

Development of Watermelon rind incorporated Fruit butter

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Abstract: In the present study of watermelon rind incorporated Fruit butter, the principle ingredients used were watermelon rinds, apples, sugar and spice mix (nutmeg, cloves & cinnamon). Watermelon rind butter was standardized by replacing apple pulp with watermelon in four ratios i.e., 25:75, 50:50, 75:25 and 100:0 respectively. The standardized watermelon rind incorporated butter and apple butter was analysed for its sensory and nutritional properties. The watermelon rind incorporated at 100% level has good acceptability when compared with apple fruit butter (control).

Key words: Watermelon rind pulp, apple pulp, sugar and fruit butter.

1. Introduction

The present study was undertaken to assess the suitability of edible waste of watermelon fruit in the preparation of Fruit Butter. Fruits and vegetables being perishable in nature undergo spoilage at various stages of their harvesting, handling, transport, storage, marketing, processing. The spoiled produce is not fit for marketing and is a virtual loss. Some fruits do not find much suitability for processing and are mostly used for direct consumption (Table purpose), one such fruit is watermelon. In watermelon (*Citrullus lanatus*), the rind constitutes 33% of the total fruit weight. Some work on utilization of watermelon peel in preparation of value added products like pickle and jam, but there is scope for trying out some more products with this material. (Bhatnagar D K 1991).

Fruit butter is prepared from unpeeled or sometimes unpitted fruits until tender and then forcing it through a sieve or food mill. Sugar, and sometimes spices and lemon juice, are added and the pulp is reduced by cooking until thick. No gelling

agent, such as pectin, is used. There is no butter used in the product unlike fruit curds (Gross D R 1974). The term fruit "butter" derives from its spreadability. Preparation of fruit butter is similar to that of jam except that fine pulp is used and small quantities of spices are added (Srivastava and Sanjeev Kumar 2001).

Watermelon rinds are edible, taste good and healthy too. Watermelon rinds are very good source of vitamin-A, C, B₆, and Mg and K. Watermelon rind consists of higher concentration of the non-proteinous amino acid called Citrulline in it. Citrulline is converted to another amino acid Arginine, which is precursor for nitric oxide. Arginine, an amino acid vital to the heart, circulatory system and immune systems, says researchers from Texas A&M's Fruit & Vegetable Improvement Centre. These researchers speculate that watermelon rind might relax blood vessels and have a role in treating erectile dysfunction.

Apples (*Malus domestica*) are crunchy and delicious fruit; it is one of the most popular fruit favoured by health conscious & fitness freaks. Apples are abundant in Quercetin, flavonoids, which helps to prevent the growth of prostate cancer cells. Because of the presence of flavonoids, they inhibit the growth of carcinogenic substances in the bladder and thus, diminish the risk of bladder cancer, especially in smokers. The fiber and phyto-nutrients present in apple help in the reduction of blood cholesterol and it also been found to restrain the oxidation of harmful cholesterol i.e., LDL (low density lipoprotein). Researchers have also suggested that foods like apples, which contain flavonoids, might reduce the risk of lung cancer and the dietary fiber helps in better digestion and also promote weight loss.

Spice mix is used for flavour, aroma and as preservative of the product. Nutmeg spice (*Myristica fragans*) contains chemical compounds that are known to have anti-oxidant, disease preventing and health promoting properties. It is also rich source of vital B-complex including vitamin-C, folic acid, riboflavin, niacin, vitamin-A and many flavonoids anti-oxidants like beta carotene & cryptoxanthins that are essential for optimum health. Cloves (*Syzigium aromaticum*) & cinnamon (*Cinnamon verum*) spices contains active principles which are known to have anti-oxidant, anti-diabetic, anti-septic, local anaesthetic, anti-inflammatory, rubefacient (warming & soothing), carminative & anti-flatulent properties. Cinnamon has highest anti-oxidant strength of all the Food sources in nature and it is also used as natural food preservative. Cloves are believed to have natural anti-parasite (kills intestinal worms) function. (Susheela Raghavan 2007).

Gross (1974) discussed that fruit preserves, jams and jellies and fruit butter comes under the category of spreads and he also stated that fruit butter is prepared from unpeeled or sometimes unpitted fruits until tender and then forcing it through a sieve or food mill. Sugar, and sometimes spices and lemon juice, are added and the pulp is reduced by cooking until thick. No gelling agent, such as pectin, is used. The term fruit "butter" derives from its spreadability. There is no butter in the product (unlike fruit curds). Srivastava and Sanjeev Kumar (2001) reported that Fruit butter are prepared from apples, peaches, pears, apricots, plums, grapes, etc or a combination of these fruits and also stated that preparation of fruit butter is similar to that of jam except that fine pulp is used to small quantities of spices are added.

Grosch et.al.,(2004) discussed the nutritional composition of various fruit jams, fruit butters and spreads i.e., for strawberry jam moisture content, total sugars, total acids, ash, dietary fibre were 35%,58.7%,0.89%,0.23% and 0.80% respectively. Similarly for rasp berry jam moisture content, total sugars, total acids, ash, dietary fibre were 35.9%, 54.6%,1.03%,0.23% & 1.20% respectively. Grocer (2003) reported that fruit spreads, jellies and marmalades represent 40% of the jams/jellies/spreads category also include peanut butter, honey, fruit and honey butter and garlic spreads. Srivastava and Sanjeev Kumar (2001) reported that Fruit butter have a soft butter- like consistency and can be spread easily on breads.

Srilakshmi (2007) reported the nutritional value of watermelon fruit per 100g i.e., Moisture, Energy, Protein, Fat, Carbohydrates, Calcium & Ascorbic acid were 95.8%, 16k.cal, 0.2g, 0.2g, 3.3 g, 11g&1mg respectively. Gill and Tomar (1991) reported that the production of Watermelon in India is about 206 thousand tonnes annually and each fruit weighs about 2 kg; the seeds of the fruit are used for extraction of kernel while rind is discarded. Bhatnagar (1991) worked on utilization of watermelon rind in preparation of value added products like pickle and jam.

Watermelon rind contains a compound known as citrulline, which have antioxidant effects that protect us from free-radical damage (anonymous, 2005). Kumar (1985) reported about 33% portion of Watermelon fruit is rind out of which about 4.36% is the outer green portion and 29% is the inner white portion. Madhuri and Devi (2003) studied the Value Addition to Watermelon Fruit Waste – value added preserved products like pickles, tutti fruity, fruit cheese, vadiyams were prepared using the white portion of watermelon rind and the quality in terms of physical parameters was evaluated.

Gupta (2002) reported that the thick rind of the fruit can be candied or made into chutney. The mildly flavoured pinkish juice of the fruit, which is of about 8° Brix and 1.5% acidity and preserved with 1000ppm of sodium benzoate. Texas A & M's Fruit and Vegetable Improvement Centre (2000) stated that Citrulline converts to arginine, an amino acid vital to the heart, circulatory system and immune system.

2. Materials and methods

Different concentrations of Watermelon rind (25:75,50:50 &75:25) replaced in Apple fruit butter is made by cooking 300g of sugar with 400g of pulp (both apple and watermelon rind pulp based on concentrations) and adding spice mix (nutmeg, cinnamon and clove) along with citric acid. Apples and Watermelon rinds are first washed and cut into pieces and then boil them in equal amount of water to soften the pulp. The cooked apple pieces are made into fine pulp, to this fine pulp add sugar and cook them to the consistency till it reach 68° brix. Finally add citric acid and spice mix and fill hot in sterilized bottles The sequential steps involved in preparation of Apple fruit butter replaced with watermelon rind is given below (fig: 1)

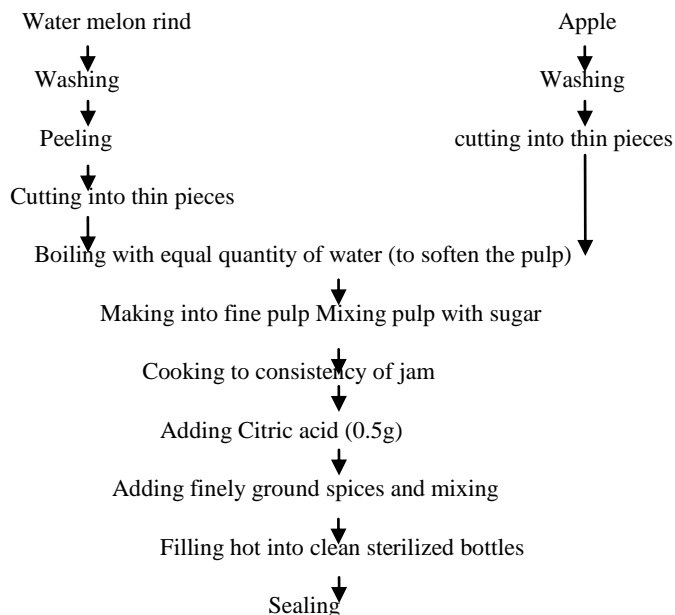


Fig: 1 Flowchart for preparation of Apple fruit butter replaced with watermelon rind

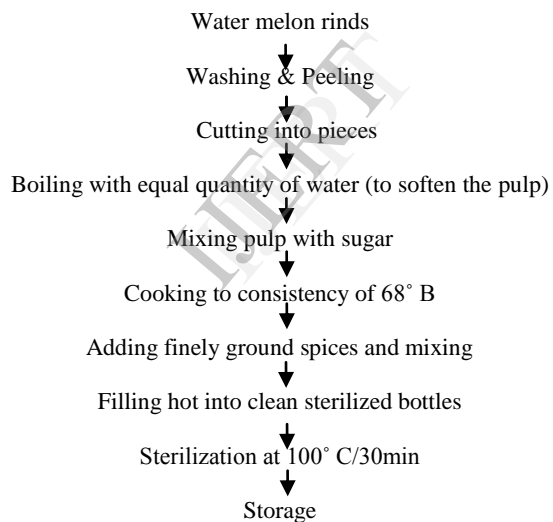


Fig: 2 Flowchart for development of watermelon rind fruit butter

Table: 1 Variation of samples in their composition

Sample variations	Apple pulp	Watermelon rind pulp	Sugar	Spice mix	Citric acid	Product weight
Control	400g	0g	300g	1g	0.5g	550g
Sample1 (75:25)	300g	100g	300g	1g	0.5g	550g
Sample 2 (50:50)	200g	200g	300g	1g	0.5g	550g
Sample 3 (25:75)	100g	300g	300g	1g	0.5g	550g
Sample 4 (0:100)	0g	400g	300g	1g	0.5g	550g

Watermelon rind Fruit butter is made by cooking 300g of sugar with 400g of Watermelon rind pulp and adding spice mix (nutmeg, cinnamon and clove) along with citric acid. Watermelon rinds are first washed and cut into pieces and then boil them in equal amount of water to soften the pulp. The cooked apple pieces are made into fine pulp, to this fine pulp add sugar and cook them to the consistency of jam. Finally add citric acid and spice mix and fill hot in sterilized bottles. The sequential steps involved in the preparation of watermelon rind fruit butter is given below (fig: 2)

Samples of different fruit butter formulations, which were formed with the ratios of 100:0, 75:25, 50:50, 25:75 and 0:100 (Apple: watermelon rind) were carried out for various physico-chemical characteristics including moisture, total soluble solids, carbohydrates, pH, acidity, ash, crude fibre and energy by the methods followed from Ranganna (1986).

Sensory evaluation of watermelon rind fruit butters was carried out by comparing with control samples. Sensory testing was conducted in the sensory evaluation laboratory, Department of Food science and Technology. Five trained panel members and ten semi trained members were selected for the evaluation by polite solicitation. Panellists were selected solely based on their interest, time availability and lack of allergies to the food ingredients used in the study.

Panellists were provided with evaluation card and coded samples. Sensory evaluation was carried out under ambient conditions, under fluorescent lighting and controlled temperature in the test booths. The colour, consistency, flavour, taste and overall acceptability of the products were evaluated by the sensory panellists according to 9-point scale evaluation as described by Karl Ruher (2007).

3. Results and Discussion

The data regarding moisture content, total soluble solids (TSS), pH, acidity, carbohydrates, ash content, crude fibre and energy values of samples has been represented in Table: 2. It was observed there the formulations showed non significant difference in moisture, TSS, pH and acidity ,where as significant difference in carbohydrates, ash content, crude fibre

and energy. The moisture content of control, Sample 1, Sample 2, Sample 3& Sample 4 were 33.4%, 34.6%, 34.4%, 34.9% & 35.2% respectively, where it showed almost similar moisture content with negligible difference. Grosch et.al, (2004) stated that moisture content of fruit butters is around 35%. The Total soluble solids were 68%, 66%, 65.8%, 65.2% & 65% respectively. Grosch et.al, (2004) stated that Total soluble solids of fruit butters is around 58.7%. Grocer (2003) reported that fruit spreads represent 40% of the jams/jellies/spreads category also include peanut butter, honey, fruit and honey butter and garlic spreads. Srivastava and Sanjeev Kumar (2001) reported that Fruit butter have a soft butter- like consistency and can be spread easily on breads. The P^H of Control, Sample 1, Sample 2, Sample 3, and Sample 4 were 3.69, 3.97, 4.06, 4.14 & 4.22 (% citric acid equivalent) respectively, where as the acidity of the samples were noted that 0.51, 0.5, 0.54, 0.53, 0.52.

The Ash content of Control, Sample 1, Sample 2, Sample 3, & Sample 4 were 21.22g, 20.35g, 17.91g, 14.16g&13.56g respectively. Whereas carbohydrate content of were 43g, 39g, 48g, 44g and 54g respectively. The Energy content of Control, Sample 1, Sample 2, Sample 3, & Sample 4 were 14k.cal, 13.3k.cal, 13.9k.cal, 15.1k.cal and 15.4k.cal respectively and Crude fibre content of samples were 0.009g, 0.009g, 0.023g, 0.027g&0.051g respectively. Grosch et.al.,(2004) discussed the nutritional composition of strawberry jam as moisture content, total sugars, total acids, ash, dietary fibre were 35%,58.7%,0.89%,0.23%and 0.80% respectively. Similarly for rasp berry jam moisture content, total sugars, total acids, ash, dietary fibre were 35.9%, 54.6%,1.03%,0.23% & 1.20% respectively.

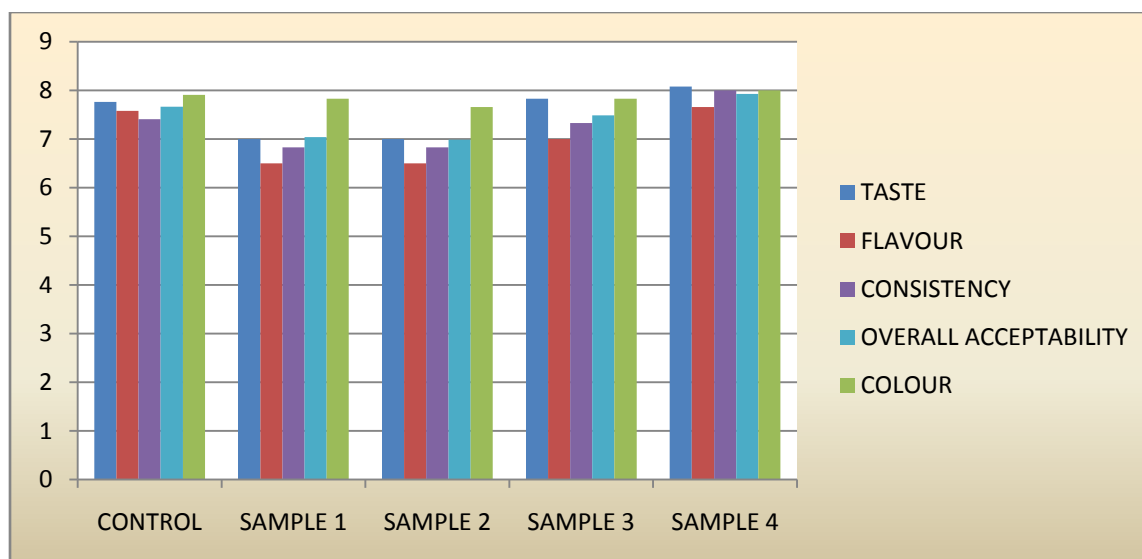
The score for taste was found highest in Fruit butter Sample 4 with a score of 8.1 as compared to that of control. Flavour of Fruit butter Sample 4 was found as good as control with a score of 7.7.The score for colour was found highest in Fruit butter sample 4 with a score of 8.0. Consistency of fruit butter sample 4 was as good as compared to that of the control with a score of 8.0. Overall acceptability of sample 4 fruit butter prepared by 100% watermelon rind pulp was higher in comparison to other samples.

Table: 2 Physico-chemical analysis of Fruit Butter incorporated with watermelon rind. (n = 3)

S.No	Experiment	Control	Sample 1	Sample 2	Sample 3	Sample 4	LSD (P≤0.05)
1	Moisture Content (%)	33.4	34.6	34.4	34.9	35.2	NS
2	Total soluble solids (%)	68.0	66.0	65.8	65.2	65.0	NS
3	p ^H	3.69	3.97	4.06	4.14	4.22	NS
4	Titration acidity (%)	0.51	0.5	0.54	0.53	0.52	NS
5	Ash content(g)	21.22	20.35	17.91	14.16	13.56	1.02
6	Carbohydrates(g)	43.0	39.0	48.0	44.0	54.0	0.08
8	Energy(k.cal)	1492	1430	1372	1313	1266	0.20
9	Crude fibre(g)	0.009	0.009	0.023	0.027	0.051	0.09

Table: 3 Sensory scores of Watermelon rind incorporated Fruit Butter (n = 3)

Attribute	Control	Sample 1	Sample 2	Sample 3	Sample 4
Taste	7.7	7.0	7.0	7.8	8.1
Flavour	7.6	6.5	6.5	7.0	7.7
Colour	7.9	7.8	7.7	7.8	8.0
Consistency	7.4	6.8	6.8	7.3	8.0
Overall acceptability	7.7	7.0	7.0	7.5	7.9

**Fig.3 Sensory scores for different attributes of Fruit Butter**

4. Summary

From the results of the present study it can be concluded that Fruit Butter prepared from 100% watermelon rind showed significantly high acceptability when compared to control apple butter. Utilization of watermelon rind in preparation of fruit butter can serve as healthy product for heart patients as it contains an amino acid called citrulline. Citrulline is converted to another amino acid called arginine, an amino acid vital to the heart, circulatory system & immune system and also a very good source of vitamin-A, C, B₆, and Mg and K. Therefore it was suggested that watermelon rind upto 100% can be incorporated for preparation of nutritious and acceptable fruit butter. The estimated fruit waste in watermelon fruit is around 35-40% and hence the utilization of watermelon rind in the preparation of fruit butter will result in fruit waste utilization & also increase economical production of fruit products.

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