Development & Quality Evaluation of Jelly Prepared from Guava Blended with Pomegranate

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Abstract -- The research work was undertaken to develop technology for preparation of good quality jelly from guava blended with pomegranate and to study the chemical composition and sensory qualities of the jelly with different proportions of guava and pomegranate. Different treatments were used namely T1 (90:10), T2 (80:20), T3 (70:30), T4 (60:40)for study using different proportion of guava and pomegranate. T.S.S of fresh jelly varied from 64 to 68 0Brix and was maximum for treatment T4. Ascorbic acid content of jelly varied from 27.37 (mg/100g) to 32.46 (mg/100g) and was found maximum in treatment T1. pH of fresh jelly varied from 5.53to 5.72 % and was maximum for T1 (90:10). Titrable acidity of fresh jelly varied from 0.48%to 0.72%and was found maximum for T4 (60:40). Moisture content of fresh jelly varied from 30% to 50% and was found maximum for treatment T4. Based on sensory score and chemical composition treatment T4(60:40) was found best.

Indexed Terms: Guava jelly, pomegranate, Treatment Physico-chemical evaluation, sensory evaluation

I. INTRODUCTION

Guava

Guava (*Psidium gujava*) is an important fruit of family Myrtaceae, occupied an important place among the fruit plants and is grown throughout the world. The area under guava is about 0.15 million hectare, producing 1.80 million tonnes of fruit in India (Mitra, 2008). Bihar is the leading state in guava production followed by Andhra Pradesh and Uttar Pradesh. Guava is one of the most common and important fruits in Bangladesh. It claims to be the most important fruit in area and production after mango (Anoymous, 1995).

Guava is a rich source of vitamin C (260 mg/100g of fruit) and pectin which has industrial use for jelly production (Bose and Mitra, 2011). Guava is also a good source of calcium and phosphorus. Guava contains 84.2% water, 9.68% total soluble solids, 0.50% ash, 4.45% reducing sugar, 5.23% non-reducing sugar, 1.25%acid, and 560 mg/100g vitamin C, which differ with the cultivar, stage of maturity, and season. Guava jelly is well known to all and it can be caned in sugar syrup or made into fruit butter. Guava contains vitamin C, 2 to 5 times more than that of fresh orange juice. In some countries, the leaves are used for curing diarrhea, and also for dyeing and tinning.

During harvesting season, a market glut is occurred in the guava producing areas. Due to lack of marketing, storage1facilities the growers bound to sell their produce at throw away prices and huge quantity of guava spoiled. As estimated by Lushly (1984) an approximately 30-50% fruit goes waste during post-harvest handling, storage and ripening. This postharvest loss is highly prominent in guava because of its high perishability.

The prevention of losses of the seasonal surplus of the fruit by processing and preservation techniques at farmer's level and as well as industrial scale should be warranted. Such efforts will help the development of processing industries in the growing areas of the countries. Moreover, this will stimulate an increase in production and bring better return to the guava growers. There is a wide prospect of producing guava products such as guava juice, pulp, jelly, squash, marmalade, ready to serve beverage, candy, vinegar, wine etc. But unfortunately, the present technology of production, processing and preservation of guava is not well developed up to the volume of its annual production. It is therefore essential to investigate to develop suitable inexpensive method for processing and preservation of guava.

There are a number of methods for processing guava. The health benefits of guava are (1) Guavas are a good source of fiber, carbohydrates, proteins, iron, calcium and phosphorus. (2) They are a rich source of Vitamin C, lycopene and antioxidants that are beneficial for skin. (3) Guavas are also rich in manganese which

helps the body to absorb other key nutrients from the food that we eat. Guavas contain folate, a mineral which helps promote fertility.

Pomegranate

Pomegranate (*Punicagranatum*L.) of family Lythraceae, is one of the ancient and highly praised favorite fruit of Mediterranean, tropical and subtropical regions of the world. It is an important commercial fruit preferred by the consumer all over the world for its sweet- acidic taste, fine dessert quality and excellent blend. The total area under cultivation of pomegranate in India is 107.00 thousand ha and production is around 743.00 thousand tones. (APEDA)

The fruit is also popular due to the organoleptic characteristics of the arils (i.e. the seeds), nutritional and therapeutic values for its usefulness in cancer, indigestion and leprosy cure. Pomegranate is widely considered native to the region from Iran to Northern India (Morton, 1987). In terms of farmer's economy, pomegranate is next to grape in its importance and is cultivated in various districts of Maharashtra, commercially (Kaulgud, 2002).

Pomegranate has a deep association with the culture of the Mediterranean region and Near East where it is a savored delicacy and is an important dietary component and greatly appreciated for its medicinal properties (Ed Stover and Mecure, 2007). Currently there is a great interest in pomegranate juice due to its anti-oxidant activities and potential health benefits (Hess-pierce and Kadar,2003). The anthocyanins of pomegranate have rich anti-oxidant property. The anthocyanin responsible for pigmentation of the pomegranate were isolated and identified as 3, 5-diglucoside delphindin (DP-2, 5) and 3, glucoside (DP-3), cynadin 3, 5-diglucoside (Cy-3, 5) and 3-glucoside (CY-3), peralgonidin 3, 5-diglucoside (Pg-3, 5) and 3-glucoside (Pg-3) (Du *et al.*, 1975).

The total area under this fruit at present accounts to 113.2 thousand hectares with an annual production of 745 thousand metric ton of which 78thousand hectare area and 408 thousand metric ton production is met by Maharashtra (Annonymous, 2013). The health benefits of pomegranate are (1) High blood pressure is one of the leading drivers of heart attacks and strokes, pomegranate may lower blood pressure. (2) Breast cancer is the most common type of cancer in women, pomegranate may also be useful against breast cancer. (3) The plant compounds in pomegranate can help fight harmful microorganisms.

Jelly

Jellies are defined by CAC section 2-2 as the products brought to semi-solid gelled consistency and made from the juice and / or aqueous extracts of one or more fruits or vegetables, mix with foodstuffs with sweetening properties with or without the addition of water (Codex Alimentarious Commission). Apricot, pineapple, strawberry, raspberry, etc. can be used but only after addition of pectin powder, because these fruits have low pectin content. Jellies are made by cooking fruit juice with sugar.

Citric acid is used as preservative in jelly. This weak organic acid with the formula $C_6H_80_7$, acts as a natural preservative and also imparts a sour taste to food products. It acts as an acidifier, chelating agent and also flavoring agent (Patil P., Sayed H.M.)

For preparing jelly, sometimes agar agar gel is used instead of pectin. Agar or agar agar is a jelly like substance obtained from algae. Agar is derived from polysaccharide agarose, which forms the supporting structure in the cell walls of certain species of algae, and which is released on boiling.

Objectives

Taking all these points in view, we attempted to prepare jelly with the following objectives.

1. To prepare jelly from guava blended with pomegranate.
2. To evaluate the chemical and sensory properties of jelly.

II. MATERIALS & METHODS

This chapter describes the experimental set-up, method and materials used for development of mixed fruit jelly. The experiment was also conducted to assess the quality of developed jelly. Laboratory tests for determination of ascorbic acid (vitamin C) were carried out in the Laboratory.This chapter includes the details of materials used for the work and detailed procedure of the project.

Fresh and properly matured guava and pomegranate fruits were procured from the local market. Sucrose (common sugar) required for the research work was also procured from the local market. Agar agar gel, citric acid, Digital glass pH meter, Digital refractrometer, refrigerator, weighing balance,hot air oven, cutting knife, muslin cloth, plates etc. were at various stages during the preparation of jelly.

Mixed fruit extract was prepared by mixing guava shreds and pomegranate in 1.5 times water and were boiled for 15-20 minutes. The fruit extracts were then strained off and collected for further use.

Jelly was prepared by heating juice extract of 100 ml of the clear juice of guava & pomegranate, few strips of agar agar gel, 60-65 % sugar and 0.5% citric acid were added to the extract while heating. Heating was continued with constant stirring up till the TSS reached to 65^0Brix and desired consistency was reached.

Table: Treatments for preparation of jelly

Treatments	Guava(%)	Pomegranate(%)
T1	90	10
T2	80	20
T3	70	30
T4	60	40

Chemical Analysis of prepared Jelly Treatments:

1. Moisture content: The moisture content was determined using following formula by using hot air oven method.

$$MoistureContent(\%) = \frac{InitialWeight - FinalWeight}{InitialWeight} x100$$

2. TSS (Total Soluble Solid): TSS of extracted juice was determined using Erma hand refractometer (A.O.A.C.1990). A drop of jelly was placed on prism of refractometer and TSS was obtained directly from the scale of refractometer. Care will be taken that prism of refractometer were washed with distilled water and wiped dry with clean cloth before every reading.
3. pH: pH was determined using standard or digital pH meter.
4. Moisture content: The moisture content was determined using following formula by using hot air oven method

$$MoistureContent(\%) = \frac{InitialWeight - FinalWeight}{InitialWeight} x100$$

5. TSS (Total Soluble Solid): TSS of extracted juice was determined using Erma hand refractometer (A.O.A.C.1990). A drop of jelly was placed on prism of refractometer and TSS was obtained directly from the scale of refractometer. Care will be taken that prism of refractometer were washed with distilled water and wiped dry with clean cloth before every reading.

6. Moisture content: The moisture content was determined using following formula by using hot air oven method.

$$MoistureContent(\%) = \frac{InitialWeight - FinalWeight}{InitialWeight} x100$$

Flow Chart:

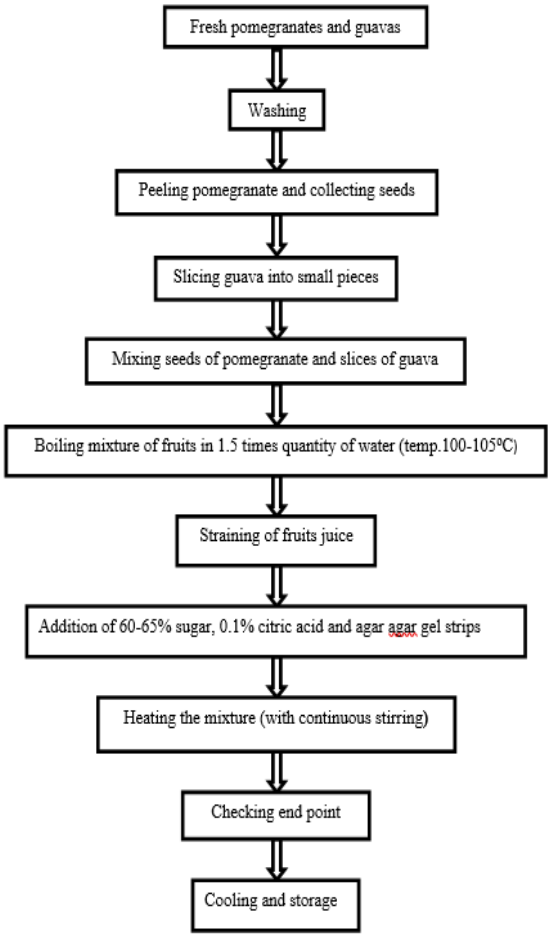

Fig 1:Flow chart for preparation of Jelly

7. TSS (Total Soluble Solid): TSS of extracted juice was determined using Erma hand refractometer (A.O.A.C.1990). A drop of jelly was placed on prism of refractometer and TSS was obtained directly from the scale of refractometer. Care will be taken that prism of refractometer were washed with distilled water and wiped dry with clean cloth before every reading.
8. pH: pH was determined using standard or digital pH meter
9. Ascorbic acid (Vitamin C): It was estimated by using 2-6-Dicholorophenol-Indophenol (DCPIP) visual titration method. The dye which is blue in alkaline solution & red in acid solution is reduced by ascorbic acid to a colorless form.

$$Mg\ of\ Ascorbic \frac{acid}{100} gm\ or\ ml = \frac{Titre \times Dyefactor \times Volumemadeup \times 100}{Aliquotofextracttaken \times Volumeofsampletaken}$$

10. Titrable acidity: 50 gm of sample was taken in blender & homogenized with distilled water. Blended material was then filtered & was taken in volumetric flask & volume was made up to the mark with distilled water. 5 ml solution was taken in conical flask & titrated with 0.1 N NaOH solution using phenolphthalein as an indicator. End point shows colorless to pale pink &was stand for 15 seconds.

$$Ttitrable\ Acidity\ (\%) = \frac{B.R \times normality \times volume\ made\ up \times equivalent\ wt.of\ NaOH}{wt.ofsample(g) \times sample\ taken(ml)} \times 100$$

11. Sensory Evaluation: Sensory evaluation of jelly was done by using a panel. The result was recorded by taking the reference of 9-point hedonic scale given by Gupta in 1976. The jelly prepared from guava blended with pomegranate was evaluated for color, appearance, texture, flavor and overall acceptability. The panel was selected randomly on the basis of gender and age and was briefly acquainted with the sensory characteristics that were to be judged. The average values of the ratings given by all the members were then calculated and used for further analysis. The sensory evaluation scale for rating the sensory quality of jelly prepared from guava blended with pomegranate was done based on four main parameters i.e. color, appearance, texture and flavor and these quality characteristics of samples were examined by using rating scales.

III. RESULTS AND DISCUSSION

The present research was conducted to study the development and quality evaluation of jelly prepared from guava blended with pomegranate. Various chemical parameters like moisture content, titrable acidity, pH, total soluble solids and ascorbic acid content were analysed.

Chemical Composition of Jelly: following table shows the chemical composition of jelly prepared from guava and pomegranate.

Table: Chemical Composition of Jelly

Samples	Moisture Content (%)	Titrable Acidity (%)	pH	T.S.S. (^{o}Brix)	Ascorbic Acid Content (mg/ 100 gm or ml)
T1	30	0.48	5.72	64	32.46
T2	35	0.52	5.70	64	31.08
T3	40	0.60	5.64	67	28.76
T4	50	0.72	5.53	68	27.37

Table showsthe chemical composition of jelly. From table, it can be seen that, moisture content, titrable acidity, pH, T.S.S. and Ascorbic acid content of jelly varied from 30 to 50%, 0.48 to 0.72 (g/l), 5.53 to 5.72, 64 to 68^{0}Brix and 27.37 to 32.46 (mg/100g) respectively.

The highest moisture content was found in the treatment T4 followed by T3, whereas lower moisture content was found in T1 and T2. Highest acidity was found in treatment T4 followed by T3, whereas lower acidity was found in T1 and T2. From table, it can also be seen that the highest pH was found in treatment T1 followed by T2, whereas lower pH was found in T3 and T4. Highest TSS was found in treatment T4 followed by T3, whereas lower TSS was found in T1 and T2. The highest ascorbic acid content was found in treatment T1 followed by T2, whereas lowest ascorbic acid content was found in T3 and T4.

Fig.4.1.(a)Treatment T1

Fig.4.1.(b)Treatment T2

Fig.4.1.(c)Treatment T3

Fig.4.1.(d)Treatment T4

Plate no.4.1 : Treatments of Jelly

Sensory Evaluation of Jelly

The data on sensory evaluation of jellies are presented in the table given below.

Table: Sensory Evaluation of Jelly

Parameter	Sensory Score			
	T1	T2	T3	T4
Colour	7	8	8	9
Appearance	8	8	7	8
Texture	8	7	8	8
Flavour	8	8	8	7
Overall Acceptability	7.5	7.8	7.6	8

For the treatment T1, the average mean score for colour, appearance, texture, flavour & overall acceptability was 7, 8, 8, 8 & 7.5 respectively whereas For the treatment T2, the average mean score for

colour, appearance, texture, flavour & overall acceptability was 8, 8, 7, 8 & 7.5 respectively.

Similarly for the treatment T3, the average mean score for colour, appearance, texture, flavour & overall acceptability was 8, 7, 8, 8 & 7.6 respectively whereas for the treatment T4, the average mean score for colour, appearance, texture, flavour & overall acceptability was 9, 8, 8, 7 & 8 respectively.

Plate: Sensory Evaluation

IV. CONCLUSION

Jelly from guava blended with pomegranate was successfully developed.The Sensory score of treatment T4 (60:40) for colour was higher and it was 9 and 8 and for appearance and texture respectively. The overall acceptibility of the treatment T4 was decided on the basis of highest score of 8.The highest score of 8 for the tatse was observed for the treatment T2. From present study it can be concluded that treatment T4 prepared with combination guava(60%) + pomegranate(40%) was found best.From chemical composition of fresh jellly it can be concluded that the values of moisture content, Titrable acidity , pH , TSS ,and Ascorbic acid content of fresh jelly for treatment T4 were 50%, 0.72%, 5.53, 68, 27.37 mg respectively which was much more than the other treatments.

REFERENCES

[1] Anonymous.2012. Area under different fruits, Horticulture development in Himachal Pradesh at a glance. (www.hpagrisnet.gov.in).

[2] Anonymous.2013. Horticulture Database for the year 2012-2013. National Hort. Board.

[3] Bose, T. K. 2011. Fruits of India, Tropical and Subtropical. 1stedn, Naya Proksash, Calcata – 6 India. P. 278.

[4] Codex Alimentarious commission (296 - 2009).

[5] Desrosier, N. W. 1963. The technology of Food Preservation the AVI publishing company 2nd Ed. Westport, U.S.A 2(5): 40-279.

[6] Donchonko,L.V. ; N. S. Karpovich ; I.I. Uvarova and O.P. Mironova. 1988. Effect of acidity of strength of Jam / Jelly. PzvestiyavysshikhunhebnykhZavedenil, PishchevayaTekhnologiya. USSR, 1:108.

[7] Ed Stover and Mercure E W. 2007. The Pomegranate-a new look at the fruit of paradise. Hort Sci., 42(5): 1088-1097.

[8] Hess-Pierce B and KadesAA. 2003. Response of 'Wonderful' pomegranate to controlled atmosphere. Acta Hort. Proc. of 8th International conference.

[9] Kaulgud S N. 2002. Pomegranate aril blackening: fungal or physiologicaldisorder. In: Advances in arid and semi-arid fruit crops. Centre for AdvancedStudies in Hort. (fruits). MPKV Rahuri. pp. 145-147.

[10] Kaulgud S N. 2002. Pomegranate.In:Chadha, K.L. (ed.) Handbook ofHorticulture-I pp.297-304.

[11] Lashely, D. 1984. Advances in post-harvest technology and new technologies in food. Proc. Seminar. St. Augistine (Trinidad Tbago) pp. 173-183.

[12] Mitra S. K., Gurung M. R. & Pathak P. K. 2008. Guava Production and Improvement in India: An Overview. Aqua Hortic. 787, 59-66.

[13] Mitra, R.J. and T.K. Bose. 1990. Guava. In: Fruits: Tropical and subtropical. T.K.Bose and S. K. Mitra. Eds. Nayaprokash. Calcatta-6 India. pp. 280-303.

[14] Mitra, S. K., S.C. Maiti, S.K. Sen & T.K. Bose. 1983. Physico-chemical characters of some guava varieties of West Bengal. . South India Hort., 31:62-65.

[15] Morton J. 1987. In: Fruits of warm climates. pp352-355.

[16] Parashkova, L. P. 1982. Use of low methylatedpectine for the manufacture of jelly like fruit preserves. Konservanaya I

ovoshchosuchilInaya Promyshle most. USSR, 2:16-17.

[17] Patil P., Sayed H.M., Joshi A.A., Jadhav B.A., Comparative Evaluation of physic chemical properties of two different varieties of pomegranate, African Journal of Food Science (2013).

[18] Ranganna S.,Handbook of analysis & quality control for fruits & vegetable products.

[19] R. Srivastva and S. Kumar, Fruits and Vegetables preservation-principle and practices, 3rd edition, International book distribution co. Army printing press, Lucknow, India 2007.