

Development and Evaluation of Jam using Ficus Racemosa

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Abstract

Objective: The objective of this study is to develop a natural, low calorie and nutritious jam using figs without any artificial preservatives and colours especially for children.

Method: An attempt has been made to develop a nutrient rich jam using figs (*Ficus Racemosa*) honey, sugar cinnamon and ginger. Different compositions and combinations were tried to arrive at an acceptable product. The variations were evaluated for their overall acceptability using a 9-point hedonic scale by 25 semi-trained panellists. Shelf-life studies were conducted at room temperature (36°C) and at refrigeration temperatures (0 – 5 °C).

Results: Statistical evaluation of all the variations was carried out. It was found that Variation 1 had good overall acceptability score of 8.3. The variation 1 had the following composition; figs 50%, honey 25%, sugar 20%, cinnamon and ginger 1%. The variation which was selected contained per 100 gms the following: total energy 152 kcal, protein 1.95 gms, carbohydrates 41 gms, fat 0.19gms, fiber 2.08gms, iron 0.65 mg, ash 1.18% and moisture 53.57%. The fig jam was 133 kcal (53%) less than the commercially available jam which also had added sucrose, chemical preservatives, added colours and flavours. Shelf life studies showed that the jam was good for consumption for 15 days at room temperature and for 20 days at refrigeration temperature.

Conclusion: The World Health Organization estimates that over 340 million children (ages 5 to 10) were overweight according to a 2016 survey. Children in general are fond of jams. Fig trees are native of Indian subcontinent. The fig trees grow in dry regions and need no maintenance. Fig trees bear fruits all year round and in abundance. Figs are a rich source of calcium, polyphenols and dietary fiber. Antioxidants present in figs prevent lipoprotein oxidation thus help in the prevention of cardiovascular diseases. The low-calorie fig jam thus produced can not only be used by children but also by individuals across all age groups.

Keywords: Indigenous fruit, natural preservatives, Nutri fig jam, standardization, proximate analysis

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Introduction

India with its varied Agro-climatic conditions and diversified soil types makes it possible for the growth of a wide variety of fruits. India has emerged as the second largest producer of fruits in the world after China [1]

Figs are native to South East- Asia, Australia, Malaysia, and the Indian subcontinent, and it belongs to the family - Moraceae. *Ficus racemosa* (Linn) is popularly known as the Cluster figs, Indian figs, or goolar (gular) figs [2] [3].

In Hindi language figs are known as Anjeer. In Hindu mythology fig tree is considered as a sacred tree. Figs have a special place in all major religions like Christianity, Islam, Hinduism, Buddhism and Judaism. *Ficus Carica* Linn is a deciduous tree and grows in tropical and sub-tropical regions. Fig trees grow in dry climates with very little rainfall. Fig trees produce abundance of fruits all-round the year. Fig trees need no maintenance like pruning, manuring or watering.

Figs can be used both as a fruit and vegetable. Since ages figs were used in Ayurveda for both its nutritive and curative value. In traditional Indian medicine all parts of the fig tree are used. For example, the roots of the fig tree are used in the treatment of leukoderma. Fig fruits are supposed to have antipyretic, purgative and aphrodisiac effects. Sushruta used the fig fruits for treatment of various ailments like fever, asthma, diabetes, etc.

Figs are rich in Iron, Calcium, Polyphenols, Aminoacids, Potassium and Fiber. Figs have anti-oxidant, antibacterial, anti-inflammatory, gastroprotective properties, analgesic and hypoglycemic activity [4].

Honey is the earliest sweetener known to mankind; it is used in traditional medicine since the olden days [5]. Fruit jams are prepared from a different variety of edible fruits at both household and commercial levels. To prepare fruit jam, fruits and sugar are mixed approximately in equal quantities and boiled together to a thick consistency, usually with pectin as a gelling agent.

Children have fondness for jams. Jams are used in eating foods like bread, biscuits, pies, etc [6]. Most of the jams commercially available in the market are processed by using artificial pectin, chemical preservatives, and food colors that can cause damage to human health on regular consumption.

The developed, standardized nutri fig jam in this study is a unique blend of figs (*Ficus racemosa*), honey, sugar, lemon juice, ginger, and cinnamon. Each ingredient used has its own nutritional and medicinal benefits.

Materials and methods:

An attempt was made to develop and standardize a nutrient rich jam using figs (nutri fig jam), honey, sugar, cinnamon and ginger. Each ingredient used has its own nutritional and medicinal benefits.

The *Ficus racemosa* fruits were collected from the tree growing in our college campus, Maharani college Bangalore. All other ingredients like sugar, lemon, honey, ginger were brought from a nearby vegetable market and a general store in Avenue Road, Bangalore.

The Nutri fig jam can be consumed by all age groups including children, adolescents, and health-conscious adults. Nutri fig jam was planned and developed without adding any chemical preservatives and shelf-life was observed at room temperature and refrigeration. Different variations using different proportion of sugar, honey, and dates (both dry and fresh) was prepared and a final product selected by conducting several experimental trials. Table I shows the composition of different variations of nutri fig jam.

Table I. Composition of different variations of nutri fig jam.

Ingredients	Percentage variations			
	Basic	Variation 1	Variation 2	Variation 3
Figs	50	50	50	50
Honey	-	25	25	25
Dates fresh	-	-	20	-
Dates dried	-	-	-	20
Sugar	45	20	-	-
Ginger	1	1	1	1
Cinnamon	1	1	1	1
Lemon juice	2	2	2	2
Lemon zest	1	1	1	1

The sensory evaluation of Nutri fig jam was done by 9 points hedonic scale [6] [7] with 25 semi-trained panelists. Various characteristics like taste, color, texture, appearance, flavor, overall acceptability, and odor were evaluated by rating score of 9 to 1, by 25 semi-trained panelists for the control (basic) and different variations of jam.

Figure 1: Flow Chart of Development of Nutri Fig Jam

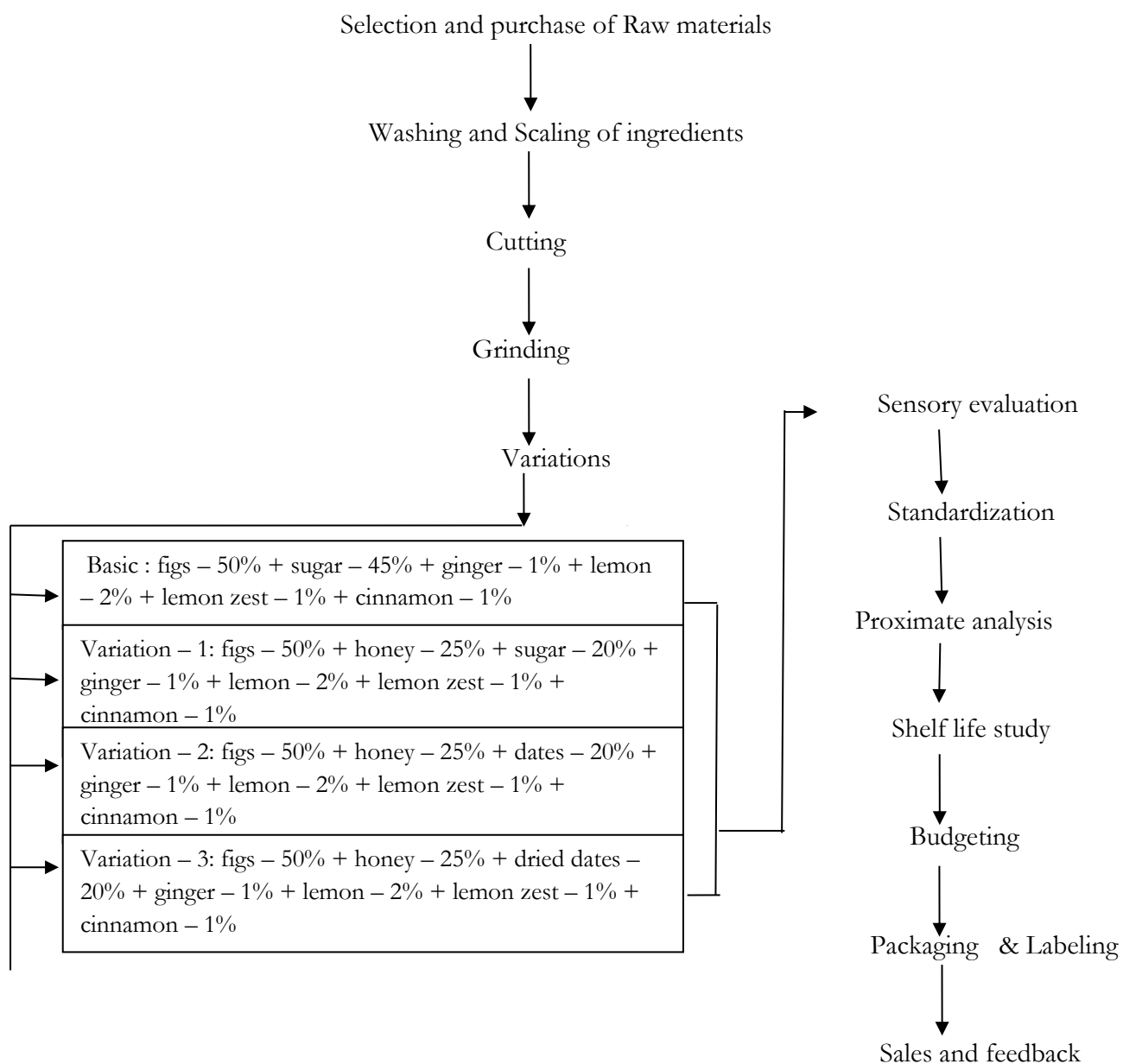
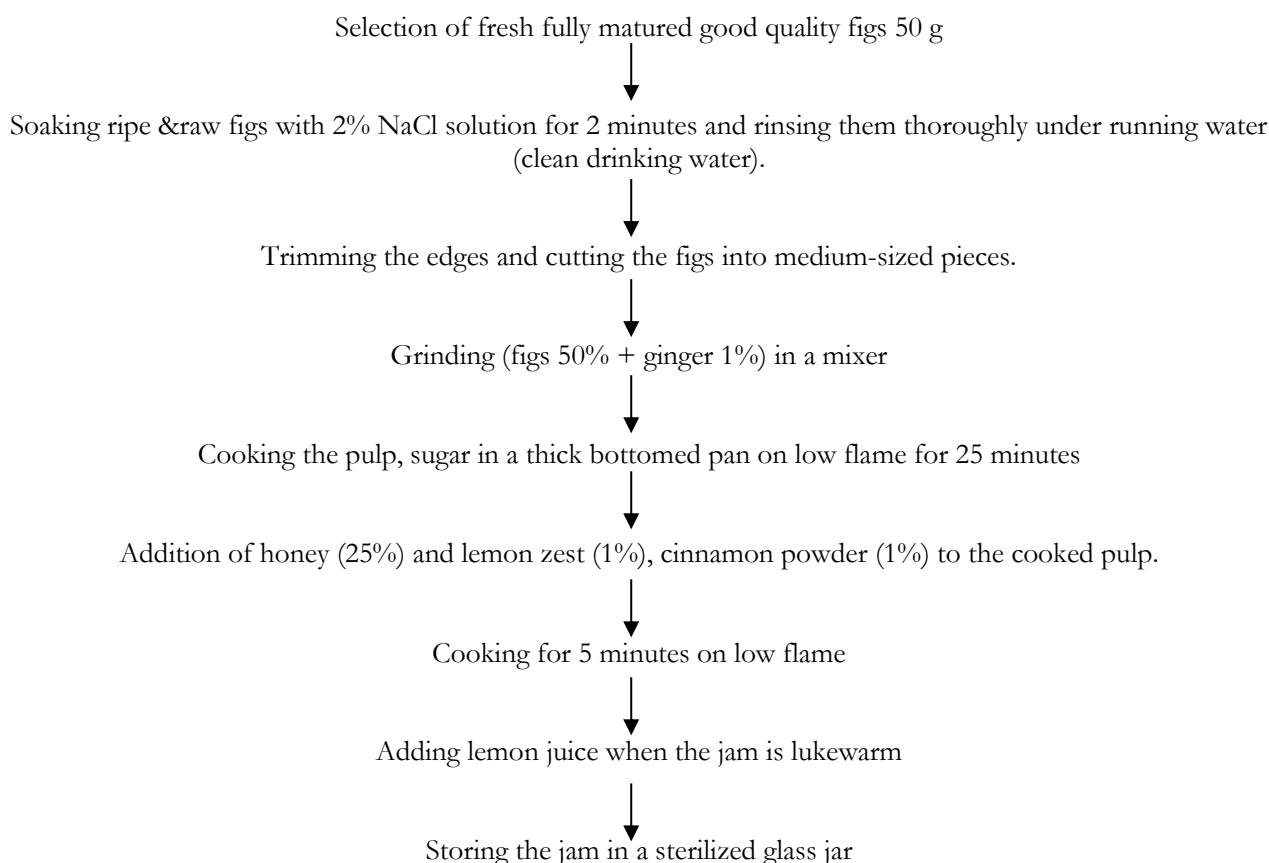


Figure 2: Standardization of Nutri Fig Jam with Natural Ingredients (Final Product)

The nutritional parameters of standardized Nutri fig jam evaluated were energy, protein, fat, carbohydrates, fiber, moisture, and ash content. The methods like IS 78745, IS 1656, and physicochemical methods [8] were employed to do proximate analysis. Shelf-life studies of the nutri fig jam were conducted under two conditions, at room temperature (34°C) and refrigeration (-5°C) in a sterilized glass jar.

Results and Discussion

Trials for standardization of jam were done by the inclusion of different ingredients. Table II depicts the sensory score of basic and variations of nutri fig jam. The various characteristics like overall acceptability, color, taste, texture, appearance, and odor were analyzed by using mean scores. As per the statistical analysis report variation 1 had a high acceptable appearance, with the mean value of 8.4 ± 0.86 . Least acceptable mean scores of 7.08 ± 1.10 was observed in variation 3 nutri fig jam. A least significant difference (LSD) post hoc comparison is used to assess the mean judge's responses on the appearance, concerning the different varieties of components with $F = 9.141$, P -value < 0.001 at 5% level of significance.

With regard to taste, variation 1 nutri fig jam, had the best acceptable taste with a mean score of 8.32 ± 0.74 . A least significant difference was seen in the mean responses concerning to taste among different variation components with $F = 9.415$, P -value < 0.001 . For texture, variation 1 showed the highest mean sensory score of 8.32 ± 0.69 , variation 3 showed low mean score of 7.2 ± 0.9 . There is a significant difference at a 5% in mean responses on texture when compared with other components with $F = 8.956$, P -value < 0.001 . For colour, variation 1 showed high mean score of 8.36 ± 0.7 , whereas variation 3 showed the lowest mean score of 7.24 ± 0.96 . Major difference was observed in colour among the variation at a 5% level of significance with $F = 8.715$, P -value < 0.001 .

For overall acceptability of the jam, variation 1 showed greater mean score of 8.24 ± 0.72 , whereas variation-3 showed least mean score of 7.16 ± 0.85 . The overall acceptability has shown crucial difference with respect to different components with $F = 10.373$, P -value < 0.001 at 5% level of significance. With regard to total mean score

of all variations, it is found that variation 1 showed the highest acceptability among other variations and was near to the basic nutri fig jam, mean scores.

From the table, it is evident that the multiple comparison test significance with basic and an overall significance level is $P < 0.05$. All variations have significant differences among taste, odor, color, texture, overall acceptability, and appearance. However, the variation-1 mean score are near the basic nutri fig jam mean scores.

Table II. ANOVA and Post Hoc comparison among variations of Nutri Fig Jam.

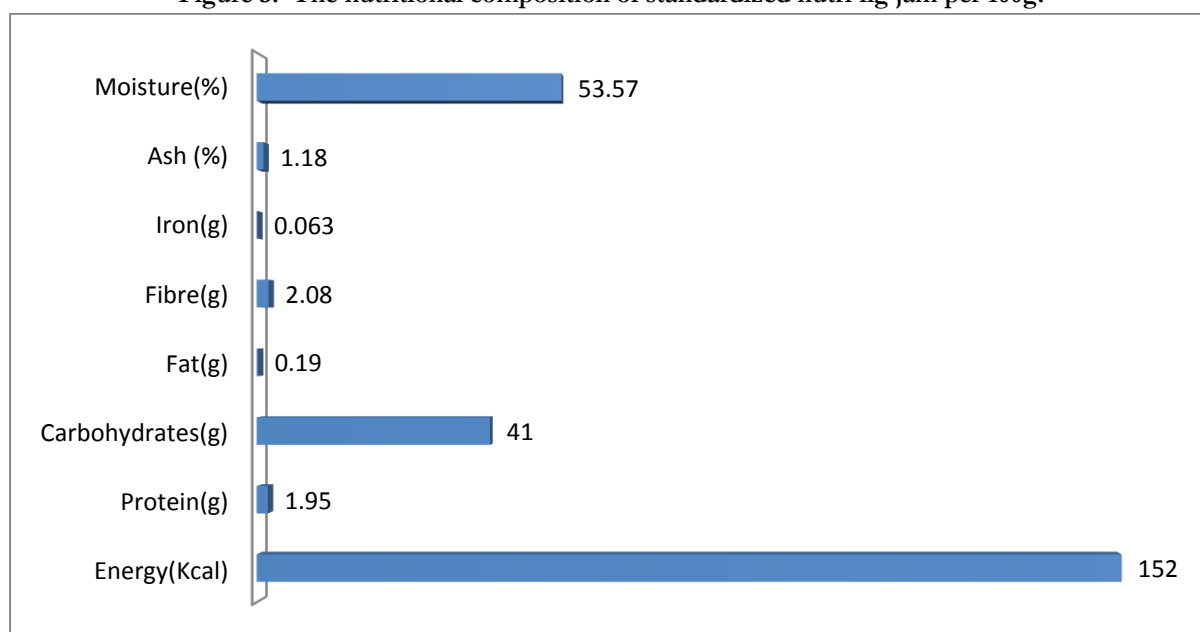
Variations	Appearance Mean $\pm$ SD	Taste Mean $\pm$ SD	Texture Mean $\pm$ SD	Colour Mean $\pm$ SD	Odour Mean $\pm$ SD	Overall Acceptability Mean $\pm$ SD	Total Mean $\pm$ SD
Basic	7.94 $\pm$ 0.88	7.96 $\pm$ 0.78	7.84 $\pm$ 0.74	8.2 $\pm$ 0.83	7.5 $\pm$ 1.1	8 $\pm$ 0.64	47.5 $\pm$ 3.7
Variation 1	8.4 $\pm$ 0.86	8.32 $\pm$ 0.74	8.32 $\pm$ 0.69	8.3 $\pm$ 0.7	7.8 $\pm$ 1.02	8.24 $\pm$ 0.72	49.4 $\pm$ 3.8
Variation 2	7.36 $\pm$ 1.04	8.12 $\pm$ 0.73	7.2 $\pm$ 1.12	7.68 $\pm$ 0.98	7.44 $\pm$ 1.04	7.6 $\pm$ 0.71	45.4 $\pm$ 4.4
Variation 3	7.08 $\pm$ 1.10	7.2 $\pm$ 0.9	7.04 $\pm$ 1.2	7.24 $\pm$ 0.96	7.3 $\pm$ 1.11	7.16 $\pm$ 0.85	43.1 $\pm$ 5.31
F Test	9.14	9.42	8.96	8.72	0.94	10.37	9.91
P Value	< 0.001	< 0.001	< 0.001	< 0.001	0.43	< 0.001	< 0.001
Post Hoc Comparision	0.033*, 0.002+, <0.001^, <0.001#	0.027*, <0.001+, 0.007^, <0.001#	0.024*, 0.005+, <0.001^, <0.001#	0.001+, <0.001#, <0.001&	NA	<0.001+, 0.003^, <0.001#, 0.037&	0.001+, 0.001^, <0.001#

Note: (V – Variation) *Basic Vs Variation 2, + Basic Vs Variation 3, ^ V 1 Vs V 2, # V 1 Vs V 3, and V 2 Vs V 3

Table III - Composition of Standardized Nutri Fig Jam.

Ingredients	Quantity per 100 g
Figs	50g
Honey	25g
Sugar	20g
Cinnamon	1 inch
Ginger juice	¼ tsp
Lemon juice	½ tsp
Lemon zest	1g

Figure 3: The nutritional composition of standardized nutri fig jam per 100g.



Shelf-life studies were carried out at room temperature (36°C) and refrigeration temperatures (0 - 5°C). The quality of the standardized Nutri Fig Jam was good till 20 days (refrigeration temperature) without any microbial growth. The spreadability and texture of the jam were good and there was no off odour from the jam, but there was a change in the color of the jam within 3 days of refrigeration (0 - 5°C). After 20 days the spreadability of the jam was slightly hard. Therefore, it is better to consume the jam within 20 days (Table IV) of preparation.

At room temperature (36°C) there was no off-flavor in the Nutri Fig Jam for about 15 days.

Table–IV. Shelf life study of standardized Nutri Fig Jam (Physical Examination) at room temperature (36°C) and refrigeration temperatures (0 - 5°C).

Physical Examination	At Room Temperature (36°C)			At Refrigeration Temperature (0 - 5°C)			
Days	5	10	15	5	10	15	20
Appearance	Maroon	Maroon	Dark maroon	maroon	maroon	maroon	maroon
Spread-ability	Easy to spread	Easy to spread	Slightly hard	Good	Good	Good	Good, but slightly hard
Odour	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
Presence of infestation	Absent	Absent	Absent	Absent	Absent	Absent	Absent

Conclusion

In India, there are many indigenous fruits with good nutritional properties and are available throughout the year. Fruits have a low shelf-life, hence it is necessary to process them to increase their shelf-life. An attempt was made in this investigation to increase the indigenous fruit, fig consumption by developing and standardizing fig jam. The calorie content of the developed Nutri Fig Jam is much less (53% less) when compared to commercially available sucrose based jams. The product so developed contained per 100gms : total energy 152 kcal: protein 1.95gms: carbohydrates 41 gms: fat 0.19 gms: fiber 2.08 gms; Iron 0.6gms ; ash 1.18% and moisture 53.7%. The jam thus produced is a good source of calcium, polyphenols and dietary fiber. The developed jam is natural, very low in calories and has zero artificial colours, flavours and chemical preservatives when compared to commercially available jams. Hence this jam can not only be used by children but it can also be used as a low-calorie food accompaniment by health-conscious people.

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