<sub>5</sub>) during storage

Parameters	No. of interval				
	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	W <sub>5</sub>
Total Solids (%)	36.62	36.17	35.71	35.60	35.21
Acidity (%)	0.21	0.22	0.225	0.235	0.24
Protein (%)	7.26	7.18	7.10	7.02	6.95
Fat (%)	10.20	9.96	9.90	9.84	9.80
Reducing sugars (%)	6.07	5.99	5.87	5.82	5.75
Total sugars (%)	26.76	24.41	23.66	20.42	19.38

During storage of ice-cream total solids (%), protein (%), fat (%), reducing sugars (%) and total sugars (%) were gradually decreased from W<sub>1</sub> to W<sub>5</sub>. The total solids decreased from 36.62 per cent (W<sub>1</sub>) to 35.21 per cent (W<sub>5</sub>), protein and fat decreased from 7.26 per cent (W<sub>1</sub>) to 6.95 per cent (W<sub>5</sub>) and 10.20 per cent (W<sub>1</sub>) to 9.80 per cent (W<sub>5</sub>) respectively. Similarly, reducing sugars and total sugars decreased from 6.07 per cent (W<sub>1</sub>) to 5.75 per cent (W<sub>5</sub>) and 26.76 per cent (W<sub>1</sub>) to 19.38 per cent (W<sub>5</sub>) respectively. However, the acidity (%) was increased from 0.21 per cent (W<sub>1</sub>) to 0.24 per cent (W<sub>5</sub>).

During storage of ice-cream total solids (%), protein (%), fat (%), reducing sugars (%) and total sugars (%) were gradually decreased this might be due to formation of ice crystals in ice-

cream as the storage progresses which ultimately increases moisture. Increased microbial population survive on available food material present in ice-cream which causes to reduce total solids from ice-cream. This increased population of microbes also increases acidity of ice-cream. Murtaza *et al.* (2004) given chemical analysis of ice cream in which they found similar trend of chemical attributes as mentioned above. Similar findings were also reported by Naik (2017) while working on spirulina powder ice-cream.

#### Microbial analysis of most optimum level of ice-cream (T<sub>5</sub>) at the end of storage period

Jackfruit seed powder ice-cream was analyzed for Standard Plate Count (SPC) and *Escherichia coli* counts. The results obtained are tabulated in Table 4.

**Table 4:** Microbial count of most optimum level of ice-cream (T<sub>5</sub>) during storage

Treatment	SPC (10 <sup>4</sup> cfu/g)	E. Coli (10 <sup>1</sup> cfu/g)
T <sub>5</sub>	2.04	N.D.

The mean value of standard plate count in ice cream was 2.04 x 10<sup>4</sup> cfu/g and *E. coli* were not detected in ice cream. Similar results were found by Naik (2017) while working on spirulina powder ice-cream and also by Verma (1974) in standard plate counts and coliform count.

#### Production economics of jackfruit seed powder ice-cream

The data regarding production economics are given in table 5. Higher gross return and net profit of Rs. 375 and Rs. 127.74, respectively was found in T<sub>5</sub> and lowest gross return and net profit of Rs. 315 and Rs. 52.22, respectively was found in T<sub>1</sub>. Benefit: cost ratio was maximum (1.52) in treatment T<sub>5</sub>.

**Table 5:** Production economics of jackfruit seed powder ice-cream

Treatments	Total expenditure (Rs.)	Gross returns (Rs.)	Net profit (Rs.)	B:C ratio
T <sub>1</sub>	262.78	315	52.22	1.20
T <sub>2</sub>	258.55	315	56.05	1.22
T <sub>3</sub>	255.05	345	89.55	1.35
T <sub>4</sub>	251.14	375	126.86	1.49
T <sub>5</sub>	247.26	375	127.74	1.52
T <sub>6</sub>	243.38	345	101.62	1.42

#### Conclusion

The treatment T<sub>4</sub> (3% jackfruit seed powder + 2% skim milk powder + 95% constant ingredients) recorded maximum score for colour and appearance as well as flavour. Whereas, Treatment T<sub>5</sub> (4% jackfruit seed powder + 1% skim milk powder + 95% constant ingredients) recorded maximum score for body and texture as well as overall acceptability. Treatment T<sub>5</sub> (4% jackfruit seed powder + 1% skim milk powder + 95% constant ingredients) also recorded highest B C ratio. on the basis of sensory evaluation treatment T<sub>5</sub> (4% jackfruit seed powder + 1% skim milk powder + 95% constant ingredients) was found to be best and recorded highest B C ratio among six treatments. However, during the storage of five weeks this treatment has shown best results with respect to changes in chemical composition, sensory evaluation and even in microbial count.

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