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Research Note

Blending of Kokum Extract in Concord Grape Juice: Study on Physico-Chemical Characteristics, Sensory Quality and Storage

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Abstract

Juice blending is one of the best methods to improve nutritional quality of the juice besides enhancement of sensory quality. The Concord grape juice was blended with kokum extract with different combinations as T1 (grape juice), T2 (0.2 per cent blended), T3 (0.4 per cent blended) and T4 (0.6 per cent blended). The blending resulted in significant increment of total monomeric anthocyanin, total phenols, colour intensity, anti-oxidant activity and acidity in blended juice. Maximum increase in phenolic, anthocyanins, colour intensity, anti-oxidant activity and acidity took place in T4 while minimum was registered in blending of grape juice with 0.2 per cent of kokum extract in comparison to the control (T1). Minimum loss of anthocyanins was recorded in T2 when compared to the control (T1) among all the treatments during cold storage of 4 months. The highest overall acceptability (maximum mean score) was noted in T3 (7.8) followed by T4 (7.6) were found most acceptable in maintaining the sensory characteristics compared with others. Hence, T2 treatment found more acceptable and stable product than other treatments.

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Keywords: Grape, *Garcinia*, juice blending, antioxidant activity, sensory,anthocyanin

Introduction

Preparation of juice is an excellent way to absorb the maximum nutritional content of fruits and vegetables. All the enzymes, water-soluble vitamins and minerals built-in in these foods are condensed in the juice and, because of the deficiency of fibre; the vastly concentrated nutrients go straight into the bloodstream. The nutritional quality of grapes are well known. Fruit and rind extract of(*kokum Garcinia indica)*, find applications in neutraceutical field, which include hydroxy citric acid (HCA) known as weight reducing agent (Lowenstein 1971). Water soluble HCA is available as soft drinks, beverages, tablets, capsules etc. HCA reduces the conversion of fat into calories by inhibiting the action of ATP-citrate lyase, the enzyme which converts citrate into fatty acid and cholesterol in the primary pathway of fatty acid synthesis in body (Watson *et al.*, 1969, Lowenstein, 1971). A thermogenic effect has been found experimentally for the body wt. loss by using HCA (McCarty, 1994). It has been proved that *Garcinia camogia* extract inhibits lipid droplet accumulation in fat cell without affecting adipose conversion in 3T3l1 cell (Hasegawa, 2001). Garciniol is other constituent in *Garcinia* extract which have free radical scavenger activity thus, have potential to act as antiulcer agent (Kamat, 2002). A recent

study showed non-specific inhibition of histone acetyl transferases by Garciniol suggesting anti-HIV property (Balsubhramanyam *et al.*, 2004). The neutraceutical properties of grapes are also well known. But due to use of most of grape juice in the winemaking, preparation and consumption of juice is not very common. Acceptability and marketing of juice generally is affected by aroma, freshness, and overall quality of juice. Kokum extract is commonly available in Maharashtra and is being used as a drink. However, grape juice is very rich in several parameters but some constituents are only available in Kokum. Considering availability of Kokum extract in plenty and its beneficial health effects present study was conducted to evaluate the effect of grape blending juice with kokum extract on physico-chemical characteristics, sensory properties and storage behaviour. The results obtained are described in this paper.

Materials and Methods

The present study was carried out during cropping season of 2011 at National Research Centre for Grapes; Pune. The bunches of Concord grape variety attaining proper ripening with desired Total Soluble Solid (TSS) i.e. more than 17° B (Brix) were collected from vineyard. The harvesting was done in the morning hours. Just after harvesting, bunches of grapes were placed at low temperature to remove the field heat. The sorted bunches were de-stemmed manually. Before de-stemming, the grape bunches were cleaned by water. Pressing was done manually with the muslin cloth to separate the skins and seeds from the juice. After pressing, 250 ppm of KMS was added in the collected juice and the juice was transferred to the cold storage (2 ± 2<”C). After 2-3 days of grape juice storage at (2 ± 2<”C), the sediments that settled down were removed. The grape juice was blended with kokum extract by using a blender. The concord grape juice and Kokum extract was blended as T1 grape juice, T2 0.2 per cent kokum extract in grape juice, T3 0.4 per cent kokum extract in grape juice and T4 0.6 per cent kokum extract in grape juice. Bottles of 200 ml capacity were rinsed with KMS solutory and filled with blended juices. The $S0_2$ level was maintained before capping of bottles. These bottles were crown capped and stored at 4 <”C for 4 months. Before blending the grape juice and kokum extract was analysed and data are presented in Table 1.

Physico-chemical characters were estimated by following various standard methods. TSS was determined with the help of hand refractometer. The pH values of juice samples were recorded with the help of pH meter (Metrohm). Appropriate quantity of juice sample was taken in beaker and the pH was noted. The pH electrode was calibrated before use. Total titratable acidity was determined by following titration method (Margaret *et al*,. 2007) and for anthocyanins, method of Fuleki *et al.*, (1968) was adopted. Colour intensity was determined by method of Somers and Evans (1977). Antioxidant activities were estimated by determination of total phenols (Singleton *et al*., 1965) and DPPH assay (Arnous *et al.*, 2001). Protein content was evaluated by following method of Lowry *et al.*, (1951). The juice samples were organoleptically assessed by 10 trained panellist (including 5 women and 5 men), using a sensory rating of hedonic 9 point scale. The data of sensory analysis were analysed by using RBD method. Three samples were analysed from each treatment and CRD method was applied for statistical analysis of generated data of chemical analysis.

Results and Discussion

The data (Table 2) clearly showed effect of kokum extract addition on various parameters of grape juice. All studied parameters were significantly affected by blending of kokum extract. The pH value decreased very fast and minimum was recorded when 0.6 per cent kokum extract was added in grape juice. The acidity of grape juice was 0.76 per cent which increased with increased kokum extract addition and maximum (0.95) was found in T4. Colour intensity of grape juice was only 9.68 and it was recorded almost double when 0.6 per cent kokum extract was added to the grape juice. Same trend was reflected in content of anthocyanins also. Antioxidant properties which were recorded in the form of anthocyanins, total phenolic content and DPPH assay were also significantly affected by the addition of kokum in Concord juice. Increment in antioxidant activities was noted with enhanced concentration of kokum extract. The pH value of grape juice was declined by blending. In other words, the acidity of blended juice was more than control. The kokum extract contain high acidity (17.91 per cent) which was much higher than grape juice. So the increment was registered in treatments T2, T3 and T4, respectively and it was also reflected in reduced values of pH. The results of present study were found in confirmation with results of Waskar *et al*., (2009). The colour contributing substances were anthocyanins; phenols etc. Control contains minimum value of colour intensity as grape juice has less anthocyanins content as compared to kokum.

Hence, anthocyanins pigments are responsible for colour development in juice (Tsai and Huang, 2004). So, increasing kokum concentration in grape juice resulted in higher colour intensity in blended juices. Maximum colour intensity was recorded in T4, due to high percentage of kokum extract. The results of present study were found similar to the results of Waskar et al (2009) who have reported that the addition of kokum juice in pomegranate juice the TSS of the resultant blend was decreased with an increase in acidity. The blending of pomegranate and kokum juices in 80%+20% gave good TSS, acidity and anthocyanins. This combination rated the highest for colour score. Grape juice (control) had less antioxidant activity than the kokum extract. Increasing kokum concentration in grape juice increased the antioxidant activity. Antioxidant activity of fruits, vegetables and plant materials results mainly from phenolic, particularly flavonoids. It has been also shown that kokum extract exhibited strongest anti-oxidant activity (Mishra *et al.,* 2006). So the blended juices have improved DPPH assay values than control.

To evaluate the sensory properties of blended juice, collected data were based on 9 point hedonic scale and presented in Table 3. Sensory evaluation of blended juice was significantly affected by the kokum extract addition. Data based on 9 point hedonic scale revealed that colour and flavour scored maximum in case of T4 while T3 was found better for taste and overall acceptability. Mean scores of overall acceptability increased in blended treatments T3 and T4 when compared with control. As the percentage of grape juice decreased, the sensory attribute in sweetness also decreased or in other words sensory attributes of sourness, astringency, colour, flavour and taste increased with the increased per cent of kokum extract.

The degradation rate of anthocyanins significantly increased during storage as the temperature rises. The storage period and treatments both had impact on colour intensity and anthocyanins content of juices. Extended storage period decreased the colour intensity and anthocyanins content in all blended juices (Fig.1). Significant decreased in colour intensity in all treatments due to loss of anthocyanins as mentioned above. Maximum decrease in colour intensity was noted in control T1 as compared to other blended treatments (Fig. 1). Minimum decrease of colour intensity was found in T3 that is due to inter molecular co-pigmentation of anthocyanin that results in stability of colour intensity and anthocyanin in blended juice model systems reported by Malien-Aubert *et al.,* (2001). During storage of juices anthocyanins content was reduced in all the treatments. The reduction in anthocyanins content in same treatment was noted by Alongi *et al*., (2010). They stated reduction in anthocyanins content during storage period was due to formation of potassium bitartrate crystals to which anthocyanin were bound therefore, resulted in loss under refrigeration condition in grape juice. Maximum anthocyanins loss was observed in control (T1) when compared to the blended juices and it may be due to the intermolecular co-pigmentation of anthocyanin in fortified juices as reported by Pacheco-Palencia et al., (2007). The co-pigmentation results in anthocyanin stability in blended juice during storage. The blended Concord grape juices were noted with enhanced nutritional and antioxidant values having improved sensory properties. The kokum extract can be used for blending in juice of easily available white juicy grape varieties also.

Table 1. Physicochemical characteristics of Concord grape juice and fruit extract of Kokum (*Garcinia indica)*.

Parameters	Grape Juice	Kokum extract
TSS (<"B)	17.4	13.20
pH	3.76	1.75
Acidity (%)	0.76	17.91
Total Anothycanin (mg/L)	147.66	372.84
Total Phenol (mg/ml)	0.85	2.78
Total Protein (mg/ml)	21.2	18.75
DPPH assay (mM)	0.532	1.352

Table 2: Physico-chemical parameters of blended grape juices

Treatments	pH	Acidity (%)	Colour Intensity	Anthocyanins (mg/L)	Total Phenolic content (mg/ml)	DPPH (mM)
T1	3.76	0.76	9.68	147.66	0.85	0.532
T2	3.66	0.85	14.67	168.55	1.33	0.638
T3	3.59	0.90	17.72	182.46	1.54	0.749
T4	3.54	0.95	19.15	197.14	1.76	0.895
LSD at 5%	0.031	0.033	0.24	0.283	0.03	0.032

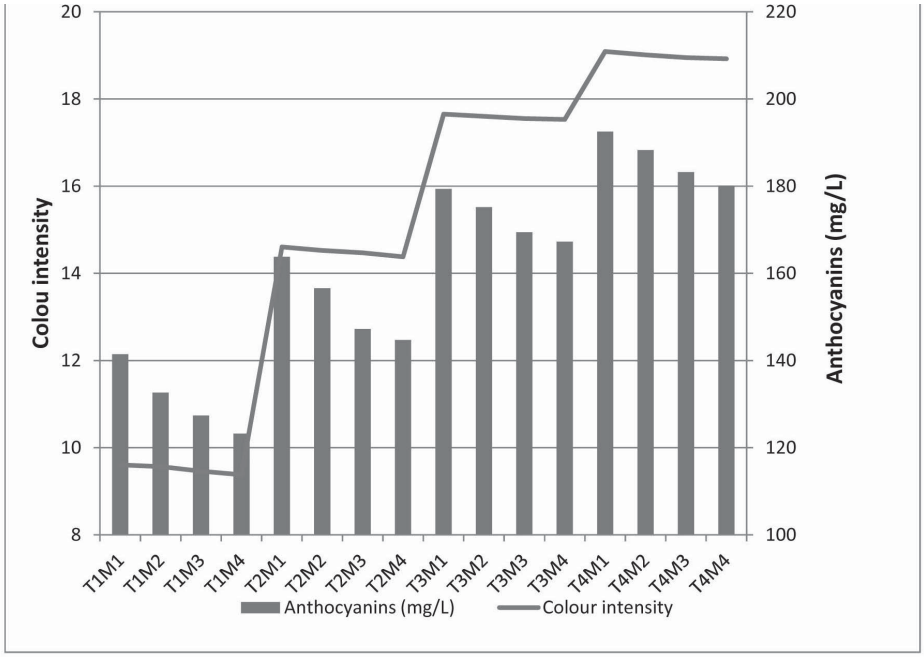

Fig. 1: Colour intensity and anthocyanins in blended juices as affected during storage.

Table 3: Sensory evaluation of blended grape juices Treatments on point hedonic scale

	Colour	Flavour	Taste	Overall acceptability
T1	6.1	7.1	7.6	6.5
T2	4.6	5.7	5.5	6.1
T3	7.6	7.5	8.3	7.7
T4	8.0	7.9	7.1	7.5
LSD at 5%	0.18	0.188	0.26	0.21

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