International Journal of Advanced Research and Review

www.ijarr.in

QUALITY EVALUATION AND NUTRITIVE VALUE OF THE DIFFERENT MANGO JUICES AVAILABLE IN THE MARKET

Syed Asim Shah Bacha[*1], Sumayya Rani[2], Syed Masood Shah[3], Muhammad Junaid[4], Shujaat Ali[1] and Ashfaq Ahmed[1], Abdul Jalal

[1]Department of Horticulture, Faculty of Crop Production Sciences, The University of Agriculture Peshawar, Pakistan. **Email:** Syedasimhorticulture@gmail.com
[2]Department of Food Science and Technology, Faculty of Agricultural Sciences, The University of Swabi, Pakistan.
[3]Department of Food Science and Technology, Faculty of Nutrition Sciences, The University of Agriculture Peshawar, Pakistan.
[4]Institute of Biotechnology and Genetic Engineering, The University of Agriculture Peshawar, Pakistan.
Corresponding Author: Syed Asim Shah Bacha[*], Department of Horticulture, Faculty of Crop Production Sciences, The University of Agriculture Peshawar, Pakistan. **Email:** Syedasimhorticulture@gmail.com

ABSTRACT

This study was carried out on tetra pack mango juices to analyze for selected physicochemical analysis that included pH, acidity, ^{0}brix and total sugar. These samples were also analyzed for sensory evaluation i.e. color, taste, appearance and smell. This research was carried out in the Department of Food Science and Technology, Agriculture Research Institute (ARI), Swat. Different brands of mango juice were purchased from local market of Swat that included Pepsico, Enjoy, Tops, Nestle, Kool and Tropico. These brands were analyzed and the results were recorded. The physicochemical analysis of these samples were as; Brad A (Pepsico) pH 3.73, acidity 0.27 %, 0brix 12.9, and total sugar 10.4%. Brand B (Enjoy) pH 4.20, acidity 0.13%, 0brix 9.8 and total sugar 2.17%. Brand C (Tops) pH 4.03, acidity 0.19%, 0brix 5.1 and total sugar 2.73%. Brand D (Nestle) pH 3.97, acidity 0.23%, 0brix 5.1 and total sugar 7.8%. Brand E (Kool), pH 4.02, acidity 0.17%, 0brix 10.3 and total sugar 7.41%. Brand F (Tropico) pH 4.05, acidity 0.18%, 0brix 6.5 and total sugar 5.37%. Brand (A) got highest scores in sensory as well as in physicochemical analysis, comparatively, it is considered as the best mango juice i the local market, while brand C and F were below the stadard limits of Pakistan Pure Food Laws.

KEY WORDS: Mango Juice, Nestle, Pepsico, Sensory evaluation and Food

INTRODUCTION

Fruit juices are becoming an important part of the modern diet in many communities. They are nutritious beverages and can play a significant part in a healthy diet because they offer good taste and a variety of nutrients found naturally in fruits. Juices are available in their natural concentrations or in processed forms. Juice is prepared by mechanically squeezing fresh fruits or is extracted by water. Juices are fat-free, nutrient-dense beverages rich in vitamins, minerals and naturally occurring phytonutrients that contribute to good health. For example, mango juice is

rich in vitamin C, an excellent source of bio-available antioxidant phytochemicals (Franke *et al*., 2005) and significantly improves blood lipid profiles in people affected by hyper-cholesterolemia (Kurowska *et al.,* 2000). Fruit juices promote detoxification in the human body (Deanna and Jeffrey, 2007).

Mango is mostly consumed as fresh fruit, but due to its perishable nature, it cannot be stored for long time. In order to make the mango fruit available during off season, it is processed to make juices, jams, squashes, nectars, chutney, pickles, toffees and canned mango slices etc. Mango is one of the cherished fruit not only for taste but also for nutritional values. In India, mangoes are used as a blood builder, because of their high iron contents. They are suggested for treatment of anemia and beneficial to women during pregnancy and menstruation. People who suffer from muscle cramps, stress and heart problems can benefit from high potassium and magnesium contents that also help those with acidosis. Mango fruit is also beneficial in the treatment of nephritis as well as other kidney troubles (Islam 1986). It serves as good source of energy, vitamins A, vitamin C, iron and phosphorus etc. (Malik, 1994).

A large number of new brands of fruit juice based beverages have appeared in the market in glass and plastic containers and brick pack. Although, food laws exist for the production of quality food products (Awan, 1985), yet most manufacturers do not strictly comply with these laws. Food adulteration can prove very dangerous for the development of a healthy society. It can lead to a number of diseases such as paralysis, cancer, mental retardation and hypertension etc. Therefore it is essential to take necessary steps to check food adulteration etc.

The volatile components of fruit juices play a very important role in influencing the sensory quality of juices, particularly following heat processing and storage. Among fruit products, mango juice has been extensively investigated (Hunter *et al.,* 1974).

Among the lesser known mango juice benefits is the fact that, the fruit has anticancer properties. The fruit has phytochemical content, which is said to have chemopreventive properties. It thereby helps reduce the development of cancer cells within the body. Mangoes are also highly regarded for their high iron content and are regularly used in a number of home remedy for anemia. Studies and tests have also shown that the high iron content also contributes to the reduction in muscle cramp, stress and heart problem occurrences. A single cup of mango juice is known to contribute as much as 42 percent of the overall recommended amount of vitamin C for the day. Some of the factors that vitamin C contributes to are–collagen production, injury healing, and management of the immune system as well as repair of bones (Khan *et al.* 1995).

Another very beneficial aspect of high mango consumption is the fact that they are very good in dealing with stomach problems. Suffering from conditions like constipation is primarily because of the lack of fiber rich foods in the regular diet. However, mangoes are highly regarded for their significant fiber content and play an important role in helping the body cope with stomach related problems. If you suffer from an inflammatory bowel syndrome, on the other hand, it is highly recommended that you avoid any substantial mango consumption as it is only likely to aggravate the condition. Experts will recommend that you incorporate some amount of mango consumption into a well planned and nutritious diet in order to promote overall wellness (Ahmad *et al.,* 2011).

Mango juice is rich in Nutrients, Vitamin A, Vitamins B (B1, B2 and B3), Vitamin C, Calcium, Iron, Phosphorus and Potassium. Being regarded as the best summer time drink, this drink is extremely beneficial to consume during **constipation, excessive thirst, cancer, heart diseases, anemia, pregnancy, mental weakness and stress (Andrade, Maia, and Zoghbi, 2000).**

Adulteration and contamination in edibles especially beverages, bottled water, cooking oil/ ghee, spices, tea, sweeteners like sugar, sweetmeats, bakery products, milk and milk products, fruit and vegetable products are constant threat to the health of common man (Yu and Yang, 1980). One of the important measures in this regard is to create awareness amongst the public regarding the hygienic conditions. The kinds of impurities found in food items sold in the markets should be highlighted. This can only be done by media through advertisements. Government should start campaign against food adulteration, forcing the producers to change their methods of production. Keeping in view this fact the present study was under taken to evaluate quality and nutritive value of the different mango juices available in the market.

MATERIALS AND METHODS

Collection of Samples

Samples of mango juice were purchased from a retailer shop of Swat and brought to the laboratory of Food Science and Technology, Agriculture Research Institute, Swat.

In this study, following names were used:

Brand name	Given name
Pepsico	Brand A
Enjoy	Brand B
Tops	Brand C
Nestle	Brand D
Kool	Brand E
Tropico	Brand F

Proximate analysis

Brix (Total Suspended Solids)
pH
Acidity

Total sugar

Brix (Total Soluble Solids)

TSS of the sample was determined by the standard method of AOAC (2000).

Equipment

Digital refractometer (Atago RX-1000) was used to determine brix.

Procedure:

1) I Switched on the equipment and cleaned the prism with distill water and dried.
2) Whenever refractometer showed zero brix it was corrected otherwise calibrated.
3) I placed the beverage drop on prism and closed the lid.
4) The reading was shown on the screen immediately and was noted.

pH measurement

pH of the sample was measured by the pH meter as reported in the standard method of AOAC(2000).

Equipment

pH meter (HANNA Model HI 8520)

Purpose

pH is measured because high pH may cause microbial spoilage, while low pH will decrease the acceptance of the product by increasing pungency.

Procedure

1. I took pH meter and wash with distill water.
2. The pH meter was checked and calibrated it with buffer solution.
3. Then sample was taken in a small cleaned beaker and the pH meter was dipped in the sample.
4. Reading was taken.

Titratable acidity

Titratable acidity of the sample was determined by the standard method of AOAC (2000).

Reagent:

Phenolphthalein, 0.1 N (NaOH)

Standardization of Acid

1) Standardization of NaOH was done with Oxalic Acid.
2) 0.1 N NaOH was taken in a beaker.
3) 1ml oxalic acid was taken in a flask.
4) Then 3 to 4 drops of phenapthlene indicator were added.
5) The oxalic acid was titrated with 0.1 N, (NaOH) and the reading was noted.

Procedure

1) 0.097 N or 0.01 N (NaOH) was taken in a burette.
2) 20ml sample was taken in a conical flask.
3) Then 3 to 4 drops of phenapthlene indicator were added in the sample.
4) The sample was titrated with 0.09 N (NaOH).
5) Initial reading of the burette and the volume of NaOH used was noticed.
6) End point was light pink color.

Determination of reducing sugar, total reducing sugar and sucrose

Principle

Invert sugar reduces the copper in Fehling. A solution to a brick red insoluble cuprous Oxide.

Reagent:

Fehling. A: 69.28g of copper sulphate (CuSO4.5H2O) was dissolved in water and diluted to 1000ml. Filtered through No.4 Whatman paper whenever necessary.

Fehling. B: 346g of Rochelle salt, Potassium sodium tartarate (KNaC4H4O6.4H2O) and 100g of NaOH were dissolved in water and the volume was made up to 1000 ml.

Mthylene Blue Indicator: One g of methylene blue indicator was dissolved in 100ml of water.

45% Neutral Lead Acetate Solution: 22g of neutral lead acetate was dissolved in water and diluted to 500 ml.

Determination of Reducing Sugar

Procedure

Reducing Sugar of the sample was determined by the standard method of AOAC (2000). 20g of sample was weighed accurately and transfered to 250 ml flask. 10 ml of neutral lead acetate solution was added and diluted to volume with water and filtered. An aliquot of 25 ml of the clarified filtrate was transferred to 500 ml volumetric flask containing about 100 ml water. Potassium oxalate was added in in small amount until there was no further precipitation. The solution mixed well and filtered through Whatman No.1 paper. The filtrate was transferred to a 50 ml burette.

Preliminary Titration: 5 ml each of Fehling. A and Fehling. B were pipetted in to 250 ml conical flask. Then these were mixed in about 10 ml water and a few boiling chips or glass beads. The solution was dispensed and the flask was heated to boiling. Three drops of methylene blue indicator were added. I continued the addition of solution drop wise until the blue colors disappeared to a brick red end point. The titre valve was noted down.

Final titration: 5 ml each of Fehling. A and Fehling. B were pipetted. About 2 ml less than titre value of preliminary titration was added to sample solution. I heat the flask to boiling with in three minutes and completed the titration. The titration duplicate was performed and the average was taken. Reducing sugar was calculated by applying formula:

$$\text{Reducing sugar \%} = \frac{\text{Factor} \times \text{dilution} \times 100}{\text{\% Titrate} \times \text{Wt or Volume of Sample}}$$

Determination of Total Reducing Sugar:

Total Reducing Sugar of the sample was determined by the standard method of AOAC (2000). Pipette an aliquot of 50 ml of a clarified, de-leaded filtrate to a 100 ml volumetric flask. Add 5 ml of conc. HCl and allow standing at room temperature for 24 hours. Neutralize with conc. NaOH. Make upto volume and transfer to 50 ml burette having an offset tip and perform the titration on the Fehling solution similar to the procedure describe in the determination of reducing sugar.

Determination of Factor (for Invert Sugar) of Fehling Solution

4.75 grams of analar grade sucrose were accurately weighed and transfered to 500 ml volumetric flask with 50 ml distilled water. 5ml conc. HCl was added and allowed standing for 24 hours. The solution was neutralized with NaOH solution and volume was made upto the mark. 50 ml was transferred to a 100 ml volumetric flask after mixing and made up to the volume. Then it was transfered to burette having an offset tip. The titration of Fehling solution was performed (AOAC, 2000).

Sensory evaluation

All the juice samples were evaluated organoleptically for color, taste, appearance and smell by the method as described by Larmond (1977). Samples will presented to trained judges to compare them and assign them score between, 1 – 9, where 1 represents extremely dislike and 9 represents extremely like from printed Performa.

Table 01: Point Hedonic Scale (Larmond, 1977).

S. No:	Rating
01	Dislike extremely.
02	Dislike very much.
03	Dislike moderately.
04	Dislike slightly.
05	Neither like nor dislike.
06	Like slightly.
07	Like moderately.
08	Like very much.
09	Like extremely.

RESULTS AND DISCUSSION

Mango juice is rich in Nutrients, Vitamin A, Vitamins B (B1, B2 and B3), Vitamin C, Calcium, Iron, Phosphorus and Potassium. It is also anti cancer in nature, good for digestion, it has high iron content and many other health benefits. But these juices are often adulterated and miss labeled. Keeping his fact in view, the present study was under taken to evaluate quality and nutritive value of the different mango juices available in the market.

Samples of apple juice were collected and brought to the laboratory of Food Science and Technology and were analyzed for quality attributes like Sensory evaluation and physicochemical analysis. Sensory parameters include color, taste, appearance, smell and physiochemical parameters included brix, pH, acidity and total sugar. Physiochemical analysis and sensory evaluation of tetra pack mango juices were carried out for different brands such as brand A (Pepsico), brand B (Enjoy), brand C (Tops), brand D (Nestle), brand E (Kool) and brand F (Tropico).

Table 02: Physicochemical analysis of Tetra Pack mango juices

S/No	Sample name	•Brix	pH	Titratable Acidity %	Total Sugar (g)
01	Brand A	12.9	3.73	0.274	10.4
02	Brand B	9.8	4.20	0.135	2.17
03	Brand C	5.1	4.03	0.186	2.7
04	Brand D	5.1	3.97	0.234	7.8
05	Brand E	10.3	4.02	0.173	7.41
06	Brand F	6.5	4.05	0.176	5.37

4.1 Physicochemical Analysis

Brix (TSS)

Results regarding TSS of these brands showed that brand A had highest TSS (12.9), followed by brand D (7.8), brand E (7.41), brand F (5.37), brand C (2.7) and brand B (2.17), respectively.

In similar study, Akubor (1996) had found TSS up to a level of 4.2 % in mango juices. The Increase in TSS during storage had been reported by Mahajan (1994).

Three samples (brand C, D and F) had lowest total soluble solids level which was less than the standard limit of Pakistan Pure Food Laws.

pH

The results of this study showed that there was no significant difference in the pH of all the selected mango juice brands. Brand B had the highest pH of (4.20), while brand A had the lowest pH value among all the samples i.e. (3.73). The descending trend was followed by brand F (4.05), brand C (4.03), brand E (4.02) and brand D (3.97).

The higher pH values may be due to the loss of acidity. Sivakov (1990) also observed a rise in pH of fruit juices during storage.

Titratable Acidity

Results regarding acidity of these brands showed that brand A had the highest percent titratable acidity of (0.274), followed by brand D (0.234), brand C (0.186), brand F (0.176), brand E (0.173) and brand B (0.135) respectively.

In a similar study,Akubor (1996) also analyzed acidity for mango juices and reported that acidity increased with increasing period of storage.

Total Sugar

Results of total sugar concluded that brand A had the highest level of total sugar i.e. (10.4), followed by brand D (7.80), brand E (7.41), Brand Far i.e. (5.37). While brand C and brand B had the lowest total sugar contents of (2.73) and (2.17) respectively.
In a similar study, Akubor (1996) reported 3.6% total sugar in mango juices.

Table 03: Sensory analysis of Tetra Pack mango juices

S/No	Sample name	Color	Taste	Appearance	Smell	Mean Score
01	Brand A	5.7	7.5	7.4	6.7	6.82
02	Brand B	3.7	7.3	3.3	5.7	5.0
03	Brand C	3	5.7	4.3	3	4.0
04	Brand D	3	7.7	8.7	7.7	6.77
05	Brand E	5.3	7.3	6.3	8	6.72
06	Brand F	5.7	7.8	4.7	8	6.55

4.2 Sensory evaluation

Results regarding sensory analysis revealed that brand A had the highest mean score of 6.82, followed by brand D (6.72), brand E (6.72), brand F (6.55), brand B (5.0) and brand C (4.0) respectively. Brand B and brand C had the lowest sensory scores among all the brands, while brand A was considered as the best mango juice by the sensory panel.

The samples which exhibited less total soluble solids than the standard limit prescribed by Pakistan pure Food Laws also showed poor sensory attributes.

CONCLUSION AND RECOMMENDATIONS

It is concluded from this study, that Brand A (Slice) is the best mango juice among all the collected samples of the local market of Swat. Brand A not only showed the best sensory characteristics i.e. color, taste, appearances and smell but it was also compact in other quality attributes like pH, TSS, acidity and total sugar. Brand A also exhibited standard limit prescribed by Pakistan Food Laws.

On the other hand, Brand C, D and F did not fulfill standard limits prescribed by Pakistan Food laws. These three samples also, were unable to be accepted organoleptically.

Some of the recommendations for further studies and research are as under:

1. Apple juices of other brands should also be analyzed.
2. Microbial analysis should also be carried out for these samples.
3. Other fruit juices should be studied.
4. All types of food brands should be used for further studies.

REFERENCES

1. Ahmad, I., M. Usman, S. Rashid, M.K. Saeed, Imran-ul-Haq. 2011. Evaluation of quality of mango (*Mangifera indica L.*) squashes available in Lahore market. Pak. J. Food Sci., 21 (1-4): 67-71.
2. Akhtar, S., M. Riaz, A. Ahmad and A. Nisar. 2010. Physicochemical and microbiological and sensory stability of chemically preserved mango pulp. Pak. J. Bot. 42: 853-862.
3. Akubor, P.I. (1996). Dept. of Food Tech., Federal Polytechnic, P.M.B, 10371 dah, Nigeria, J. Plant Fruits for Human Nutrition. 49 (30): 213-219.
4. Andrade, E., J. Maia and M. Zoghbi. 2000. Aroma volatile constituents of Brazilian varieties of mango fruit. J. Food Composition and Analysis. 13, 27–33.
5. AOAC. (2000). Official method 920.184 Sucrose in juices / I.S.I, 17th Ed. Hand Book of Food Analysis. 2: 35-36.
6. Bernardi, S., R. B. Bodini, B. Marcatti, R. R. Petrus and C. S. Favaro-Trindade, 2009. Quality and sensorial characteristics of osmotically dehydrated mango with syrups of inverted sugar and sucrose. J. Chem. Sci. 66(1), 40-43.
7. Buck, R. P., S. Rondinini, A. K. Convington and F. G. K. Baucke. 2002. Measurement of pH, definition, standards and procedures. Int. Union. Pure. Appl. Chem. 74: 2169–2200.
8. Daris, J., G. L. Rodrigo, J. H. Cordero, E. D. Díaz and C. D. Romero. 2003. Alcoholic beverages obtained from Black Mulberry. J. Food Tech. and Biot. 41: 173–176.
9. Deanna M., Minich and S. B. Jeffrey. 2007. Acid alkaline balance: role in chronic disease and detoxification. Alternative Therapies. 13(4): 62–65.
10. Faten, S. M., K. S. Nagy, A. Amal and K. A. Askar. 2011. Factors affecting the fungal contamination of some fruit juices packaged in Tetra Pack. Pak. J. Biot. 10: 12957-12962.
11. Franke A. A., R. V. Cooney, S. M. Henning and L. J. Custer. 2005. Bioavailability and antioxidant effects of orange juice components in humans. J. Agric. Food Chem. 53 (13): 5170–8.
12. Hunter, G. L. K., W. A. Bucek and T. Radford. 1974. Volatile components of Canned Alphonso mango. J. Food Sci. 39, 900-3.
13. John, S., I. Rapp, F. Akinnifesi, V. Ndolo and J. Mhango. 2007. Physicochemical and organoleptic characteristics of Uapaca kirkiana, Strychnos cocculoides, Adansonia digitata and Mangiferia indica fruit products. Int. J. Food. Sci. Tech. 42: 836–841.
14. Khan, I. A., M. J. Jaskani and S.N.H. Ali. 1995. A report on mango orchard. Survey and Research Prospects. Dept. Hort. Univ. Agri. Faisalabad.
15. Kurowska E. M., J. D. Spence, J. Jordan, S. Wetmore, D. J. Freeman, L. A. Piche, P. Serratore. 2000. Cholesterol raising effect of orange juice in subjects with hypercholesterolemia. American J. Clin. Nutr. 72: 1095–100.
16. Mahale, D. P., G. K. Ranjana and K. V. Varsha. 2008. Microbiological analysis of street vended fruit juices from Mumbai City, India. Inter. J. Food. Safety. 10: 31-34.
17. Malik, M.A., A. Salam and M. Saleem. 1994. Mango Products. In: Mango and Summer Fruits of Pakistan. A Brochure of the Hort. Foundation Pak. Islamabad.
18. Mukhopadhyay, M., M. Majumdar and P. Basu. 2011. Microbial contamination of street vended fruit juices In Kolkata City. Inter. J. Food. Safety. 13 : 1-5

19. Nitu, M. R., I. Khalil, S. Hussain and S. Islam. 2010. Studies on the biochemical composition of commercial citrus juices and laboratory prepared pineapple juices. Europe. J. Biol. Sci. 2: 9-12.
20. Reddy, L. V. and O. V. S. Reddy. 2009**.** Production, optimization and characterization of wine from Mango (*Mangifera indica* L.). Natural Product Radiance. 8 : 426-435.
21. Sahota, P. P., D. Kaur and G. Pandove. 2010. Studies on the preparation of low alcoholic naturally carbonated blended beverage from guava and lemon. Inter. J. Food. Safety. 12 : 165-180.
22. Tasnim, F., A. Hossain, S. Nusrath, M. H. Kamal, D. Lopa and K. M. Formuzul Haque. 2010. Quality assessment of industrially processed Fruit Juices available in Dhaka City, Bangladesh. Mal. J. Natural. Sci. 16: 431-438.
23. Titarmare, A., P. Dabholkar and S. Godbole. 2009. Bacteriological analysis of street vended Fresh Fruit and vegetable juices in Nagpur City, India**.** Inter. J. Food. Safety. 11 : 1-3.
24. Torezan, G. A. P., P. C. Favareto, D. Pallet, H. C.Menezes and M. Reynes. 2004. Use of a combined process of osmotic dehydration and deep fat frying to obtain mango chips from the cultivar Tommy Atkins. ISHS, Acta Horticulture, 645; 285-291.
25. Ullah, J., N. Khan., T. Ahmad and M. Zafarullah. 2005. Effect of optimum harvesting dates on the quality and post harvest losses of red delicious apple stored in commercial cold store. Sarhad. J. Agri. 21 (1): 135 -139.
26. Yu, Y. and S. F. Yang. 1980. Biosynthesis of wound ethylene. Plant Physiology. 66; 281–285.