
Development and Evaluation of A Healthy Jam

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Abstract

To develop a tasty, attractive and nutritious product is a challenge. An attempt was made to develop a healthy jam by replacing sugar with less-refined sweeteners like jaggery, raisins, dates and honey and a jam free from artificial colours, preservatives & flavours. Beetroot was selected based on nutrient composition, antioxidant capacity, pectin content, availability, low cost and organoleptic properties.

Beetroot pulp was cooked for 5 minutes. Sweeteners like jaggery, dates paste, raisins paste, honey, and lemon juice and cardamom powder were added into the pulp in varying proportions and cooked. Four variations using different sweeteners were developed. For all the four products variation was introduced by adding honey to improve the glossiness of the jam. Evaluation was done by 30 trained panel members using nine-point hedonic scale and Food Action (FACT) Rating Scale. Shelf life was assessed. The study was carried out at Smt. VHD Central Institute of Home Science, Bangalore. The developed beet root jams with different variations were found to be acceptable. They were also safe after one month of refrigerated storage. The different variations of jam provide low fat energy, micronutrients such as calcium, iron, potassium and sodium etc. This jam provides a better substitute to butter on bread.

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Keywords:

Beetroot Jam;
Natural Sweeteners;
Natural food additives;
hedonic scale;
Low fat energy.

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1. Introduction

The Sugars are an indispensable part of our daily diet. Sugars are added to food primarily to enhance sweetness. The consumption of sugars, particularly refined sugars has increased by leaps and bounds in recent times. Nutritionists have expressed their concern about this dramatic rise in the consumption of sugars and their possible role in increasing the health risk. Scientists opine that the health risks associated with high sugar consumption are more due to high energy consumption and lack of micronutrients rather than sugar per se. It is therefore necessary to increase the nutrient density of the sweeteners by replacing low nutrient dense sweeteners by high nutrient dense sweeteners

Healthy food choices help in betterment of health and nutritional status of an individual. Consuming too much of refined sugars is a health risk particularly to Indians as Indians are genetically more susceptible to obesity and diabetes. So there is a need to develop a healthy alternative to the refined sugars in everyday use. This can go a long way in minimizing the health risks associated with sugar consumption without considerably altering the taste. Substituting the refined sugars by other healthy sweetening agents also improves the nutritive value of the diets as sugars contain only sucrose whereas other sweetening agents such

as jaggery and honey contain a mixture of different carbohydrates and a small amount of minerals. In this study, sugar is replaced by natural sweeteners such as jaggery, raisins, dates and honey in preparation of jam.

Jam was selected for enrichment as it is one of the commonly used sugar products. The term jam refers to a solid gel made from the pulp of a single fruit or mixed fruits or vegetables. Jam is formed when acid reacts with pectin and sugar. Jam making offers entrepreneurs a promising business and is suitable for small-scale production. According to specifications, the fruit / vegetable content or pulp must be at least 40 per cent. In mixed fruit jams the first-named fruit must be at least 50 per cent of the total fruit. The total sugar content must be not less than 68 per cent. Over-ripe and/or bruised fruit will not make good jam as it has low levels of pectin and/or acid. Due to the high acid and sugar content jams and marmalades have longer shelf life.

A jam is usually made up of fruits and vegetables, sweetening agents, flavouring agents, preservatives, thickening agents or stabilizers, colouring agents. In this study a vegetable was used for making jam and no synthetic food additives were used.

2. Research Method

Selection of ingredients:

Fruit/vegetable: Based on the antioxidant capacity, pectin content, organoleptic properties and color, beetroot was selected

Sweetening agents: All natural sweeteners such as jaggery, dates, raisins were selected. A review of literature shows that the natural sweeteners have their own advantages.

Jaggery: Jaggery, a product of sugarcane, is rich in important minerals such as Calcium-40-100 mg, Magnesium-70-90 mg, Potassium-1056 mg, Phosphorus-20-90 mg, Sodium-19-30 mg, Iron-10-13 mg, Manganese-0.2-0.5 mg, Zinc-0.2- 0.4 mg, Copper-0.1-0.9 mg, and Chloride-5.3 mg and Vitamins such as Vitamin A-3.8 mg, Vitamin B1-0.01 mg, Vitamin B2-0.06 mg, Vitamin B5-0.01 mg, Vitamin B6-0.01 mg, Vitamin C-7.00 mg, Vitamin D2-6.50 mg, Vitamin E-111.30 mg, protein-280 mg per 100 g of jaggery. Studies have shown that Magnesium present in jaggery strengthens our nervous system, helps to relax our muscles, gives relief from fatigue and takes care of our blood vessels. The selenium in jaggery is a well known antioxidant. The potassium and low amount of sodium present in it maintain the acid balance in the body cells and also combat acids and acetone and control our blood pressure. As jaggery is a good source of iron it can help in fighting against anemia. [1]. Singh et al (2013).

Dates: Dates are a good source of energy, carotenoids, minerals like calcium, iron, magnesium, phosphorus, potassium. [2] Indian Food Composition Table (2017). According to Marc Seward (2015) [3] the health benefits of dates include improvement in bone health, prevention of anemia, prevents seasonal allergies, reduction of LDL cholesterol and total cholesterol levels.

Raisins: Raisins are a rich source of energy in addition to providing carotenoids, calcium, iron and potassium.

Honey: Honey provides energy in addition to some medicinal properties.

Flavoring agents:- A natural flavouring agent green cardamom was selected

Thickening agent: Beet root has high pectin content. Hence no thickening agent was used.

Coloring agents: Beetroot is bright bluish-red in nature which provides intense color. So no artificial colour was used.

Preservatives:- Natural preservative lemon juice was selected as preservative.

SELECTED INGREDIENTS FOR PREPARATION OF JAM

Vegetable



Beetroot

SWEETENING AGENTS



Jaggery

Golden raisins



Dates



Honey

*(Beta vulgaris)**(Phoenix dactylifera)***FLAVOURING AGENT****PRESERVATIVE**

Green cardamom and its powder **Lemon** (*Citrus limon*)
(Elettaria cardamomum)

Figure: 1 List of selected ingredients for product development

2: Development and evaluation of the jam:

Procurement of raw materials: The ingredients were procured from a super market, wholesale and local stores located at Hebbal, Bangalore. All the ingredients were of good quality. Beetroots selected were fresh, free from infestation. Packed foods such as lion dates, Coorg honey, golden raisins were labeled with food standards such as AGMARK (Agricultural Marketing) and FSSAI (food safety and standard authority of India) and were within the expiry date.

Place of study: The product development and evaluation was carried out in Food Science Laboratory of Dept of Food and Nutrition, Smt. VHD Central Institute of Home Science and Research Center, Bangalore.

Standardization of the product: Jam was prepared using the following procedure.

1. Peeled, washed and weighed beetroot was pressure cooked for 15 minutes. The boiled beetroot was allowed to cool and using a mixer grinder it was made into a fine paste. The remaining water after boiling beetroot was stored in a bottle for further use. Cardamom was finely powdered, dates and raisins were separately blended for making fine paste and jaggery was finely hand pounded.
2. All the utensils, cutlery, containers were thoroughly sterilized by keeping in boiling water for 15 minutes before the preparation of the jams and dried before use.



Figure 2: Beet root paste



Figure 3: Sterilization of the containers

3. A thick bottom pan was heated over medium heat and the beetroot pulp was cooked for 5 minutes. The remaining water from boiled beetroot was added with constant stirring to avoid charring. Once beetroot was cooked, other different varying proportions of natural sweeteners such as jaggery, dates paste, raisins paste, honey, lemon juice and cardamom powder were added into the pulp and cooked till done.
4. For testing the viscosity of the jam, a tea spoon of jam was put into a saucer plate and tilted. If it flowed over the saucer plate then, heating was continued till a thick paste like consistency was formed.



Fig 4 a: Cooking in Jam Pan

4b: Viscosity test

4c: Candy thermometer

5. Using a candy thermometer temperature of the end point was measured and noted down.
6. Different variations were prepared by adding different proportions of natural sweetening agents like dates paste or raisins paste, jiggery and honey.
7. All the prepared jams were weighed, sealed and stored in a clean, dry sterilized jam jars.



Fig 5: Weighing the final product

Four products were standardized for further study. Each product had two variations viz variation A and variation B. Variation A was without honey and all Variation B samples had 2 per cent honey in addition to the natural sweeteners. Honey was added to improve the glossiness and viscosity of the jam.

Organoleptic Evaluation of the jams: The following methods were used.

- **A 9 - point hedonic rating scale** was used for rating the attributes such as colour, texture, flavor, appearance and overall acceptability. highest score (9) was assigned to the most preferred characteristic and (1) to the most undesired characteristic.
- **Food Action Rating Scale (FACT scale):**[4] (Schutz 1965) It is a simple and quick method to know the likes and dislikes of the product in which each taster chooses his/her choice of product and frequency of consumption in all the variations of the developed products according to their own desires. Frequency of consumption is coded from 1 to 10, where responses range from I would eat this at every opportunity (1) to I will never try (10).

A score card was prepared by keeping in mind the quality characteristic of the developed jams.

Organoleptic evaluation was done by a panel consisting of 30 members.

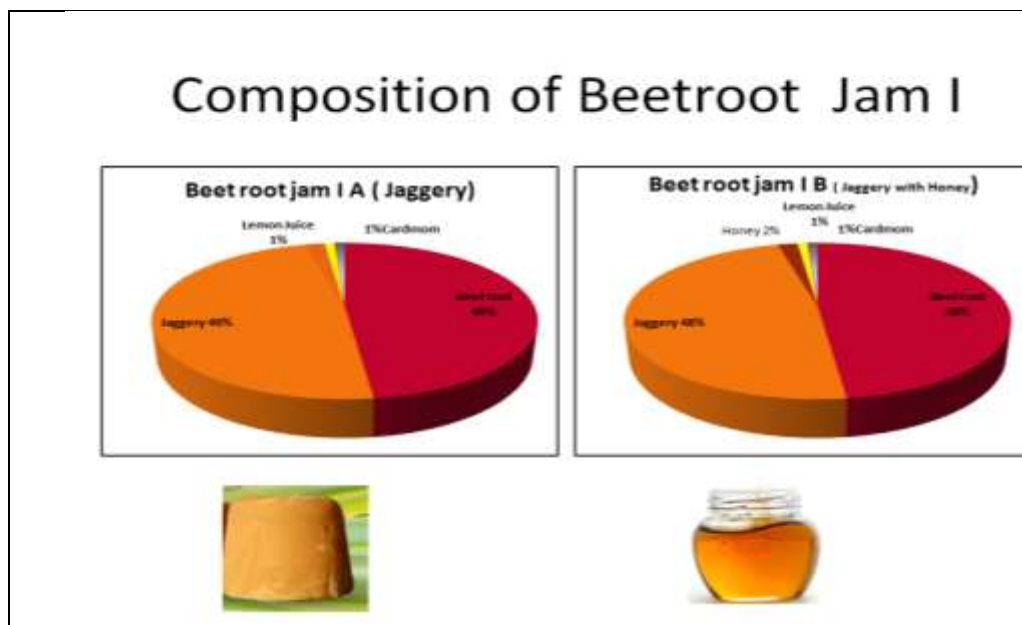


Fig 6: Organoleptic evaluation of the products

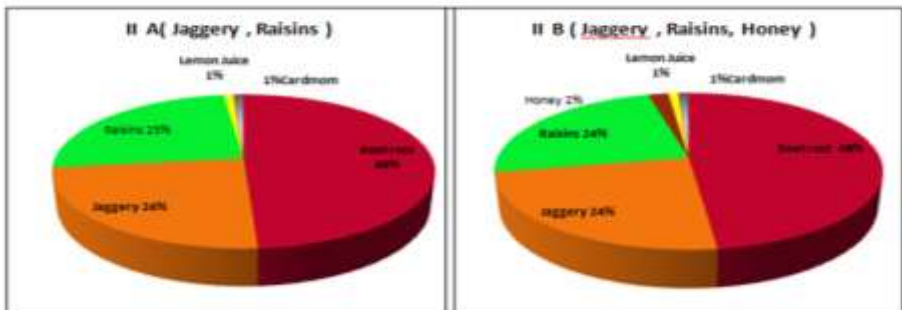
The mean score of 9 point hedonic scale for each attribute were calculated. Nutrient composition of the jam was calculated using Indian Food Composition Table (2017).

3. Results and Analysis

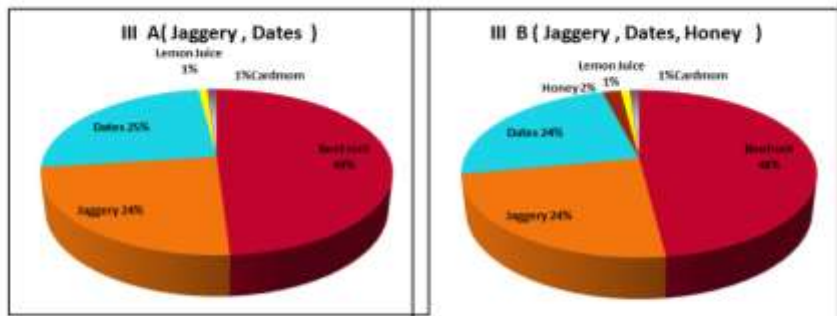
Four products were developed, where each product has two variations A and B with variation in the type and proportions of sweetening agents. The food compositions of all the standardized products and their variations are shown below:



Composition of Jam II



Composition of Jam III



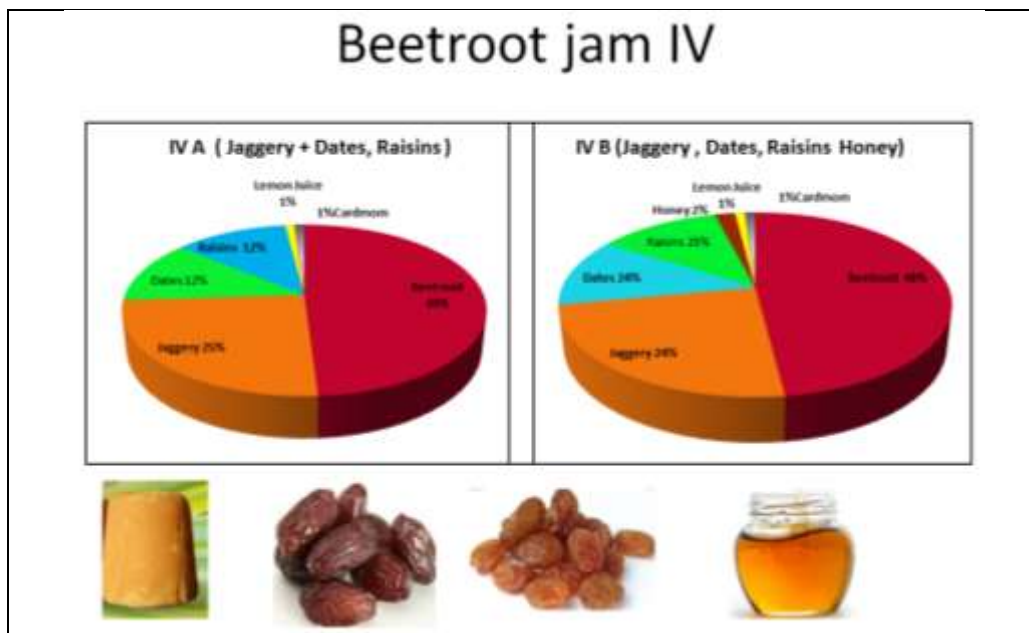


Figure7 : Food Composition Of The Developed Beetroot Jams.

ORGENOLEPTIC EVALUATION:

Table 1: The mean sensory scores of beetroot jam with different sweeteners

	PRODUCT 1		PRODUCT 2		PRODUCT 3		PRODUCT 4	
ATTRIBUTES	VARIATION		VARIATION		VARIATION		VARIATION	
	A	B	A	B	A	B	A	B
COLOR	8.33	8.0	7.9	8.0	7.7	7.8	7.2	7.65
TEXTURE	8.33	8.13	7.7	7.6	7.53	7.73	7.26	7.61
FLAVOUR	7.9	7.96	7.5	7.36	7.5	7.66	7.33	7.66
APPEARANCE	8.3	8.1	7.56	7.66	7.63	7.83	7.26	7.73
OVERALL ACCEPTABILITY	8.24	8.09	7.69	7.74	7.63	7.78	7.30	7.68

Overall, the developed jams were found to be acceptable. The overall acceptability of the product 1-variation A was found to be higher than that of all the other variations.

TABLE – 2 : Response on FACT scale

N=30

No.	Eating Response	Respondents							
		Product-1		Product-2		Product-3		Product-4	
		A	B	A	B	A	B	A	B
1	Every opportunity	36.7	30.0	16.7	10.0	13.4	10.0	6.7	10.0
2	Very often	13.3	20.0	10.0	10.0	10.0	10.0	23.3	16.7
3	Frequently	10.0	10.0	33.4	30.0	20.0	16.7	10.0	16.7
4	Now and then	6.7	10.0	10.0	16.7	23.3	23.3	13.3	6.6
5	If available	26.6	23.3	23.3	20.0	20.0	23.3	16.7	30.0
6	On occasion	6.7	6.7	0.0	6.7	6.7	10.0	16.7	3.3
7	Hardly ever eat this	0.0	0.0	3.3	3.3	3.3	6.7	6.7	16.7
8	No other food choices	0.0	0.0	3.3	3.3	3.3	0.0	3.3	0.0
9	Not eat even forced	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0
10	Never tried	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	100	100	100	100	100	100	100	100

For product 1 –variation A, 36.7 % would like to eat it at every opportunity, 13.3% would eat is very often ,10.0% would eat it frequently,7.7% now and then ,26.6 % if available ,6.7 on occasion , 0.0% depicts who would hardly try , No other food choices , Not eat even forced , Never tried.

The products were found to be safe for a period of one month under refrigerated conditions.

Jam is normally eaten along with bread or Indian breads. The beetroot jam [per serving (20 g)] provides about 40 K cal of energy, 10 mg folic acid, 32 mg potassium, 24 mg calcium, 1.3 mg iron. Date jam provides higher amount of potassium (65 mg potassium). When compared with this, commercially available mixed fruit jam provides [per serving (20 g)] 52 K cal of energy and 5 mg sodium and no other nutrient.

4. Conclusion

An attempt has been made to develop and evaluate healthy jam using natural sweetening agents, without using any artificial food additives such as colours, flavours or preservatives etc. This is a healthier option when compared with a regular jam because it is replacing sugar by more micronutrient dense natural sweeteners. The micronutrients present in the beetroot also add to the nutritive value of jam. The developed products were found to be highly acceptable. Other fruits and vegetables can also be explored in developing a nutrient dense fruit or vegetable based jams.

References

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