

Development and quality evaluation of protein enriched fruit juices

KAPILA JAIN, KOMAL CHAUHAN AND VIBHA BHATNAGAR

Preparation of apple and tomato juices fortified with green gram extract was studied. The extracts of green gram were prepared by providing different processing techniques including soaking, soaking and cooking, germination, germination and cooking. Blends prepared by mixing apple juice and tomato juice with four different green gram extracts in a ratio of 50:50 were evaluated for organoleptic properties. The blends apple juice and tomato juice mixed with soaked and cooked green gram extract (AJ-SCGE, TJ-SCGE) were selected best and further analyzed for nutritional quality. Both the blended juices possessed higher nutritional quality than the pure juices and the sample TJ-SCGE had all the nutritional components in a higher proportion than the sample AJ-SCGE.

Key Words : Juice blends, Extract, Organoleptic evaluation, Enrichment, Nutritional quality

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INTRODUCTION

Beverages are consumed by all age groups to quench the thirst, as social drinks and for health conscious and medicinal values. Non-alcoholic beverages are of various types such as fruit based drinks, sweetened aerated water or carbonated drinks (Illamaran and Amutha, 2010).

Fruit juices occupy a unique position among those products classified as beverages. Pure fruit juices, being a source of energy, phyto-nutrients, vitamins and minerals are not only indispensable for the maintenance of health but also considered as the beverages of refreshment, which quench thirst and encourage liquid intake. They are becoming popular due to their pleasing flavour and nutritional characteristics

(Kothari and Bhatnagar, 2010). They contribute significantly to the vitamins especially vitamin A and C and minerals including potassium, magnesium and calcium of the diet. They are also rich in antioxidants and phytochemicals which have been proven to protect human cells from oxidative damage. However, fruit juices are generally poor sources of protein. This inherent lack of protein in juices can be made up by addition of an ingredient, which provides protein and does not negatively affect the colour and flavour. The vehicle for fortification must be such that are highly consumed and preferred by the consumers and there is great demand in the market.

There has been considerable increase in the consumption of fruit and vegetable juice beverages in the world during the last few years (Anonymous, 1998). Since the demand for fruit juices in the market is increasing every year, this trend may be exploited by developing protein enriched fruit juice beverages, as the consumers are becoming increasingly conscious of the ways in which diet is linked to a healthy life style.

Blending fruit juice is also gaining importance as it helps to improve the nutritional value (Bhuvaneshwari and Gowda, 2006; Sharma *et al.*, 2010). Sandhu and Sindhu (1992), Saxena *et al.* (1996), Attri *et al.* (1998), Langthasa (1999),

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Deka (2000) and Deka and Sethi (2001) reported that two or more fruits juice/pulp may be blended in various proportions for the preparation of nectar, RTS beverages etc. The blending of juice may also improve aroma, taste and nutrients of the beverages. Moreover, one could think of a new product development through blending in the form of a natural health drink, which may also be served as an appetizer.

In the present study, two commonly consumed juices *viz.*, apple juice and tomato juice were enriched with whole green gram pulse extracts prepared by four different processing techniques and evaluated for their acceptability. The nutrient content of highly accepted fruit juice blends was further analyzed.

METHODOLOGY

Preparation of pulse extract :

Whole green gram was purchased from the local market in a single lot. It was cleaned and divided into four lots. Each lot was given different household processing techniques including soaking, soaking and cooking, germination, germination and cooking. The detailed procedure followed during the preparation of pulse extract is described in Fig.A.

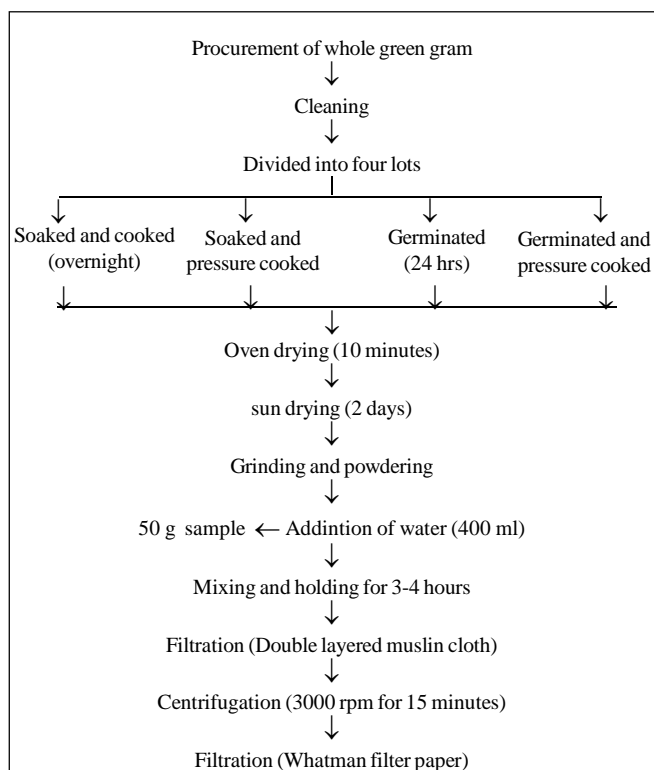


Fig. A : Flow sheet for preparation of green gram extract

Preparation of fruit juices :

Fresh apples and tomatoes were purchased from the local

market. Both were washed and juice was extracted in electric juicer.

Blending of fruit juices with pulse extracts :

Apple and tomato juices were blended with pulse extracts obtained by different processing methods as shown in Table A and B.

Table A : Apple juice blended with processed green gram extracts

Apple juice + Soaked green gram extract (AJ-SGE)
Apple juice + Soaked and cooked green gram extract (AJ-SCGE)
Apple juice + Germinated green gram extract (AJ-GGE)
Apple juice + Germinated and cooked green gram extract (AJ-GCGE)

Table B : Tomato juice blended with processed green gram extracts

Tomato juice + soaked green gram extract (TJ-SGE)
Tomato juice + soaked and cooked green gram extract (TJ-SCGE)
Tomato juice + germinated green gram extract (TJ-GGE)
Tomato juice + germinated and cooked green gram extract (TJ-GCGE)

Sensory evaluation :

All the four samples of protein enriched apple juice blends/tomato juice blends were evaluated organoleptically with the help of ten semi trained panel of judges comprising of PG students of the department. Nine point hedonic scale was used for the sensory evaluation (Swaminathan, 1995).

Nutritional quality assessment :

Most accepted protein enriched apple and tomato juice blends were assessed for nutritional quality parameters. Moisture, ash, calcium and iron contents were estimated by methods described in NIN manual (2003). Crude protein content was determined by Lowry method, vitamin C was assessed by titration method (Sharma, 2007).

OBSERVATIONS AND ASSESSMENT

The findings of the present study as well as relevant discussion have been presented under the following heads :

Sensory quality of developed fruit juice blends :

Data pertaining to the sensory scores of protein enriched juice blends of apple and tomato have been presented in Table 1 and 2, respectively.

As evident from Table 1, the highest score was awarded for colour, flavour and taste to the apple juice blended with soaked and cooked pulse extract (AJ-SCGE) whereas appearance was found to have scored best in apple juice enriched with germinated and cooked green gram extract (AJ-GCGE). Table 1 also shows that score for overall acceptability was maximum in sample AJ-SCGE and minimum in AJ-GGE.

It is observed from Table 2 that mean scores for colour, appearance and taste were highest in tomato juice sample TJ-SCGE however with respect to flavour attribute, sample TJ-GCGE was adjudged best among all the other counterparts having a mean score of 6.5 ± 1.36 . Sample TJ-SCGE scored highest for overall acceptability (7.0 ± 1.22) and lowest score was obtained by the sample TJ-GGE (6.4 ± 1.20).

It is clearly evident from the above data (Table 1 and 2) that apple juice and tomato juice blended with soaked and cooked green gram extract were superior over rest of the treatments. Therefore, samples AJ-SCGE and TJ-SCGE were selected for further study. The results of the present study are in line with that of Bhatia and Chawla (2004) who also reported that apple juice enriched with black gram extract in the ratio of 50:50 was considered best.

Nutritional quality of developed fruit juice blends :

Results of nutritional quality of protein enriched juice blends are presented in Fig. 1 to 6. Data reveal the comparison of nutritional components between two juice blends *i.e.* apple juice and tomato juice blended with soaked and cooked green gram extract (AJ-SCGE), (TJ-SCGE). The results of the present study have been compared with nutrient content of pure apple and tomato juices reported by Dallas (2009).

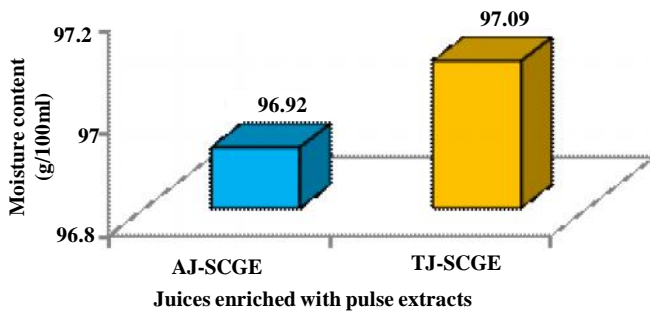


Fig. 1 : Moisture content of blended juices

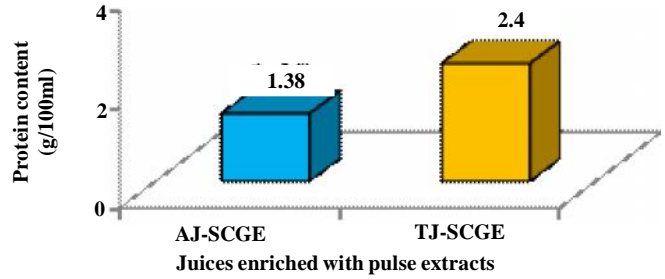


Fig. 2 : Protein content of blended juices

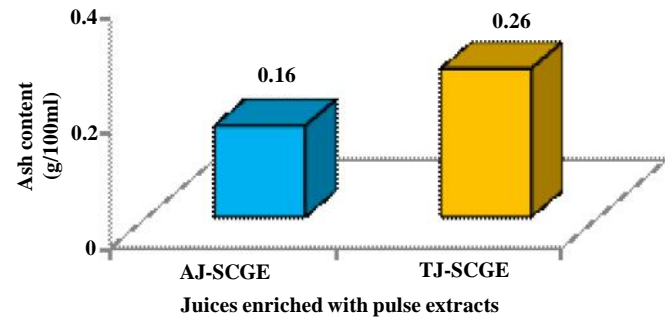


Fig. 3 : Ash content of blended juices

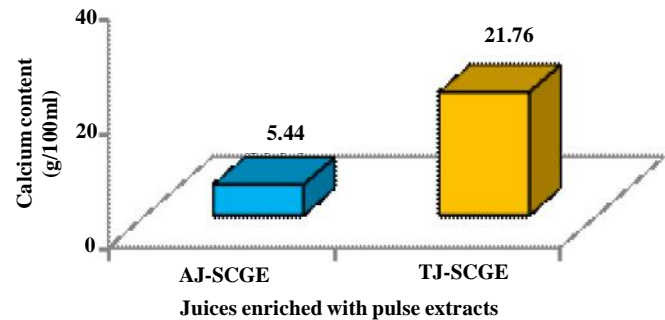


Fig. 4 : Calcium content of blended juices

Table 1 : Sensory scores (Mean ± S.D.) of apple juice blended with pulse extracts

Attributes	Sample Aj-sge	Sample Aj-scge	Sample Aj-gge	Sample Aj-gcge
Colour	7.0± 1.09	7.4± 1.20	6.8± 0.97	6.6± 1.41
Appearance	6.9± 0.94	7.5± 0.50	7.0± 0.63	7.6± 0.66
After taste	7.0± 1.00	7.3± 0.64	6.7± 0.45	6.7± 1.03
Flavour	7.4± 0.91	7.4± 0.94	6.8± 1.24	6.9± 0.98
Overall acceptability	7.2± 0.87	7.3± 1.18	7.1± 0.83	7.2± 1.26

Table 2 : Sensory scores (Mean ± S.D.) of tomato juice blended with pulse extracts

Attributes	Sample Tj-sge	Sample Tj-scge	Sample Tj-gge	Sample Tj-gcge
Colour	6.9± 1.04	7.3± 0.90	6.7 ±0.90	7.0± 1.34
Appearance	6.6± 0.66	7.0± 0.89	6.4± 0.91	6.7± 1.00
After taste	6.4± 1.35	6.5± 1.02	5.9± 1.30	6.3± 1.18
Flavour	6.5± 1.02	6.4± 1.01	6.3± 1.26	6.5± 1.36
Overall acceptability	6.6± 0.91	7.0± 1.22	6.4± 1.20	6.9± 1.39

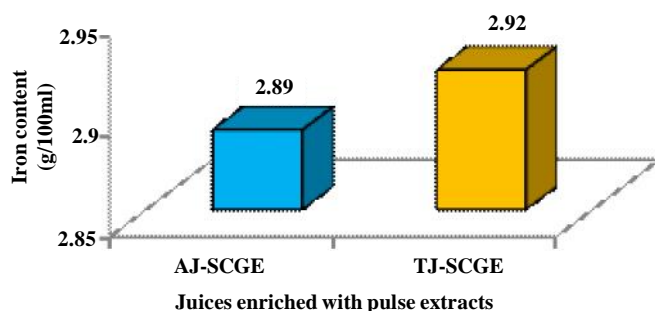


Fig. 5 : Iron content of blended juices

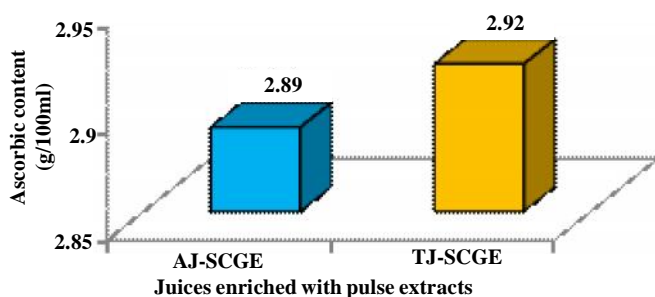


Fig. 6 : Ascorbic acid content of blended

Moisture analysis was the preliminary step of chemical analysis of the blended beverages. It is the account of water present in the product. Water has its own significance because of an array of important functions it performs in biological system. Fruit juice beverages are very good source of water as indicated in Fig. 1 which shows 97.09 per cent and 96.92 per cent moisture content being higher in blended tomato juice.

It is well known that fruits contain an abundant variety of vitamins and minerals but are lacking in an important nutritional component *i.e.* protein which is required for growth and maintenance of body tissues. As shown in Fig. 2 the protein content of apple juice blend was 1.38 per cent and it was mainly due to blending of pulse extract in these juices. Pure apple juice contains average 0.19 per cent protein. Blending of apple juice with green gram extract in present study resulted increase in protein content. Pure tomato juice contains 0.85 per cent protein whereas higher values were obtained in the present study in blended tomato juice (2.4%).

The ash content of any food gives an idea about its minerals and trace elements. The higher the mineral content, higher would be the ash content. The ash content of blended tomato juice was higher (0.26%) than the blended apple juice (0.16%) as revealed in Fig. 3.

Therefore, it is clear from above data that tomato juice blended with soaked and cooked green gram extract was superior in moisture, protein and ash contents as compared to apple juice blended with soaked and cooked green gram

extract.

The data pertaining to calcium, iron and vitamin C (ascorbic acid) contents of the two fruit juice blends is shown in Fig. 4, 5 and 6, respectively. It is evident from the data that there was a difference between calcium, iron and ascorbic acid contents of tomato juice and apple juice blended with soaked and cooked green gram extract. Further, it can be inferred that sample TJ-SCGE *i.e.* tomato juice blended with soaked and cooked green gram extract was possessing higher values for minerals (calcium and iron) and vitamin (vit. C) as compared to other counter part. Calcium is an important nutrient of animal body which is required for healthy teeth and bones and iron as a component of haemoglobin plays an important part in the transport of oxygen from the lungs to the tissues. The sample TJ-SCGE containing 21.76 mg/100 ml of calcium and 2.92 mg/100 ml of iron was found as better than sample AJ-SCGE which contains 5.44 mg/100 ml of calcium and 2.89 mg/100 ml of iron.

The ascorbic acid, is an anti-scorbutic substance which prevents scurvy was also found (2.89 mg/100ml) in sample TJ-SCGE and (2.92 mg/100ml) in sample AJ-SCGE.

Tomato juice blend in the present study was found superior with respect to calcium and iron content of pure juice which has been reported to contain 5 mg/100 ml of calcium and 0.45 mg/100 ml of iron whereas the present study reveals calcium and iron contents as 21.76 mg/100 ml and 2.92 mg/100 ml, respectively. Iron content of AJ-SCGE (2.89 mg) was also found higher than that of pure apple juice *i.e.* 0.18 mg/100 ml. However, with respect to ascorbic acid content both tomato and apple juice blends showed less value than the pure juices (26.0 mg/100 ml and 5.7 mg/100 ml), respectively.

Conclusion :

From the results obtained in the present study, it can be concluded that among all the processing techniques for preparing pulse extracts, soaked and cooked sample was found most acceptable when mixed in the ratio of 50:50 to respective juices. Further, nutrient analysis revealed that the developed apple juice and tomato juice blends enriched with pulse extract were superior in terms of nutritional quality than the pure juices. Of the two juice blends, tomato juice blend (TJ-SCGE) contained higher amounts of all the nutrients in comparison to apple juice blend (AJ-SCGE).

LITERATURE CITED

- Anonymous (1998). Can juices replace tea or coffee on breakfast table ? *Process. Food*, **1**(5): 36.
- Attri, B.L., Lal, B.B. and Joshi, V.K. (1998). Physico-chemical characteristics, sensory quality and storage behaviour of sand pear juice blended with temperate fruit juices/pulp. *Indian Food Packer*, **52**(6): 36-42.

- Bhatia, A. and Chawla, P. (2004).** Development of protein enriched apple beverage. *J. Food Sci. & Technol.*, **41**(2): 174-177.
- Bhuvaneshwari, S. and Gowda, I.N. (2006).** Small scale processing of blended grape RTS beverage. *Beverage & Food World*, **33**(10): 72-74.
- Deka, B.C. (2000).** Preparation and storage of mixed fruit juice spiced beverage, 2000 Ph.D. Thesis, IARI, NEW DELHI, INDIA.
- Deka, B.C. and Sethi, V. (2001).** Preparation of mixed fruit juice spiced RTS beverages. *Indian Food Packer*, **42**(3): 58-61.
- Ilaumaran, M. and Amutha, S. (2010).** Studies on the biochemical and sensory qualities of carbonated sapota beverages. *Beverage & Food World*, **37**(4): 50.
- Kothari, C. and Bhatnagar, V. (2010).** Development and quality evaluation of Aonla blended spiced fruit juice. *Beverage & Food World*, **37**(4): 29.
- Langthasa, S. (1999).** Processing and preservation of apple pulp. Ph. D. Thesis, IARI, NEW DELHI, INDIA.
- NIN (2003).** *A manual of laboratory techniques*. Raghuramulu, N., Madhvan, Nair, K. and Kalyansunderam, S. ICMR. Hyderabad, A.P. (INDIA).
- Sandhu, K.S. and Sindhu, J.S. (1992).** Studies on the development of multi fruits ready-to-serve beverage. *J. Plant Sci. Res.*, **8**: 87-88.
- Saxena, A.K., Teotia, M.S. and Berry, S.K. (1996).** Studies on the development of grape-mango and grape-pineapple beverage blends. *Indian Food Packer*, **50**: 26-29.
- Sharma, H.P., Singh, S.K. and Sharma, R. (2010).** Development of mixed fruit squash of pineapple and pomegranate. *Beverage & Food World*, **37**(4): 55.
- Sharma, S. (2007).** *Experiments and techniques in biochemistry*. Galtotia Publications (P) Ltd. NEW DELHI (INDIA).
- Swaminathan, M. (1995).** *Food science, chemistry and experimental foods*. The Bangalore Printing and Publishing Co. Ltd. Bangalore (KARNATAKA) INDIA.
- **WEBLIOGRAPHY**
- Dallas, J. (2009).** Juicing book. www.juicingbook.com.

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