



IMPACT ASSESSMENT OF FACTORS AFFECTING SENSORY QUALITY OF KINNOW MANDARIN

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ABSTRACT : Different fruit juice blends were prepared as (Kinnow juice: Aonla juice: Ginger juice in 100: 0: 0, 95: 5: 0, 92: 5: 3 ratio for improving flavour, palatability, nutritive and medicinal value. The juice blends were preserved by pasteurization (75°C or 85°C for 15 minutes) and by addition of potassium meta-bi-sulphite (500 or 750 ppm). These blends were stored in 200 ml colourless glass bottles at refrigerated condition (4 ± 1°C) for six months and tested at three months interval for sensory evaluation. The results revealed that non-enzymatic browning, flavour, colour, bitterness and affected significantly up to sixth month of storage. The individual effect of juice blending ratio, processing temperature and potassium meta-bi-sulphite treatment was found to be significant in prolonging storage duration and maintaining the acceptable quality of juice blends. The juice blend by 92:5:3, processed at 75°C for 15 min with 750 ppm KMS was the most effective treatment for sensory quality of the juice blend but minimum microbial population was recorded with juice processed at 85°C temperature with same treatment combination in both year of experimentation.

Keywords : Kinnow juice; Juice blends; sensory quality Ready-to-serve.

The Kinnow is a variety of citrus fruit cultivated extensively in India and Pakistani Punjab Province. It is a hybrid of two citrus cultivars — “King” (*Citrus nobilis*) × “Willow Leaf” (*Citrus deliciosa*), first developed by H. B. Frost at the Citrus Research Centre of the University of California, Riverside, USA. Kinnow mandarin is quite important as it has a great variety of beverage, industrial and medicinal uses due to its attractive colour, distinctive flavour and being rich source of vitamin ‘C’, vitamin ‘B’, β-carotene, calcium and phosphorous. The post-harvest shelf life of kinnow fruit at room temperature is very limited (Jawandha and Singh, 3) and shelf life can be extended to a maximum period of up to 45 days under refrigerated storage conditions. In view of its limited shelf life, the fruit must be processed to extend its availability period and also to minimize the glut in the market in its peak season of production. Like all fresh products, the quality of kinnow mandarin juice changes with time. Several key parameters influence the rate of microbial spoilage, enzymatic degradation, chemical changes and deterioration in flavour or turn bitter after extraction (Ranote and Bains, 5). For improving the taste, aroma, palatability, nutritive value and reducing bitterness kinnow juice was blended with some other highly

nutritive fruit juices namely pomegranate and aonla juice with spice extracts like ginger. The study of the factors affecting sensory and quality of kinnow juice blends is of utmost importance from beverage industrial applications point of view. Kinnow mandarin juice turns bitter after extraction due to conversion of a chemical compound. So, for improving the taste, aroma, palatability and nutritive value, Kinnow juice was blended with some other highly nutritive fruit juices and spices extract for preparation of nutritive Ready-to-Serve (RTS) beverages which is thought to be a convenient and economic alternative for utilization of kinnow juice. The juice blends are preserved by thermal processing and addition of preservative for prolonged storage period without any quality deterioration. This renders processed Kinnow juice blend availability round the year and at the places where the fruits are unavailable. All these fruits are valued very much for their refreshing juice with nutritional, medicinal properties and ginger juice also have antibacterial and anti-fungal properties. Sandhu and Sindhu (6), Saxena *et al.* (7), Langthasa (4), Jain and Khurdiya (2), Bhardwaj and Mukherjee (1) have reported that two or more fruit juice/pulp may be blended in various proportions for the preparation of nectar and RTS beverages etc.

Article's History:

Received: 07-04-2018

Accepted: 28-05-2018

MATERIALS AND METHODS

The experiment was conducted during 2007-2008 study the factors affecting the sensory quality of kinnow juice blends in refrigerated storage condition. The fully matured, freshly harvested kinnow, Nagpur mandarin and aonla fruits and well-developed ginger rhizomes were procured from Lal kothi mandi, Jaipur and brought to the Post Harvest Technology Laboratory, S.K.N. College of Agriculture, Jobner.

Juice preparations

Fruits were washed with clean running water to remove dust particles and to reduce the microbial load on the surface of the fruits and ginger rhizomes. Peeled kinnow and Nagpur mandarin fruits were crushed in screw type juice extractor machine for extraction of juice. Aonla and ginger were sliced with the help of stainless steel knives and crushed with mixer cum juicer for the extraction of juice. The juices were kept for 24 hours in refrigerator ($4 \pm 2^\circ\text{C}$) for sedimentation. Then the clear juice was siphoned off. The juice was filtered through muslin cloth and divided into 5 lots.

Prepare juice blends as per following blending ratio

S. No.	Types of juice	Blanding Ratio	Treatment Symbol
1	Kinnow juice: Aonla juice: : Ginger juice	100 : 0: 0	B ₁
2	Kinnow juice: Aonla juice: : Ginger juice	95:5:0	B ₂
3	Kinnow juice: Aonla juice: : Ginger juice	92:5:3	B ₃

Each lot was divided in to 2 sub lots and heated separately at 75°C or 85°C for 15 minutes, respectively in a double-jacketed stainless steel kettle. Again, each sub-lot was divided in to two lots. A calculated quantity of potassium meta-bi-sulphite (500 or 750 ppm) were dissolved in small quantity of water according to the treatments and well mixed in the blended juice with the help of stirrer. Treated juice blends were filled into pre-sterilized 200 ml capacity, 240 bottles {Treatment combination (20) \times Observations (3) \times Replication (3) = 180} as soon as possible and tightly closed using crown corking machine. These bottles containing juice were stored at refrigerated ($4 \pm 1^\circ\text{C}$) condition and analysed at 90 days interval for six months.

Methods of analysis

Fresh fruit juice (2007-2008 and 2008 -2009)	B ₁	B ₂	B ₃	B ₁	B ₂	B ₃
*Flavour	8.8	8.3	8.2	8.5	8.0	8.0
*Colour	8.7	8.6	8.3	8.6	8.7	8.3
*Bitterness	8.0	8.6	8.4	8.4	8.7	8.5
Total viable counts**	9.6 $\times 10^3$	8.5 $\times 10^3$	8.5 $\times 10^3$	1.0 $\times 10^4$	9.2 $\times 10^3$	8.2 $\times 10^3$

* = Score out of 9 marks, ** = cfu/ml juice, B₁ = Kinnow juice (100%), B₂ = Kinnow juice (95%) + Aonla (5%), B₃ = Kinnow juice (92%) + Aonla (5%) + Ginger (3%), Each value is a mean of 3

In order to find out the consumer preference juice blend ratio on the organoleptic evaluation of juice was done by a panel of ten semi-trained judges using 9 point hedonic scale All estimations were carried out in triplicate, determinations were made for each attribute and data pertaining to the physico-chemical, sensory quality and microbial population were statistically analyzed by using completely randomized design.

RESULTS AND DISCUSSION

Sensory evaluation

In the present study, results indicated that flavour, colour and organoleptic (bitterness) score of juice blends, decreased with advancement of storage period. The colour, flavour, tastes and appearance as well as higher nutrient elements of the blends was found to be superior as compared to the juices prepared from individual fruits. The juice blend of kinnow juice (92%) + Aonla juice (10%) + ginger juice (3%) recorded higher score for colour (7.33 and 7.23), flavour (7.53 and 7.73) and organoleptic taste (7.74 and 7.94) as compared to other blends at the end of storage in both years of experimentation, respectively. This may be explained as ginger juice checks microbial and enzymatic activities in stored juice, which produce off flavour and change in natural colour and taste. The result is well supported by Bhardwaj and Mukherjee (1) in Kinnow juice blend. The beneficial results of thermal processing might be due to inhibition of polyphenol oxidase and the enzyme involved in discolouration and developing of off flavour during storage. The potassium meta- bi-sulphite was found to be effective in retention of good flavour, colour and organoleptic taste of fruit juice during the entire storage period. All the samples were found acceptable up to 6

months of storage. Overall qualities including colour, flavour and organoleptic scores were better in the juice which was blended in the ratio of kinnow juice: Aonala juice: ginger juice (92: 5: 3) with processing at 75°C temperature and addition of 750 ppm potassium meta-bi-sulphite.

CONCLUSION

On the basis of the results of this study it may be concluded that formulation of mixed (blend) fruit juice beverage is possible to satisfy consumer taste and preferences. These juice blends can be stored effectively for a period of 6 months. Their total soluble solids, total sugars, limonin and non- enzymatic browning increased with increased period of storage but acidity, ascorbic acid and sensory quality score was reduced with advancement of storage. The juice blend (Kinnow juice 87%+anola juice 10% +Ginger juice 3%) and followed by (Kinnow juice 92% +Aonla juice 5% + Ginger juice 3%), processed at 75°C for 15 minutes with 750 ppm potassium meta-bi-sulphite proved to be the most effective treatment for physico-chemical and sensory scores of the juice blends. The maximum B: C. ratio (1.5:1) was obtained in formulating squash from the juice blend (kinnow juice 87: Anola 10: ginger juice 3) + processed at 75°C + KMS (750 ppm) and stored under refrigerated condition.

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Citation : Bhatnagar S., Bhardwaj R.L. and Mukherjee S. (2018). Impact assessment of factors affecting sensory quality of Kinnow mandarin. *HortFlora Res. Spectrum*, 7(2) : 152-154