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Development, physico: Chemical analysis and sensory evaluation of pomegranate: Watermelon mixed squash as a natural health drink

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Abstract
This study has been undertaken to innovate a new squash from Pomegranate & Watermelon as a new drink which might be delicious, nutritious and that could be relished by people of all age groups. These two fruits were chosen because both these fruits have rich antioxidant properties, contain a large amount of Vitamin C, Potassium, Iron, Phosphorus and other nutrients. For this, three samples of Pomegranate – Watermelon mixed squash were prepared using three different amount variations - in the ratio of 2:2, 3:1 and 1:3. Sensory evaluation of the three samples has been done by a panel of 51 members using "Composite Scoring Test Card" to select the best one amongst the three samples. Statistically, the Code-II (in the ratio 3:1) was found most acceptable among the three squashes. A nutritional analysis of Code-II squash was analyzed. Energy and vitamin C content were found to be 226.25 Kcal/100 gm and 135.40mg/100gm respectively. Acidity in citric acid was 1%, pH-4, T.S.S.-42^{0}brix, % tannin -0.18, reducing sugar – 37.40, non - reducing sugar & total sugar – 41.11. It would be viable to bring it into the market which would prove to be a nutritious squash available in all seasons throughout the year.

Keywords: pomegranate; watermelon; squash; sensory evaluation; physico-chemical analysis

1. Introduction
Agro-based industries and their base products have acquired today an important place on the government's priority list and they are being considered as a very dependable segment of our national economy. Ministry of Food & Agriculture of Govt. of India has streamlined its plan-programs to make it more & more flourishing and grow rapidly for the fast growth of the economy in mind. Of them, the fruit and vegetable processing industry has been given special attention for strengthening it and to compete with other industries and achieve a prominent place amongst other heavy & small industries in the country. Some of the fruits and vegetables, which are very nutritious but they are not always available in all seasons in its original form. So in that case, if such fruits are transformed into some other delicious forms like squashes, jams, jellies, pickles etc. then it would be viable to make it available for consumption as a choice-substitute throughout the year (Pota SO, *et al* 1987) [19]. With the rapid growth of the Food Technology and Food Processing industry in the country, new products are being developed and brought in the market today. Fruits and vegetable processing projects have been put on a prominent agenda and geared up to produce more and more indigenous food products like squashes, jams, pickles, and sauces etc. so that imports of such products can be minimized and our native industries can grow rapidly and come in international markets as a viable exporter in the coming years (Germain, K. *et al*. 2003) [17].
The main objective of the fruit and vegetable processing is to supply wholesome, safe, nutritious and acceptable food to the consumers throughout the year. Especially, seasonal fruits like pomegranates, watermelons, oranges, amlas, guavas, carrots, etc. are such items which are marketed and consumed during its season period only & after or before that they are totally forgotten, although they are found in abundance in the season but beyond that neither they are stocked as fresh fruits nor as preserved food products throughout the year. However, if these food items are transformed into similar food products like other fruits and vegetables, then all these found in abundance can be stored (as preserved food items), consumed and marketed throughout the year (Akhtar S. *et al*. 2013) [1].
In India, about 20 million tonnes of foods are produced annually. But hardly 1.2% of this is utilized for processing and preservation and about 30-33% of the total production is wasted due to spoilage during handling, transportation and lack of cold storage facility (Baisya, 1980) [4]. In order to minimize post-harvest losses and to avoid market glut, fruits are needed to be effectively utilized in the processing industry (Sahota and Sunil, 2006). Fruit squash consists essentially of strained juice containing moderate quantities of fruit pulp to which sugar is added for sweetening, e.g., orange squash, lemon squash, mango squash, etc. Fresh squashes are becoming popular compared with synthetic beverages because of refreshing quality, taste, flavor, nutritive value and storage stability of fresh squashes (Jothi *et al*., 2014) [12]. Squash is quite popular all over the world as nutritious soft drinks (Babasaheb, 2000). Squash, a ready to drink beverage, is non-alcoholic concentrated syrup that is usually made from fruit juice, water and sugar or sugar substitutes (Joseph and Shukla, 2015) [11].
Pomegranate and Watermelon are two such fruits that have been selected to make a squash after blending the juices of both fruits into a tasty and healthy health drink. According to Fruits Product Order, Government of India (1955) fruits Squashes should contain not less than 25 percent fruit juice and 45 % sugar. The squash contains added citric acid, sucrose and preservatives (Sodium Benzoate ($NaC_6H_5CO_2$) or Potassium metabisulphite ($K_2O_5S_2$). Sodium or Potassium Meta bi-sulfites are used in the preservation of fruit

Products. Sulfurous acid inhibits the growth of yeasts, molds and bacteria at 220ppm of sulfites. Sulfites are not used with anthocyanin pigment as they de-colorize it. Hence in carrot or pomegranate juices only sodium benzoate is used as a preservative instead of Potassium Meta bi-sulfite. Sodium benzoate is used in preference to benzoic acid because of its solubility in water. At ph 2.3-2.4 only 0.02-0.03 % of sodium benzoate is required to prevent the growth of common fermentation organisms and at ph 3.5 to 4.0 which is the range of most fruit juices 0.06 to 0.1 %, sodium benzoate is required. Sodium benzoate is used in sauces, squashes, jams, jellies, ketchups, pickles and fruit juices. The levels of benzoic acid permitted to be incorporated in fruit products according to the Prevention of Food Adulteration Act range from 120-750 ppm depending on the product (Srilakshmi, B. 2004) [22]. Watermelon is a tender, warm-season fruit. It is perhaps the most refreshing, thirst-quenching fruit of all. Watermelon consists of 92% water and 8% sugar, so it is aptly named. The natural sweetness of watermelon makes it a favorite at any time of the year (Edwards, A.J. *et al*. 2003) [5]. Watermelon is an excellent source of vitamin C. It is also a very good source of vitamin A and vitamin B6. In addition, watermelon is a good source of thiamin, potassium and magnesium, lycopene and beta-carotene (Manay, 2003) [15]. The pomegranate has been regarded as a food medicine of great importance. All parts of the tree, the roots, the reddish-brown bark, leaves, flowers, rind and seeds, have featured in medicine for thousands of years. A delicious juice is prepared from the fruits. Its quality depends to a great extent on its acid and sugar contents and it is also a treasure of many vitamins and minerals. The juice is largely used in the country as a cool drink (John *et al*., 1985) [10]. Both watermelon and pomegranate are a goldmine of nutrients. Pomegranate contains 60Kcal of energy, 70mg of phosphorus, and 14.5 gm of carbohydrate. Besides that, it also contains many vitamins and minerals it is a good quantity. On the other hand, watermelon is very rich in water content as high as 95%. It contains 16kcal of energy and other key nutrients like protein, vitamin-A, vitamin-C, calcium, iron or dietary fiber (Gopalan, C. 1991) [8]. Both fruits contain very less amounts of fat as such its juices are regarded as a cholesterol-lowering health drink. The benefits of the two fruits are many and those can be formulated in many ways. Watermelon benefits our healthy life as it reduces the risk of prostate cancer. It controls blood pressure and regulate heartbeats, it helps in improving eye-sights. It also contains disease-fighting antioxidants that reduce the risk of kidney stones and acne. It improves eye health (El-Adawy, T.A. 2001) [6]. Similarly, Pomegranate benefits our body in many ways for its high nutrient value. Its juices boost immunity in our body system, especially to elderly and sick people. It helps in making an ample amount of hemoglobin and RBC in our body. It contains phytochemicals that strongly fight against anemia, reduce the risk of many diseases including detoxification enzymes, stimulation of the immune system, antibacterial and antiviral effect regulating a balanced blood circulatory system in our body (Matill HA, 1947) [16]. It also helps in fighting against infections and also help in maintaining our muscles and skins in our body. It is also an appetizer and it is useful for patients suffering from colitis (Noda, Y.*et al*.2002) [17].

2. Materials and Methods

The study was conducted in the laboratory of the Regional Food Research Analysis center, LUCKNOW. The process of the development of squash of Pomegranate and watermelon has been prepared in three phases.

Phase I: Development of the new food product.

Phase II: Sensory evaluation to judge the best acceptability.

Phase III: Nutritional analysis of the highly acceptable sample.

2.1 Materials

Fresh, juicy, thick, pink and fleshy pomegranates and ripe (red) watermelons of good variety were selected. Sugar, Citric acid (Class-I preservative) and Sodium benzoate (Class-II preservative) were used for the preparation of syrup. Chemicals and materials were bought from regular suppliers and are of analytical grade. **A**mmonium sulfate, concentrate H_2SO_4, 30%NaOH, ammonia, 2% boric acid solution, standard hydrochloric acid, anhydrous ether, Fehling's solution, phenolphthalein, 3 % metaphosphoric acid (HPO_3), Sodium salt of 2,6 – dichlorophenol indophenol, Sodium bicarbonate, distilled water, Sulphur dioxide, indophenol dye, 40 % formaldehyde,

2.2 Phase I -Development of a mixed squash of Pomegranate and watermelon

Fresh as well as juicy Pomegranates and Watermelons were selected. Watermelons and Pomegranates were cleaned and washed thoroughly and both fruits were weighed. After cutting and cleaning, both fruits were separately put into a processor and their juices were extracted one after the other and stored in two separate containers. Fresh juices of both the fruits were then blended to prepare mixed squash of pomegranate and watermelon using three different amount variations (2:2, 3:1 &1:3) different varieties of mixed squash of both fruits.

2.2.1 Preparation of sugar syrup

After three samples were made ready, now the sugar syrup was prepared to mix with the three samples. For that 500 gm of sugar was mixed with 250 ml water and the mixture was put into a kettle and kept on the gas stove to heat. After about 15 minutes the mixture came to boiling and turned into a thick syrup. 2 mg of citric acid was then added to it and stirred for 2-3 minutes. The syrup was brought down from the stove to let it cool down. Then the syrup was filtered through a muslin cloth into a separate container. (Porter, N. 1987).

The extracted juice was strained properly to remove the seeds. Sugar and citric acid were mixed with water and heated to prepare syrup. The syrup was cooled and then filtered through a muslin cloth (Porter, N. 1987). Measured juice was mixed with the cooled syrup. Then sodium benzoate @ of 2 g/ lL was also added (Srilakshmi, B. 2004) [22]. It was mixed thoroughly and finally, squash was prepared.

Prepared squash was filled in three sterilized HDPE (High-Density Polyethylene) bottles of 750 mL capacity separately by leaving 2cm headspace and capped finally. Bottled squash was stored at ambient temperature for further study and biochemical constituents were analyzed.

Phase-I Flow chart for preparation of Pomegranate – Watermelon mixed squash

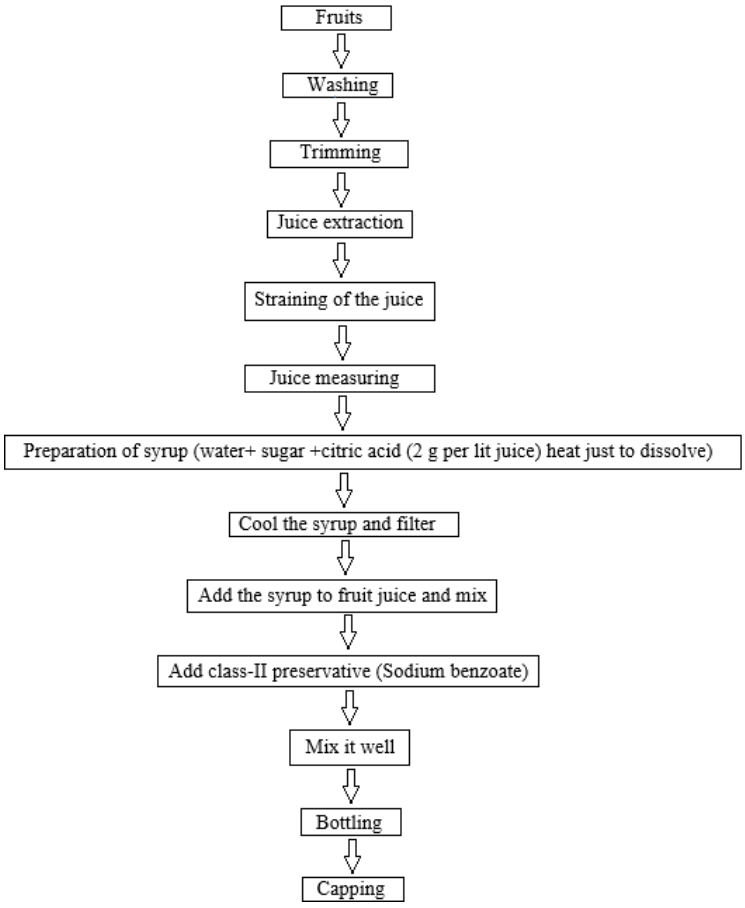

Fig 1: Flow chart of development of the new food product

2.3 Phase II Sensory evaluation of the squash

Sensory evaluation offers the opportunity to obtain a complete analysis of the various properties of squash as perceived by human sense. The organoleptic evaluation for assessing the sensory attributes like- colour, taste, flavour, consistency and overall of squash was conducted by a panel of 51 members (5 trained,18 semi-trained, 28 untrained members) using Composite scoring test. Samples were selected on random basis. The three bottles of squashes were coded in Roman Nos.-I, II and III. Out of the total 51-panel members, 5 were trained, 18 were semi-trained & 28 were untrained members. Panel members were requested to taste and critically examine the three samples separately and give their critical comments separately in the composite test proforma (a scorecard).

Phase II - Sensory evaluation of the squash

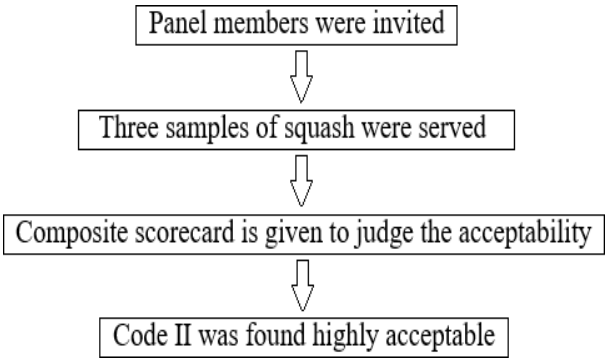

Fig 2: Flow chart of sensory evaluation to judge the best acceptability

2.4 Phase III –Analysis of the highly accepted squash

After sensory evaluation of all the three samples of squashes, the highly acceptable among them was assessed by statistical analysis using an F-test on the basis of the two-way ANOVA method to prove the hypothesis. The physicochemical parameters of the highly acceptable squash were analyzed. Total soluble solids (T.S.S.) were determined by hand refractometer (ERMA made) and

reading was corrected at 20°C (Ranganna, 2010) [20]. Total titratable acidity content was analyzed, while ascorbic acid content in the squash was determined according to the method of 2,6–Di Chlorophenol – Indophenol visual titration method, (AOAC, 2012) [2] and the determination procedure was described by (Ranganna, 2010) [20]. The Fehling's 'A' and 'B' solutions (Lane and Eynon, 1923) were used to estimate the sugars content adopting the procedure as suggested by (Ranganna, 2010) [20].

Phase III –Analysis of the highly accepted squash

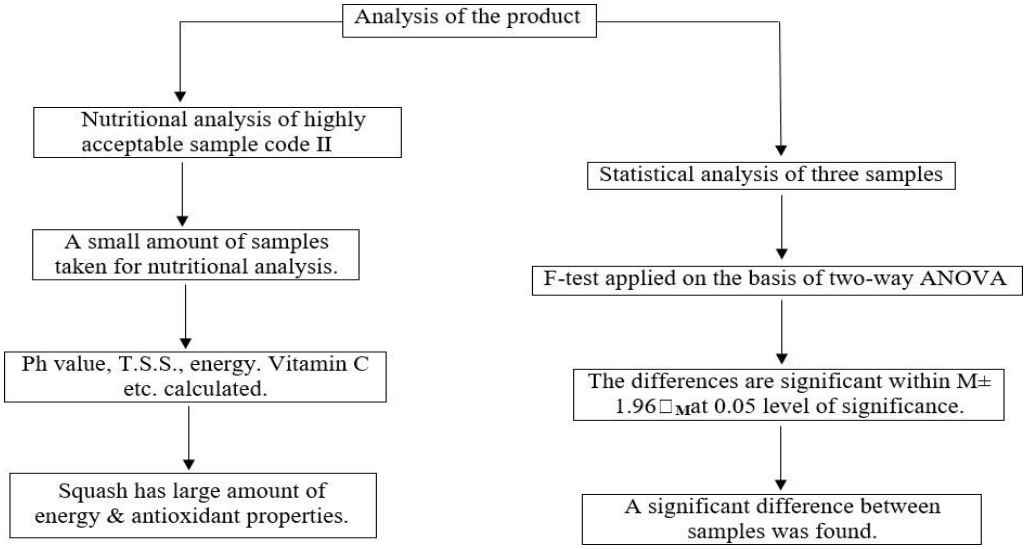

Fig 3: Flow chart of the analysis of the squash

2.5 Statistical analysis

Statistical analysis of the difference in mean values between the three samples was done using analysis of variance. The experimental data were subjected to analysis of variance for a completely random design using a statistical analysis system. Range tests were used to determine the difference among means at the level of 0.05. Data were analyzed by a two-way ANOVA method. After tabulation, collected data was analyzed in terms of percentage to determine the grades given to the characteristics of the coded sample. The calculated value of F-ratio was compared with the tabulated value.

3. Results and discussion

3.1. Sensory evaluation response of the product

Sensory evaluation of the three samples of squash by a panel of 51 members were done using the *Composite test scorecard.* The subject's response of all the three samples, coded as code I, II and III on different characteristics, i.e., Colour, Taste and Flavour were assessed (Table 1). All attributes like consistency and Overall likings were presented in Table 1.

Table 1: Mean Sensory evaluation score* of the different attributes of all three squashes:

Code	N = 51	Colour	Taste	Flavour	Consistency	Overall
I		13.49	13.52	13.45	13.49	13.56
II		17.52	17.66	17.27	17.49	17.45
III		11.09	11.23	11.01	11.03	11.15

*All scores are average of 51

Sensory scores for different attributes of 'Pomegranate-Watermelon mixed squash' was depicted in table no.1. Code I sample had the colour scores between moderately acceptable to the highly acceptable range (13.49). Colour score was highest in code – II as the colour of Pomegranate dominated in it, while colour of code I and III was lightest. They were in moderately acceptable range but code – II was best. With highly acceptable scores for colour (17.52) code – II (Pomegranate & Watermelon juice in the ratio of 3**:**1) differed significantly (P>0.05) from that of code – III which had the low score of 11.09. The low taste scores of code – III differed significantly from that of code – I (P>0.05) and code – II (P>0.05). As such the code – III had Pomegranate juice in less and Watermelon juice in more amount which contains moisture of about 98 %, the taste of syrup dominates in the squash lowering the taste scores of code – III. Mean taste scores of the squash ranged between moderately acceptable to highly acceptable. Flavour scores of code I, II and III were in moderately acceptable to highly acceptable range differed significantly from code – II at 5%. The overall acceptability scores for all squash were in acceptable range with code–II being highly acceptable due to bright colour and sweet taste.

In the study conducted, three samples were prepared on the basis of amount variations.

The variations of the three samples are demonstrated in the graph given below:

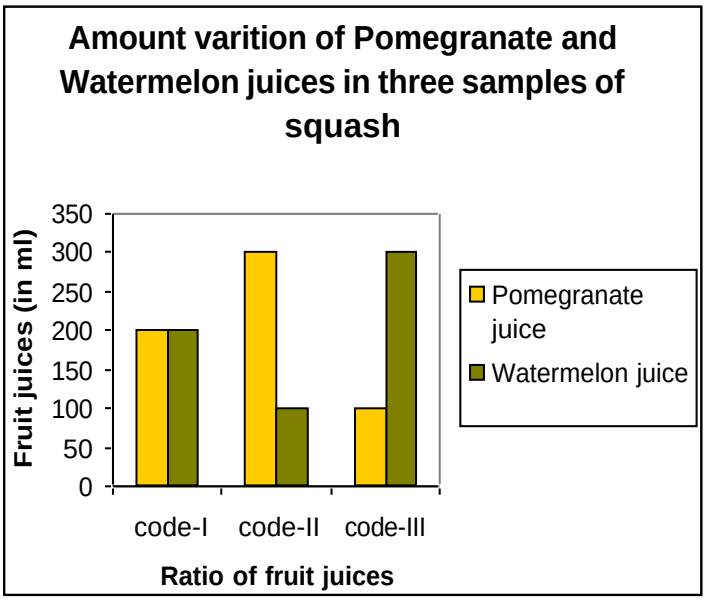

Fig 4: Distribution of both fruit juices in all samples

The F-ratio, degree of freedom and standard error of mean were calculated. Significant differences were tested using F-test and calculated critical differences (CD) values were Obtained from two-way ANOVA. Weighed scores were worked out for rating the mixed squash given by subjects (Gupta, S.P, 2003) [9].

Table 2: Analysis of variance table for two - way ANOVA

Source of variation	SS	d.f.	MS	F- ratio	5%F-limit	(SE_M)	Significance
Between columns (i.e, between varieties of attributes)	215.3	5-1=4	215.3/4 =53.8	53.8/11.98 =4.49	F(4,8)=3.83	±0.95	**
Between rows	408.14	3-1=2	408.14/2 =204.07	204.07/11.98=17.3	F(2,8)=4.45	±0.95	**
Residual or error	95.9	4×2=8	95.9/8 =11.98				

**= Significant within the confidence interval of M± 1.96 □M at 5% (P>0.05 %) level of significance.
*= Non-significant within the confidence interval of M± 1.96 □M at 5% (P>0.05 %) level of significance.
(SE_M) = | |M= Standard error of mean =± 1.96 ×0.50 or ± 0.95 of squash mean.

ANOVA table set up for the given data as shown in Table no.2. From the said ANOVA table, that differences concerning varieties of squash were significant within the confidence interval of M± 1.96 □M at (P>0.05 %) 5% level of significance. As the calculated value of F-ratio of 4.49 and 17.3 for the degree of freedom 4, 8 and 2, 8 is greater than the table value of 3.83 and 4.45 respectively. In this research work "Alternate hypothesis" was accepted and the "Null Hypothesis" was rejected. This means that there is a significant difference between the three samples. It was concluded that the mean of the three samples of squash differed significantly.

The acceptability of three different varieties of squashes in relative terms of color was shown in Fig.5. Code II having Pomegranate and Watermelon juice in the ratio of 3:1 was rated highly acceptable with 88.3% in terms of colour. Code I having Pomegranate and Watermelon juice in the ratio of 2:2 was rated slightly less acceptable in comparison to code II with 68.2%. Code III having Pomegranate and Watermelon juice in the ratio of 1:3 was lowest in the rating with 56.2%. This clearly indicates that the colour of the squash of code II was predominant.

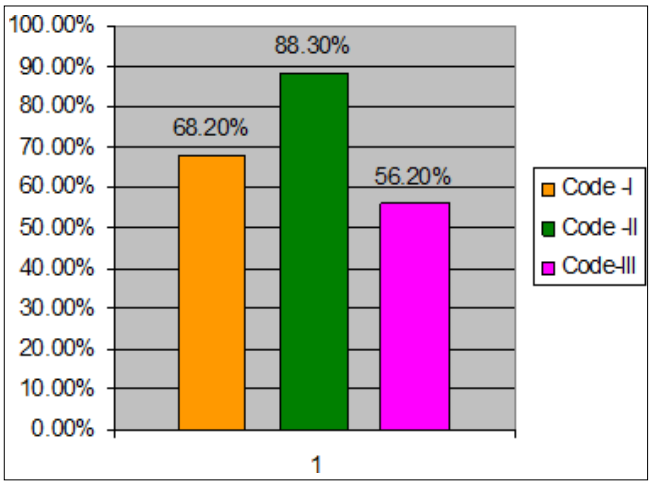

Fig 5: Acceptability of squash Colour wise in %

Fig.6 describes the acceptability of three different varieties of squashes in terms of taste. Code II having Pomegranate and Watermelon juice in the ratio of 3:1, it was rated highly acceptable with 88.6% in terms of colour.

Code I having Pomegranate and Watermelon juice in the ratio of 2:2 & was rated slightly less acceptable in comparison to code II with 68.3%. Code III having Pomegranate and Watermelon juice in the ratio of 1:3, it was lowest in the rating with 56.0%. This shows that the taste of the squash of code II was highly acceptable.

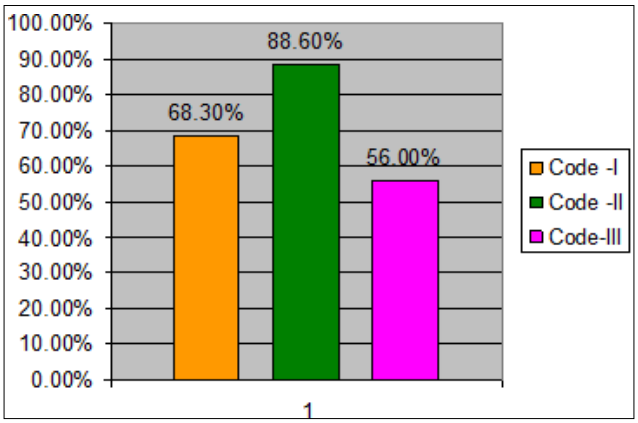

Fig 6: Acceptability of squash taste-wise in %

The acceptability of all squashes in terms of flavour was presented in Fig.7. Code II having Pomegranate and Watermelon juice in the ratio of 3:1 was rated highly acceptable with 87.6% in terms of colour. Code I having Pomegranate and Watermelon juice in the ratio of 2:2 was rated slightly less acceptable in comparison to code II with 68.1%. Code III having Pomegranate and Watermelon juice in the ratio of 1:3 was lowest in the rating with 56.5%.

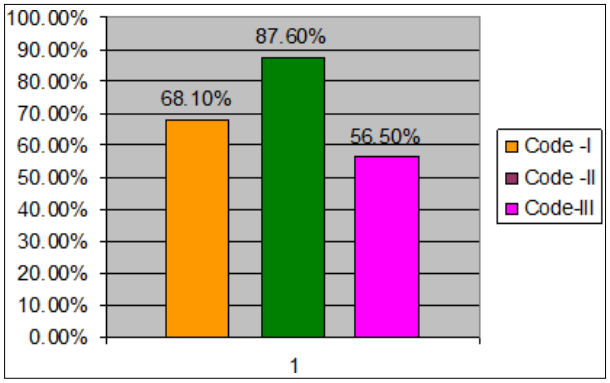

Fig 7: Acceptability of squash flavour wise in %

Fig. 8 illustrates the acceptability of all three variants of squashes in terms of consistency. Code II having Pomegranate and Watermelon juice in the ratio of 3:1 was rated highly acceptable with 88.2% in terms of colour. Code I having Pomegranate and Watermelon juice in the ratio of 2:2 was rated slightly less acceptable in comparison to code II with 68.2%. Code III having Pomegranate and Watermelon juice in the ratio of 1:3 was lowest in the rating with 56.0%.

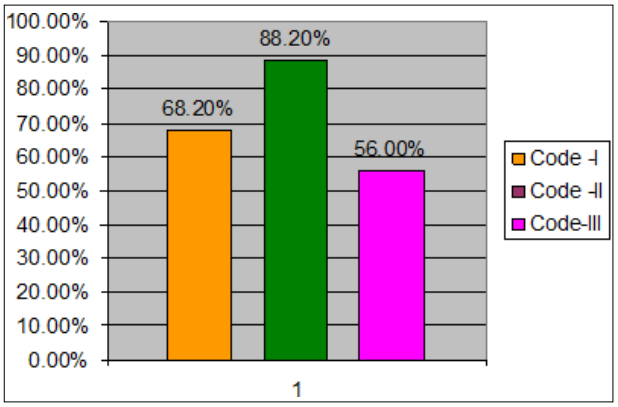

Fig 8: Acceptability of squash in consistency wise %

The acceptability of three different varieties of squashes in relative terms of overall was depicted in Fig.9. Code II having Pomegranate and Watermelon juice in the ratio of 3:1 was rated highly acceptable with 88.1% in terms of colour. Code I having Pomegranate and Watermelon juice in the ratio of 2:2 was rated slightly less acceptable in comparison to code II with 68.4%. Code III having Pomegranate and Watermelon juice in the ratio of 1:3 was lowest in the rating with 56.3%. This clearly indicates that overall, the squash of code II was liked by everyone.

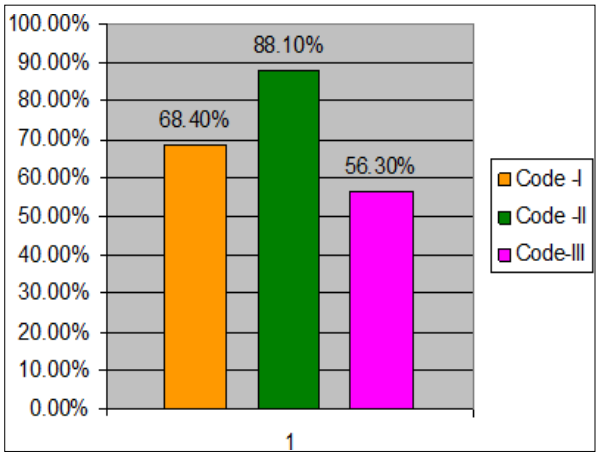

Fig 9: Acceptability of squash in overall %

3.3. Nutritional analysis of highly accepted product

On the basis of the results revealed in the study, it was concluded that Code-II was highly acceptable among all the squashes. After sensory evaluation, nutritional analysis of the highly acceptable squash (code – II) was done. Nutritional analysis was done in the Regional Food Research Analysis Center, Lucknow. The analysis of Energy and Vitamin C were on top priority as the squash was rich in energy and anti-oxidant properties. The results of the analysis of Pomegranate-Watermelon mixed squash are shown in Table 3.

Table 3: Nutrient composition of Pomegranate- Watermelon mixed squash

Parameters	Results
ph value	4
TSS	42^0brix
Acidity in % age in citric acid	1
Ascorbic acid	135.40(mg/100 gm)
% tannin	0.18

Reducing sugar	37.40(mg/100 gm)
Non reducing sugar	3.71(mg/100 gm)
Total sugar	41.11(mg/100 gm)
Energy	226.25kcal/100gm

Ascorbic acid content & energy was analyzed with the help of the colorimetric method and IS test method respectively. Similarly, other parameters of the squash were also analyzed. % tannin was 0.18, acidity in citric acid was 1%, reducing sugar – 37.40, non - reducing sugar & total sugar – 41.11. Reducing sugar, non - reducing sugar & total sugar were analyzed with the help of the Lane – Eynon method.

The pH value of the squash was determined with the help of a pH meter. The pH of the squash was found to be 4. Since the value of pH was less than 7, it was acidic in nature. The T.S.S. (Total soluble solid) of squash was found to be 42ºbrix. The significant difference was observed in TSS in squash of wood apple Kumar A *et al*., (2018) [13].

Ascorbic acid content was found to be 135.40 mg/100 gm and energy content of about 226.25kcal/100gm. The major difference was observed in ascorbic acid content, reducing sugar and non-reducing sugar in pomegranate-watermelon mixed squash in comparison to the squash from wood apple Kumar A *et al*., (2018) [13]. The results of the present study are in close conformity to the findings of Kumar A *et al*., (2018) [13] in the context of *Titratable Acidity* and *Total Sugar*.

4. Conclusion

In this study, a new innovative form of a mixed squash of Pomegranate and Watermelon was developed. In the preparation of the squash, both class I and class II preservatives i.e. citric acid and Sodium benzoate were added to the squash to preserve it throughout the year and to enhance its shelf life. Sodium benzoate was used in this squash (as pomegranate contains anthocyanin pigment) which prevented it from de-colorization providing a good, attractive and appealing colour to the squash. The findings on different parameters like colour, taste, flavour, consistency and overall acceptability were recorded by *Composite test score ratings*, and after sensory evaluation, statistical analysis was carried out to find out the hypotheses. In statistical analysis, a two-way ANOVA method was used. According to two-way ANOVA calculations, there was a significant difference among the samples. Statistical analysis showed that sample code no. II (amount variations in the ratio of 3:1, i.e.300 ml of Pomegranate juice, 100 ml of Watermelon juice) was highly acceptable among the three samples of squashes on all parameters. The nutritional analysis of Code II was determined. Nutritional analysis of the squash such as Vitamin C, energy, T.S.S., ph value, reducing sugar, acidity in %age in citric acid, % tannin, etc. of the product was analyzed. The most admirable point of this idea was the combination of the two fruits which are not available throughout the year.

5. Acknowledgments

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6. References

1. Akhtar S, Ali J, Javed B, Khan FA. Studies on the preparation and storage stability of pomegranate juice based drink. Middle- East Journal of Scientific Research. 2013; 16(2):191-195.
2. AOAC. Official methods of analysis. Association of official Agricultural chemists, Washington, D.C. 11th Edition, 2012.
3. Baba Saheb BD. Hand book of nutrition and diet. Taylor and Francis Inc, New York, United States, 2000, 231233.
4. Baisya RK. Fruits and vegetable processing Industries in Rural India- Its problem and prospects. Indian Food Packer. 1980; 34(6):29-32.
5. Edwards AJ, Vinyard BT, Wiley ER. Consumption of Watermelon juice increases plasma concentration of Lycopene & beta-carotene in humans. J. Nutr. 2003; 133(1):1043-50. Accessed on http://en. Wikepedia.org. wiki/ watermelon Health benefits on 12 Nov. 2007.
6. El-Adawy TA, Taha KM. Characteristics and Composition of Watermelon, pumpkin, and Paprika seed oils and flours. J. Agric. Food Chem. 2001; 49(3):1253-1259. Accessed on http:// en. Wikepedia. org. wiki? Watermelon as food and drink on 23 Aug, 2007.
7. Muhammad N, Uddin N, Liu M, Ali N. Ethno medicine, antioxidant potential and inter-specific variations of Punica L. species growing in Swat District, KP, Pakistan. Int J Botany Stud. 2019;4(4):36-46.
8. Gopalan C, Rama BV Sastri, Balasu bramanian BC. Nutritive value of Indian foods, National Institute of Nutrition, ICMR, Hyderabad, 1991.
9. Gupta SP. Statistical methods, 20th Edn. Sultan Chand and sons publication, New Delhi, 2003.
10. John Leslie, Violet Stevenson. Fruit for the Home & Garden. Angus & Robertson, 1985, 215-218. Accessed on http://en. Wikipedia. Org. wiki/Pomegranate Foliage and fruit on 23 Nov, 2007.
11. Joseph J, Shukla S. Preparation and Quality evaluation of mixed fruit squash. International Journal of Advance Industrial Engineering, 2015; 393:1-5
12. Jothi JS Karmoker, Pand Sarower K. Quality assessment of mixed fruit squash. Physico chemical analysis, sensory evaluation and storage studies. Journal of Bangladesh Agricultural University. 2014; 12(1):195-201
13. Kumar A. Studies on preparation and preservation of squash from wood apple (Limonia acidissima L.) fruits Int. J. Chemical Studies. 2017; 6(1):1513-1516.
14. Lane JH, Eynon L. Determination of reducing sugars by Fehling Solution with Methylene blue as an indicator. Journal of the Society of Chemical Industry London, 1923; 42:37-7.
15. Manay N Shakuntala, Shadaksharaswamy M. Foods {Facts & principles}, IInd EDITION, New Age International (P) Ltd. New Delhi, 2003.

16. Matill HA. Antioxidants. Annu Rev Biochem, 1947; 16:177-192.
17. Noda Y. "Antioxidant activities of Pomegranate fruit extract & its Anthocynidines, Delphinidin, cyanidin, & pelargonidin," Journal of Agric. Food Chem. 2002; 50(1):166-71. accessed on http://en. Wikipedia. Org. wiki/Pomegranate ≠Phytochemicals on 23 Sep.2007.
18. Porter NN. Food Science, CBS Publishers and Distributors, New Delhi, 1987.
19. Pota SO, Ketsa S, Thongtham MLC. Effect of packaging material and temperature on quality and storage life of pomegranate fruits. Kestsari Journal, Natural Science. 1987; 23(4):328-333.
20. Ranganna S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products, (Tata McGraw: Hill Education Pvt. Ltd.), New Delhi, 2010.
21. Sahota P, Sunil P. Preparation of non alchoholic naturally carbonated plum Beverage after optimizing the fermentation conditions. Beverage and Food World. 2006; 339(2):54-58.
22. Srilakshmi B. Food Science 3rd Edition, New Age International (P) Ltd. New Delhi, 2004.
23. Germain K, Benoi BK, Israel ML. Effect of ripening on the composition and the suitability for jam processing of different varieties of mango (Mangifera indica) Afr. J. Biotech, 2003; 2:301-306.