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Development and quality evaluation of rose petals - orange marmalade

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Abstract

This study aimed to develop a process for the development of marmalade from Rose petals, Orange juice and orange peels. These three were the main ingredients used in marmalade. The prepared rose petals – orange marmalade was analyzed for its different phytochemicals as well as sensory qualities by adopting 9 point hedonic scale. Among different concentrations there were three samples taken for sensory analysis, in which sample A contains all the ingredients of recipe but it has 98.8% of orange juice in it which is more than other two samples, sample B contains all the ingredients and the addition of pineapple pulp 15.1%, in sample C the ingredients were the same just the addition of lemon juice 6% is taken. As a result the analysis done by professors of K.K. WAGH College of food technology the sample A is accepted overall among three samples. Also we have taken the rose petal which is innovative part in preparing marmalade and the reason we decided to take rose petals because of its health benefits, color and a bit taste will change and it did happen.

Keywords: Rose petals – orange marmalade, phytochemicals, innovative

1. Introduction

India's diverse climate ensures availability of all varieties of fresh fruits and vegetables. It ranks second in fruits and vegetables production in the world, after China. As per National Horticulture Database published by National Horticulture Board, during 2015-16, India produced 90.2 million metric tonnes of fruits and 169.1 million metric tonnes of vegetables. The area under cultivation of fruits stood at 6.3 million hectares while vegetables were cultivated at 10.1 million hectares. Amongst fruits, the country ranks first in production of Bananas (25.7%), Papayas (43.6%) and Mangoes (including mangos teens and guavas) (40.4%). The vast production base offers India tremendous opportunities for export. During 2017-18, India exported fruits and vegetables worth Rs. 9,410.81 crores/ 1,459.93 USD Millions which comprised of fruits worth Rs. 4,229.03 crores/ 655.90 USD Millions and vegetables worth Rs. 5181.78 crores/ 804.03 USD Millions.

Different varieties of fruit jam, jellies, marmalade and beverages are available globally and there has been an increased consumption of fruit jam, juices, marmalade and beverages due to consumer awareness of nutritional and health benefits. Marmalade, nowadays generally refers to a fruit preserve made from the juice and peel of citrus fruits boiled with sugar and water. Today, the word marmalade is used to describe a citrus jam containing bits of candied rind. Typically marmalade is associated with oranges, but all citrus fruits are good marmalade candidates. Commonly, orange marmalade is consumed as spreading it on a slice of toast as part of a healthy breakfast. Various brands of marmalade available in market are Kissan, Tops, Smuckers, Tiptree, Mackays, Crosse & Blackwell, Michy's, Fruitomans, Golden Crown, Walden Farms, Stute and many more which include sugar free marmalade, diabetic orange marmalade, no carbs orange marmalade, etc. Now, marmalade prepared with oranges and Rose petals has intensely unique sharp, bitter orangey taste and promotes health by supplying nutritional aspects.

Marmalade is prepared from the citrus fruits like lemons, limes, grapefruits, mandarins, sweet oranges, bitter oranges and other citrus fruits, or any combination of them. But we prepared the innovative marmalade which includes the main ingredients rose petals, orange and its peel. Physically good quality marmalade is decided from hedonic scale rating. It is type of sensory evolution. Marmalades are gel like spreads made by cooking juice or pulp or grated fruit with sugar. Marmalade has the natural color and flavor of the fruit from which it is made. Moreover, some additives such as citric acid or gelling agents, commonly pectin,

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can be added. In traditional marmalade manufacture, all the ingredients are mixed in adequate proportions and the mix is concentrated by applying thermal treatments at normal or reduced pressure to reach the required final soluble content.

2. Materials and Methods

2.1 Procurement of raw materials: Good quality of oranges, rose petals, sugar citric acid and pectin were purchased from local market of Nashik.

Orange: It was the main ingredient for preparation of rose petals – orange marmalade.

Table 1: Nutritional value per 100 gm of orange juice

Constituents	Concentration
Calories	304kcal
Protein	4.76g
Total Lipid, Saturated	0.16g
Total Lipid, Unsaturated	0.49g
Total fat	1.35g
Ash	2.71g
Carbohydrate by difference	56.8g
Fiber, total dietary	1.35g
Sugar, total	55.3g
Potassium (K)	1353mg
Vitamin C, total ascorbic acid	337mg
Beta carotene	223 μ g

Source: USDA Nutrient Database

2.2 Preparation of rose petals – orange marmalade

Procedure

a) Washing

The entire ingredients are washed to remove dirt, dust and other contaminant on the surface, and then wipe well using tissue paper.

b) Grating (Orange)

After washing hold orange in one hand and grate with grater to get orange zest (Just grate the outer layer which is yellow/orange do not grate white portion as it bitter). Remove the zest from groove.

c) Peeling (Orange)

Then peel entire skin of orange and separate into halves.

d) Juice extraction (Orange)

Juice extraction was done by using hand fruit juicer.

e) Rose petals

Place rose petals in large bowl and sprinkle the sugar over and make sure the sugar coat each petal.

f) Orange peels

Boiling of grated orange peels in water for 2-3 min.

g) Mixing

Mixing of all ingredients (Rose petals, grated orange peels and orange juice) according to above formulation.

h) Addition of sugar and citric acid

Sugar is added according to TSS (60.6gm/100gm) of mixture (rose petals + grated orange peel + orange juice) and citric acid according to acidity (0.18gm/100gm).

i) Cooking

Cooking with continuous stirring on low flame.

j) Addition of pectin

Addition of pectin as TSS reaches to 60-62°B and then continues boiling till jelling point.

k) Testing for end-point

End point (65°B) was tested by using hand refractometer or Sheet/ Drop/ Temperature test.

l) Cooling

Cool marmalade up to 40-50° C.

m) Filling

Fill in plastic container.

n) Sealing and Labeling

Sealing of product is done after cooling to avoid condensation.

o) Storage

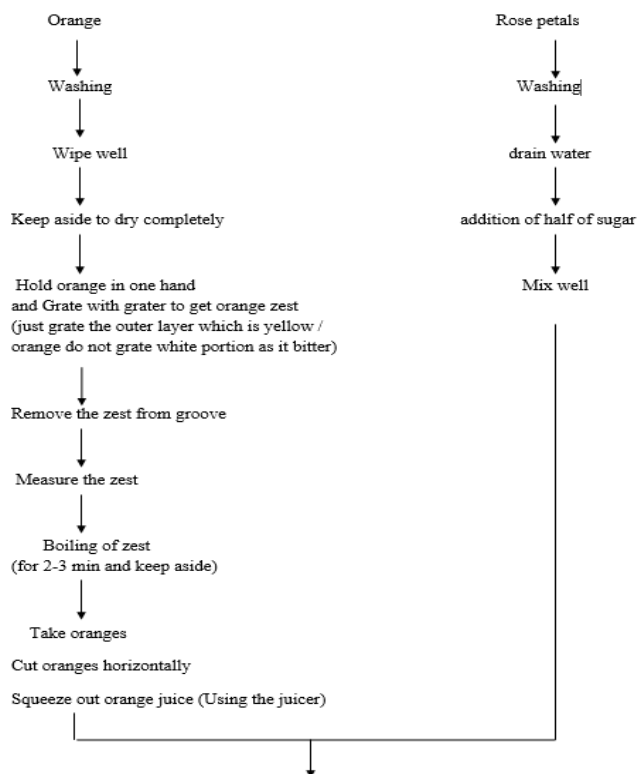
Rose petals-Orange Marmalade is stored at room temperature.

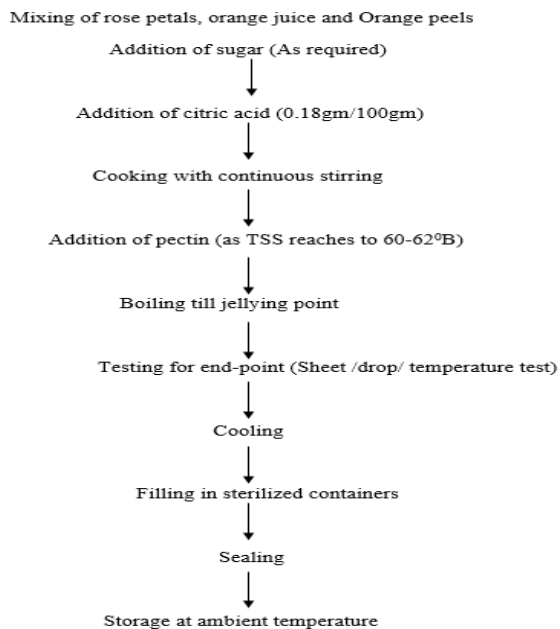
Table 2: Ingredients for preparation of 100 gm of marmalade:

Sr. No	Ingredients	Amount
1	Orange juice	98.8
2	Rose petals	12.1
3	Orange peels	1.4
4	Sugar	60.6
5	Pectin	0.45
6	Citric acid	0.18

2.3 Experimental Plan

Figure shows the flow chart for the preparation of Rose petals – orange marmalade





2.4 Proximate analysis

Ash is non organic compound containing mineral content of food and nutritionally it aids in the metabolism of the organic compounds such as fats and carbohydrates. Ash content was determined as per the method given by [3.2.1]. The moisture content of the developed marmalade was determined by the method described in [3.2.2]. The protein content of Rose petals- Orange Marmalade was determined by the method described in [3.2.3]. The total carbohydrate content was estimated using method of [3.2.4]. The Crude Fiber content of Rose petals- Orange Marmalade was determined by the method described in [3.2.5]. Sugars in all products were estimated by [3.2.6], in sugar there are three types i.e. reducing sugar, non reducing sugar and total sugar. Ascorbic acid (Vitamin C) content was determined by titration method using iodine. Acidity of sample was determined by titration against 0.1N NaOH according to Ranganna S. The pH value was determined with the help of an electronic pH meter. TSS was measured by using a hand refractometer (ERMA INC., Tokyo, Japan) (58-90 °Brix) and values were expressed as °Brix. The TSS increased with gradual passage of storage time, which might be due to hydrolysis of polysaccharides into monosaccharide. Phytochemical analysis of rose petals orange marmalade was carried out and described in [3.3].

2.5 Sensory evaluation – hedonic scale

Sensory evaluation of the sample was carried out by staff of the department of K. K. Wagh College of Food Technology using nine point's hedonic scale and composite scoring test. Attributes like taste, color, appearance, mouth feel, flavor and overall acceptability was scored based on its intensity scaled. 9-Point Hedonic Scale has been used for the purpose. The sensory score given by the panel have been evaluated for the sensory result.

3. Results and Discussion

3.1 Sensory evaluation

The result of the sensory evaluation is shown in Fig 1. Color is an important sensory attribute of any food because of its influence on acceptability. The saying that the eye accepts the food before the mouth is very true. After taking sensory analysis of 3 samples we decided to finalize the proportion of sample A and started to prepare the Rose petals orange Marmalade on large scale. The Rose petals orange marmalade

scored between 7.7 and 7.8 which was moderately liked by teachers.

3.2 Chemical analysis

The chemical parameters viz. ash content, moisture, protein, carbohydrate, crude fiber, sugars, energy value were measured by laboratory analysis.

3.2.1 Determination of ash content

The ash content of Rose petals- Orange Marmalade was determined by Muffle Furnace (Ranganna S., 1986) [12]. Note the weight of empty silica crucible. Weigh 10 ml of sample into the crucible. Flash off the moisture using water bath. Keep the content at 550°C for 6 hours in muffle furnace. Cool the dishes in desiccators & weighed. Note the difference in weight of content. Calculate the ash content in %.

3.2.2 Determination of moisture content

The moisture content of Rose petals- Orange Marmalade was determined by Hot Air Oven (Ranganna S., 1986) [12]. Weigh 10 g sample accurately and subjected to oven drying at 110oC for 4-5 hour. Oven dried samples were cooled in desiccators and weighed. The drying was repeated until the constant weights were obtained or until the difference between two successive weighing was not more than 0.002g. The resultant loss in weight was calculated as percent moisture content.

3.2.3 Determination of protein content

The protein content of Rose petals- Orange Marmalade was determined by Kjeldhal method (Ranganna S., 1986) [12]. The organic nitrogen from the protein and other nitrogenous compounds is converted to inorganic nitrogen (ammonium sulphate) by complete oxidation of sample with conc. H₂SO₄. The digest is treated with excess of 50% NaOH to liberate ammonia from ammonium sulphate. The ammonia is collected in boric acid and titrated with standard H₂SO₄.

3.2.4 Determination of carbohydrate content

The carbohydrates content of Rose petals- Orange Marmalade was determined by Gopalan *et al.* (1989).

3.2.5 Determination of crude fiber

The Crude Fiber content of Rose petals- Orange Marmalade was determined by Maynard AJ. (1970) [10]. Acid and subsequent alkali oxidative hydrolytic degradation of native cellulose degradation of native cellulose and lignin occurs. The residue after filtration is weighed incinerated, cooled and weighed. The loss in weight gives the crude fiber content.

3.2.6 Determination of sugars

Sugars in all products were estimated by Lane and Eynon's method reported by Ranganna (1995) [13].

3.3 Phytochemical analysis: (M. Satya Prasad *et al.*, 2015) [8]

Qualitative analysis

Qualitative analysis of rose petals orange marmalade was carried out. (M. Satya Prasad *et al.*, 2015) [8], it was observed that marmalade contains compound such as Amino acid and Protein, Tannin, Glycoside, Terpenoid, Phenols, Coumarins, Flavonoid, Anthocyanin and Betacyanin and it was not contain saponin.

3.3.1 Test for amino acid and protein

2ml of filter was treated with 2-5 drops of ninhydrin solution. Placed in a boiling water bath for 1-2 minute and observed for the formation of purple color.

3.3.2 Test for tannin

To 1ml of extract, 2ml of 5% ferric chloride was added. Formation of greenish black colour indicates the presence of tannin.

3.3.3 Test for saponins

To 2ml of extract, 2ml of distilled water was added and shaken in a graduated cylinder for 15 minutes length wise. Formation of 1cm layer of foam indicated the presence of saponin.

3.3.4 Test for glycoside

To 1ml of the extract add few drop of HCl, allowed for 5 minutes for hydrolysis and neutralized with NaOH solution. A few drop of Fehling's solution A and B are added and heated for few minute. An orange red precipitate indicates the presence of glycosides.

3.3.5 Test for terpenoids

To 0.5 ml of extract, 2ml of chloroform was added carefully. Red brown color formation at the interface indicated the presence of terpenoids.

3.3.6 Test for phenols

To 1ml of the extract, 2ml of distilled water followed by few drops of 10% ferric chloride was added. Formation of greenish black color indicated the presence of phenols.

3.3.7 Test for coumarins

To 1ml of extract, 1ml of 10% Sodium hydroxide was added. Formation of yellow color indicated the presence of coumarine.

3.3.8 Test for Flavonoid

5ml of dilute ammonia solution was added to a portion of the aqueous filter of extract followed by addition of concentrated sulphuric acid. Appearance of yellow color indicated the presence of flavonoid.

3.3.9 Test for anthocyanins and betacyanin

To 2ml of extract, 1 ml of 2N sodium hydroxide was added and heated for 5 minute at 100°C. Formation of yellow color indicates the presence of betacyanin.

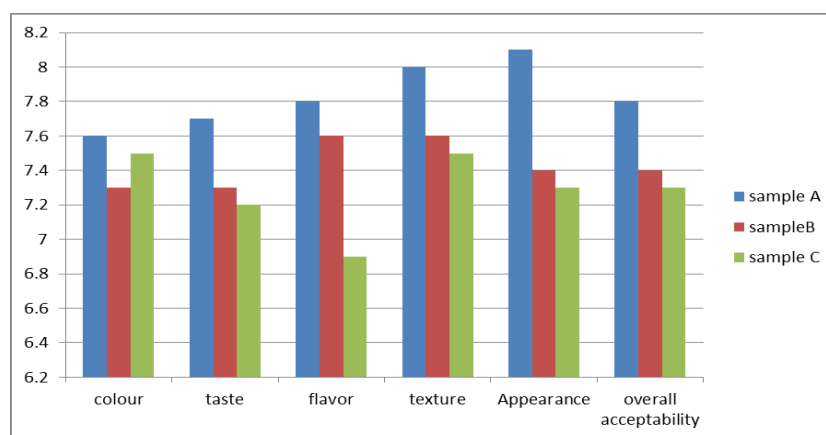


Fig 1: Results of Sensory Analysis

Table 3: Results of Chemical Analysis

S. No.	Particulars	Value (%)
1.	Energy Value (Kcal)	270
2.	Protein (%)	0.26
3.	Carbohydrates (%)	67.31
4.	Total sugar (%)	7.1
5.	Reducing sugar (%)	64.1
6.	Non reducing sugar (%)	54.1
7.	Vitamin C (mg)	21.12 mg
8.	Ash (%)	0.28
9.	Moisture (%)	29
10.	Crude fiber (%)	3.15
11.	TSS (^o Brix.)	65
12.	pH	3.3

Table 4: Result of Qualitative Analysis

S. No.	Compound	Result of test
1.	Amino acid and Protein	Positive
2.	Tannin	Positive
3.	Saponin	Negative
4.	Glycoside	Positive
5.	Terpenoid	Positive
6.	Phenols	Positive
7.	Coumarins	Positive
8.	Flavonoid	Positive
9.	Anthocyanin and Betacyanin	Positive

4. Conclusion

Marmalade is having good digestible and appetizing properties and is known for medicinal and therapeutic value. In the resultant product marmalade is prepared by blending orange juice 98.8%, orange peels 1.4% and rose petals 12.1%. The product was found to be highly nutritious because of these fruits and edible flower i.e. Orange and Rose petals. As good source of vitamins and minerals, antioxidant and phytoconstituents in orange juice which issue in preparation of marmalade, because of these functional compounds the product is said to be functional food. Chemical and sensory attributes of the marmalade was evaluated. In the result of sensory analysis it is seen that marmalade prepared by blending 98.8% orange juice and 12.1% rose petals, 1.4% orange peels is more acceptable compared to other two samples prepared. In the result of chemical analysis, it is seen that marmalade contains total sugar 64.1%, protein 0.26%, ash 0.28%, vitamin C 21.12 mg and crude fiber 3.15 %. The utilization of by products such as orange peels in the preparation of marmalade is issue of innovativeness. Food containing phytoconstituents can provide many health benefits as well as such helping to maintain weight and lowering your risk of diabetes, cancer and heart disease.

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