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# Effect of blending and storage on the physico-chemical, antioxidants and sensory quality of different squashes

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## ABSTRACT

**Amongst *Rhododendron arboreum, Kilmora* (*Berberis asiatica*), *Ghengharu* (*Crataegus crenulata*) and *Galgal* (*Citrus pseudolimon*), the highest (51.06 mg/100 ml) ascorbic acid was recorded in *Galgal* followed by *Kilmora*. The total antioxidants were found maximum (19.88 mM TE/l) in *Rhododendron* followed by *Kilmora* (14.12 mM TE/l). In all the treatments, TSS and acidity of the blended squashes was found to increase and decrease significantly faster at ambient (18-20°C) conditions than low (4°C) temperature. The highest (12.5 mg/100 ml) ascorbic acid was recorded in $T_9$ (*Galgal* juice) and lowest (5.0 mg/100 ml) in $T_1$, (*Rhododendron* juice) $T_5$, (*Kilmora* juice) $T_7$ (*Ghengharu* juice) and $T_8$ (*Ghengharu* 15% + *Galgal* (5% + Ginger 5%) which was found to decrease significantly during storage both at ambient and low temperature. The reducing and total sugars in the blended squashes increased significantly during storage at both conditions. The total antioxidants were maximum (5.00 mM TE/l) in $T_1$ (*Rhododendron* juice), which reduced to 4.65 and 4.84 mM TE/l after 6 months storage at ambient and low temperature respectively. Out of 10 treatments tried, the blended squashes ($T_2$ *Rhododendron* 15% + *Galgal* 5% + ginger 5%, $T_4$ *Rhododendron* 10% + *Ghengharu* 5% + *Galgal* 5% + ginger 5% and $T_3$ *Rhododendron* 15% + *Ghengharu* 5% + *Galgal* 5%) prepared in combination with *Rhododendron* petal juice had an edge over other treatments ($T_1$, $T_5$, $T_6$, $T_7$, $T_8$, $T_9$, $T_{10}$) in the overall quality. The prepared products had a shelf life of 6 months at ambient conditions, whereas at low temperature the products may be stored for one year without any microbial spoilage. The cost of production of the prepared products calculated was as low as 38.33 to 50.00% compared to the similar products (mango squash) available in the market.**

**Key words:** *Rhododendron*, blended squashes, physico-chemical characters, antioxidants, sensory quality.

## INTRODUCTION

Uttarakhand is very rich in plant bio-diversity because of congenial climatic and geographic conditions which is also suitable for growing a number of under-utilized wild fruits. Some of them, though are rich in bio-active compounds as well as antioxidants suitable for nutraceuticals, have not been exploited fully for the commercial preparation of value added products. A few of them, *viz*., *Kilmora* (*Berberis asiatica*), *Ghengharu* (*Crataegus crenulata*), *Galgal* (*Citrus pseudolimon*) etc. are available between 1,500 to 2,500 m above mean sea level however, except for fresh consumption by local people on a small scale are spoiled in the growing areas. These un-exploited fruits are available between May to August whereas the red coloured petals of *Rhododendron arboretum* commonly known as "*Buransh*", highly rich in antioxidants, are available between January to May. Except for the preparation of squash, the *Rhododendron* petals do not have any other commercial importance. Although, the petals of *Rhododendron* are utilized by the local people for the preparation of squash but as the method is faulty due to high temperature (>100°C) during boiling of syrup and petals rendering reduction in antioxidant properties, there is always a burning/cooking taste in the product because of which it didn't have the market beyond limited areas of Uttarakhand. Similarly, *Kilmora*, *Ghengharu* and *Galgal* had very few takers and only the local people use these fruits as fresh and culinary purposes. As these un-exploited fruits are available for a very short period, the value added products will definitely help to provide taste throughout the year if processed during the growing season. It will not only help the growers to get good returns for these under-utilized wild fruits but also provide nutritionally and medicinally rich value-added products for the consumers. Blending has emerged as an alternative to improve the quality of the final product. According to Deka *et al*. (6), it not only provides newer products but also helps in improving nutrition and palatability. Sand pear juice and other temperate fruit juice blends by Attri *et al*. (4), mango-papaya by Kalra *et al*. (9) and mango-pineapple by Deka *et al*. (6) are some of the examples of blended beverages which have been successfully standardized in the recent past.

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The present study was undertaken to utilize the petals of *Rhododendron*, fruits of *Kilmora*, *Ghengharu, Galgal* and rhizome of ginger for preparing blended squashes with storage study both at ambient and low temperature.

## MATERIALS AND METHODS

The present study was undertaken during 2010-11 at Central Institute of Temperate Horticulture-Regional Station, Mukteshwar, which is situated at 2200 m above mean sea level in Nainital district of Uttarakhand. The petals of *Rhododendron arboreum* were collected during May from the mountains of *Kumaon* hills, whereas the fruits of *Kilmora*, *Ghengharu* and *Galgal* were procured in May-July from the adjoining areas of Mukteshwar. The petals of *Rhododendron* were sorted out, washed in running water and subjected to extraction of juice after grinding petals with 100 ml water per kg. From the ground mass the juice was extracted manually through muslin cloth. The collected fruits of *Kilmora*, *Ghengharu* and *Galgal* were washed in running water, dried and the juice was extracted manually through muslin cloth. The rhizomes of ginger were washed, peeled and ground in mixer-grinder. The ground mass was filtered through muslin cloth and the juice was separated. The fruits as well as extracted juices were subjected to physical characters analysis, *viz*., weight (g), length (mm), breadth (mm), juice (%) and pomace (%) by following standard methods, whereas, titrable acidity (%) by titrating a known volume of aliquot against N/10 NaOH using phenolphthalein as indicator and ascorbic acid contents (mg/100 g) by titrating a known volume of juice with metaphosphoric acid against 2,6 dicholophenol indophenol dye as described by Ranganna (12). The total soluble solids (TSS) of the juice were recorded with hand refractometer (Erma, Japan) and expressed as °Brix. The reducing sugars (%), total sugars (%) and total carotenoids (µg/100 g) of the extracted juice were estimated by following the method of AOAC (2). The total antioxidants (mM TE/l) in the juices as well as blended squashes were recorded as per the standard method of Apak *et al*. (3). The extracted juices were blended in different ratios keeping the final percentage of juice at 25% under various treatments as given in Table 1.

The squashes were prepared after boiling sugar syrup, filteration, cooling and blending the juices as per Table 1. In the prepared squashes sodium benzoate was added @ 600 ppm/l and after bottling the products in 300 ml glass bottles were stored at ambient (18-20°C) and low temperature (4°C). During storage for 6 months the products were analysed for various physico-chemical and quality characteristics at regular intervals as per the methods described earlier. The sensory evaluation of the prepared products was carried out by a panel of 10 judges for different quality parameters at the time of preparation and after 3 and 6 months storage as per the method described by Attri *et al*. (4). The prepared products were also evaluated for the cost of production by adding the cost of raw material as well as profit on the same. The factorial completely randomized block design experiment comprising ten treatments (T), two storage conditions (SC) and treatment × storage condition (T × SC) was replicated thrice. The data on T, SC and T × SC as well as sensory quality characteristics were analysed statistically through MSTAT C software (Gomez and Gomez, 8).

**Table 1.** Treatment combination of major and minor fruit juices for preparation of blended squashes.

| Treatment | Combination |
|---|---|
| $T_1$ | *Rhododendron* juice (25%) |
| $T_2$ | *Rhododendron* (15%) + *Galgal* (5%) + ginger (5%) |
| $T_3$ | *Rhododendron* (15%) + *Ghengharu* (5%) + *Galgal* (5%) |
| $T_4$ | *Rhododendron* (10%) + *Ghengharu* (5%) + *Galgal* (5%) + ginger (5%) |
| $T_5$ | *Kilmora* juice (25%) |
| $T_6$ | *Kilmora* (15%) + *Ghengharu* (5%) + ginger (5%) |
| $T_7$ | *Ghengharu* (25%) |
| $T_8$ | *Ghengharu* (15%) + *Galgal* (5%) + ginger (5%) |
| $T_9$ | *Galgal* (25%) |
| $T_{10}$ | *Galgal* (20%) + ginger (5%) |

## RESULTS AND DISCUSSION

The physico-chemical characters of the petals of *Rhododendron* and fruits of *Kilmora*, *Ghengharu* and *Galgal* have been given in Table 2. The petals of *Rhododendron* were found rich in total antioxidants (19.88 mM TE/L) followed by *Kilmora* (14.12 mM TE/l). The variation in physico-chemical characters of different fruits are in conformity with those reported by Singh *et al*. (14) in some wild edible fruits. The effect of blending and storage on the total soluble solids of different squashes at ambient and low temperatures in Table 3 revealed that there were significant differences amongst the treatments which also varied during storage. The TSS was found to increase from 48.1 to 48.6°Brix in $T_5$ stored at ambient (18-20°C) compared to 48.1 to 48.4°Brix at low (4°C) temperature during storage for six months. The increase may be attributed due to the

**Table 2.** Physico-chemical characters of different under-utilized wild fruits.

| Character | Under-utilized fruit | | | |
|---|---|---|---|---|
| | *Rhododendron* | *Kilmora* | *Ghengharu* | *Galgal* |
| Fruit weight (g) | - | 0.39 | 0.24 | 248.75 |
| Length (mm) | - | 9.30 | 6.55 | 101.05 |
| Breadth (mm) | - | 8.77 | 9.27 | 77.85 |
| TSS (°Brix) | 12.3 | 19.40 | 11.00 | 7.00 |
| Juice (%) | - | 58.26 | 53.73 | 41.00 |
| Waste (%) | - | 41.74 | 46.27 | 59.00 |
| Acidity (%) | 0.67 | 2.94 | 0.67 | 4.64 |
| Ascorbic acid (mg/100 g) | 19.5 | 37.50 | 21.18 | 51.06 |
| Reducing sugars (%) | 5.00 | 4.54 | 3.70 | 2.50 |
| Total sugars (%) | 8.34 | 14.29 | 4.00 | 4.76 |
| Total carotenoids (µg/100 g) | - | 63.25 | - | - |
| Total antioxidants (mM TE/l) | 19.88 | 14.12 | 9.83 | 2.64 |
| TSS : acid ratio | 18.35 | 6.58 | 16.42 | 1.51 |

**Table 3.** Effect of blending and storage period on the total soluble solids (°Brix) of different blended squashes.

| Treatment | Storage period | | | | | |
|---|---|---|---|---|---|---|
| | 0 month | | 3 month | | 6 month | |
| | Ambient temp. | Low temp. | Ambient temp. | Low temp. | Ambient temp. | Low temp. |
| $T_1$ | 46.3 | 46.3 | 46.6 | 46.4 | 46.8 | 46.5 |
| $T_2$ | 43.6 | 43.6 | 43.8 | 43.6 | 44.0 | 43.8 |
| $T_3$ | 45.4 | 45.4 | 45.8 | 45.6 | 46.0 | 45.8 |
| $T_4$ | 46.7 | 46.7 | 47.0 | 46.8 | 47.2 | 47.0 |
| $T_5$ | 48.1 | 48.1 | 48.4 | 48.2 | 48.6 | 48.4 |
| $T_6$ | 46.7 | 46.7 | 47.0 | 46.8 | 47.2 | 47.0 |
| $T_7$ | 45.9 | 45.9 | 46.0 | 46.0 | 46.2 | 46.2 |
| $T_8$ | 45.9 | 45.9 | 46.2 | 46.0 | 46.4 | 46.2 |
| $T_9$ | 46.1 | 46.1 | 46.4 | 46.2 | 46.6 | 46.4 |
| $T_{10}$ | 45.8 | 45.8 | 46.0 | 46.0 | 46.2 | 46.2 |
| $CD_{0.05}$ | | | | | | |
| Treatment (T) | 2.99 | | 2.94 | | 2.94 | |
| Storage condition (SC) | NS | | 6.57 | | 6.59 | |
| T × SC | NS | | 9.29 | | 9.32 | |

breakdown of insoluble polysaccharides to simple sugars. Similar trend in TSS was also observed by Doreyappa Gowda and Huddar (7) during storage of canned mango pulp. The present findings are also in conformity with those reported by Tripathi *et al*. (17), Attri *et al*. (4) and Pandey and Singh (10) in pineapple-guava RTS, sand pear and temperate fruit juices blends and guava RTS, respectively.

The titrable acidity (%) of the various treatments was significantly different which showed significant reduction at ambient as well as low temperature storage with faster in former than latter during six months storage (Table 4). The reduction in the acidity during storage may be attributed to its utilization for conversion of complex polysaccharides to simple sugars. The results are in line with those reported by

**Table 4.** Titrable acidity (%) of different blended squashes affected by blending and storage period.

| Treatment | Storage period | | | | | |
|---|---|---|---|---|---|---|
| | 0 month | | 3 month | | 6 month | |
| | Ambient temp. | Low temp. | Ambient temp. | Low temp. | Ambient temp. | Low temp. |
| $T_1$ | 0.335 | 0.335 | 0.330 | 0.332 | 0.325 | 0.320 |
| $T_2$ | 0.335 | 0.335 | 0.328 | 0.330 | 0.320 | 0.315 |
| $T_3$ | 0.469 | 0.469 | 0.450 | 0.458 | 0.440 | 0.430 |
| $T_4$ | 0.402 | 0.402 | 0.335 | 0.332 | 0.330 | 0.330 |
| $T_5$ | 0.804 | 0.804 | 0.775 | 0.790 | 0.750 | 0.785 |
| $T_6$ | 0.670 | 0.670 | 0.650 | 0.665 | 0.635 | 0.650 |
| $T_7$ | 0.134 | 0.134 | 0.130 | 0.132 | 0.125 | 0.120 |
| $T_8$ | 0.335 | 0.335 | 0.325 | 0.330 | 0.320 | 0.320 |
| $T_9$ | 1.675 | 1.675 | 1.650 | 1.665 | 1.655 | 1.655 |
| $T_{10}$ | 1.340 | 1.340 | 1.310 | 1.325 | 1.302 | 1.310 |
| $CD_{0.05}$ | | | | | | |
| Treatment (T) | 0.34 | | 0.34 | | 0.34 | |
| Storage condition (SC) | NS | | 0.15 | | 0.15 | |
| T × SC | NS | | 0.48 | | 0.48 | |

Deka *et al*. (6) in mango-pineapple spiced beverage during storage. Table 5 revealed that there was a significant difference among different treatments in the ascorbic acid contents with highest (12.5 mg/100 ml) in $T_9$. During six months storage it was found to reduce to 11.0 and 11.5 mg/100 ml, respectively at ambient and low temperature conditions. The reduction in the ascorbic acid of the squashes during storage may be

**Table 5.** Effect of blending and storage period on ascorbic acid content (mg/100 g) of different blended squashes.

| Treatment | Storage period | | | | | |
|---|---|---|---|---|---|---|
| | 0 month | | 3 month | | 6 month | |
| | Ambient temp. | Low temp. | Ambient temp. | Low temp. | Ambient temp. | Low temp. |
| $T_1$ | 5.0 | 5.0 | 4.5 | 5.0 | 4.0 | 4.5 |
| $T_2$ | 7.5 | 7.5 | 7.0 | 7.0 | 6.5 | 6.0 |
| $T_3$ | 7.5 | 7.5 | 7.0 | 7.0 | 6.0 | 5.0 |
| $T_4$ | 7.5 | 7.5 | 7.0 | 7.0 | 6.5 | 6.0 |
| $T_5$ | 5.0 | 5.0 | 4.0 | 5.0 | 4.0 | 4.5 |
| $T_6$ | 7.5 | 7.5 | 6.5 | 7.0 | 6.0 | 5.0 |
| $T_7$ | 5.0 | 5.0 | 4.0 | 5.0 | 4.0 | 4.5 |
| $T_8$ | 5.0 | 5.0 | 4.5 | 5.0 | 4.0 | 4.5 |
| $T_9$ | 12.5 | 12.5 | 11.5 | 12.0 | 11.0 | 11.5 |
| $T_{10}$ | 10 | 10 | 9.0 | 10.0 | 8.5 | 9.5 |
| $CD_{0.05}$ | | | | | | |
| Treatment (T) | 1.48 | | 1.33 | | 1.07 | |
| Storage condition (SC) | NS | | 0.59 | | 0.48 | |
| T × SC | NS | | 1.88 | | 1.51 | |

due to the conversion of same to dehydro-ascorbic acid. The results are in agreement with those reported by Attri *et al*. (4) and Deka *et al*. (6) in sand pear and temperate juices blends and mango-pineapple spiced beverage, respectively.

A significant difference in reducing sugars among various treatments was recorded with maximum (7.14%) in $T_{10}$ and minimum (1.32%) in $T_1$, which increased to 7.84 and 7.46% after six months storage at ambient and low temperature conditions respectively (Table 6). Similarly, the total sugars were found significantly different among various treatments with highest (42.55%) in $T_5$ which increased to 43.10 and 42.90% after 6 months storage at ambient and low temperature respectively (Table 7). Gradual hydrolysis of non-reducing forms of sugars into simple sugars might be the reason for increase in the reducing as well as total sugars of the blended squashes. Further, it may be due to the degradation of insoluble polysaccharides like hemicelluloses and oligosaccharides into soluble compounds. Increase in reducing and total sugar contents in mango pulp during storage was also reported by Kalra and Tandon (8). Similarly, changes in sugars were also found in beverages prepared from Rumani mango blended with Dashehari and Mallika by Tandon *et al*. (16). Deka *et al*. (6) and Singh *et al*. (15) also registered an increase in the sugar contents in mango-pineapple spiced beverage and jams from combinations of different fruit pulps during storage. Altaf *et al*. (1), Sethi (13) and Prasad and Mali (11) had also recorded similar changes in physico-chemical characters of mango nectar, litchi squash and pomegranate squash, respectively during storage. The antioxidants are liable to change during storage which was revealed in the present study. Among different treatments the highest (5.00 mM TE/l) total antioxidants were recorded in $T_1$ followed by $T_5$ and $T_3$. During storage it was found to reduce significantly to 4.65 and 4.84 mM TE/l at ambient and low temperature respectively (Table 8). The reduction in the antioxidant contents may be due to the oxidation of the pigments faster at ambient than low temperature conditions. Deka *et al*. (6) has also reported similar findings in mango-pineapple spiced beverage.

The sensory quality of different squashes depicted in Fig. 1 revealed that the treatments ($T_2$, $T_4$ and $T_3$) by blending *Rhododendron* with other fruit juices, *viz*., *Galgal*, *Ghengharu* and ginger had an edge over other treatments ($T_1$, $T_5$, $T_6$, $T_7$, $T_8$, $T_9$, $T_{10}$) during different intervals of storage at ambient conditions. A significant linear reduction in the quality parameters was recorded during storage which may be due to the breakdown and degradation of colour and appearance of the squashes. Das (5) has also reported a fall in acceptability of *jamun* beverage during storage at room temperature. Further, Tripathi *et al*. (17), Attri *et al*. (4) and Deka *et al*. (6) had

**Table 6.** Reducing sugars (%) of different blended squashes affected by blending and storage period.

| Treatment | Storage period | | | | | |
|---|---|---|---|---|---|---|
| | 0 month | | 3 month | | 6 month | |
| | Ambient temp. | Low temp. | Ambient temp. | Low temp. | Ambient temp. | Low temp. |
| $T_1$ | 1.32 | 1.30 | 1.45 | 1.35 | 1.54 | 1.40 |
| $T_2$ | 2.08 | 2.08 | 2.25 | 2.15 | 2.35 | 2.25 |
| $T_3$ | 5.56 | 5.56 | 5.70 | 5.60 | 5.85 | 5.75 |
| $T_4$ | 2.50 | 2.50 | 2.80 | 2.60 | 2.95 | 2.75 |
| $T_5$ | 4.17 | 4.17 | 4.40 | 4.25 | 4.57 | 4.45 |
| $T_6$ | 3.34 | 3.34 | 3.60 | 3.45 | 3.75 | 3.58 |
| $T_7$ | 1.47 | 1.47 | 1.67 | 1.55 | 1.80 | 1.65 |
| $T_8$ | 1.56 | 1.56 | 1.70 | 1.64 | 1.90 | 1.76 |
| $T_9$ | 3.57 | 3.57 | 3.80 | 3.72 | 3.92 | 3.84 |
| $T_{10}$ | 7.14 | 7.14 | 7.69 | 7.35 | 7.84 | 7.46 |
| $CD_{0.05}$ | | | | | | |
| Treatment (T) | 1.02 | | 1.02 | | 1.08 | |
| Storage condition (SC) | NS | | 0.45 | | 0.48 | |
| T × SC | NS | | 1.44 | | 1.53 | |

**Table 7.** Effect of blending and storage period on total sugars (%) of different blended squashes.

| Treatment | Storage period | | | | | |
|---|---|---|---|---|---|---|
| | 0 month | | 3 month | | 6 month | |
| | Ambient temp. | Low temp. | Ambient temp. | Low temp. | Ambient temp. | Low temp. |
| $T_1$ | 40.00 | 40.00 | 41.00 | 40.50 | 41.50 | 40.65 |
| $T_2$ | 38.46 | 38.46 | 39.40 | 39.00 | 40.00 | 39.20 |
| $T_3$ | 39.21 | 39.21 | 39.80 | 39.45 | 40.20 | 39.60 |
| $T_4$ | 41.67 | 41.67 | 41.94 | 41.75 | 42.00 | 41.90 |
| $T_5$ | 42.55 | 42.55 | 42.85 | 42.70 | 43.10 | 42.90 |
| $T_6$ | 40.00 | 40.00 | 41.00 | 40.40 | 41.60 | 40.60 |
| $T_7$ | 39.21 | 39.21 | 39.75 | 39.50 | 40.10 | 39.65 |
| $T_8$ | 40.00 | 40.00 | 40.80 | 40.40 | 41.00 | 40.60 |
| $T_9$ | 40.00 | 40.00 | 40.70 | 40.30 | 41.02 | 40.50 |
| $T_{10}$ | 39.21 | 39.21 | 39.86 | 39.60 | 40.15 | 39.75 |
| $CD_{0.05}$ | | | | | | |
| Treatment (T) | 5.76 | | 5.83 | | 5.99 | |
| Storage condition (SC) | NS | | 2.60 | | 2.68 | |
| T × SC | NS | | 8.24 | | 8.47 | |

**Table 8.** Total antioxidants (mM TE/l) of different blended squashes affected by blending and storage period.

| Treatment | Storage period | | | | | |
|---|---|---|---|---|---|---|
| | 0 month | | 3 month | | 6 month | |
| | Ambient temp. | Low temp. | Ambient temp. | Low temp. | Ambient temp. | Low temp. |
| $T_1$ | 5.00 | 5.00 | 4.80 | 4.90 | 4.65 | 4.84 |
| $T_2$ | 3.20 | 3.20 | 3.00 | 3.08 | 2.85 | 3.00 |
| $T_3$ | 3.65 | 3.65 | 3.45 | 3.55 | 3.30 | 3.47 |
| $T_4$ | 2.65 | 2.65 | 2.50 | 2.56 | 2.40 | 2.50 |
| $T_5$ | 3.78 | 3.78 | 3.50 | 3.60 | 3.15 | 3.40 |
| $T_6$ | 2.62 | 2.62 | 2.32 | 2.50 | 2.10 | 2.42 |
| $T_7$ | 2.46 | 2.46 | 2.23 | 2.35 | 2.02 | 2.27 |
| $T_8$ | 1.65 | 1.65 | 1.48 | 1.53 | 1.36 | 1.48 |
| $T_9$ | 0.70 | 0.70 | 0.58 | 0.62 | 0.48 | 0.56 |
| $T_{10}$ | 0.55 | 0.55 | 0.46 | 0.50 | 0.40 | 0.45 |
| $CD_{0.05}$ | | | | | | |
| Treatment (T) | 0.64 | | 0.61 | | 0.59 | |
| Storage condition (SC) | NS | | 0.27 | | 0.26 | |
| T × SC | | | 0.86 | | 0.84 | |

also reported reduction in the sensory quality of the pineapple-guava RTS, sand pear juice and temperate fruit juices blends and mango-pineapple spiced beverage during storage respectively. The cost of production of the squashes of different combinations illustrated in Fig. 2 revealed that there was a significant difference amongst various treatments because of the cost of inputs used in the

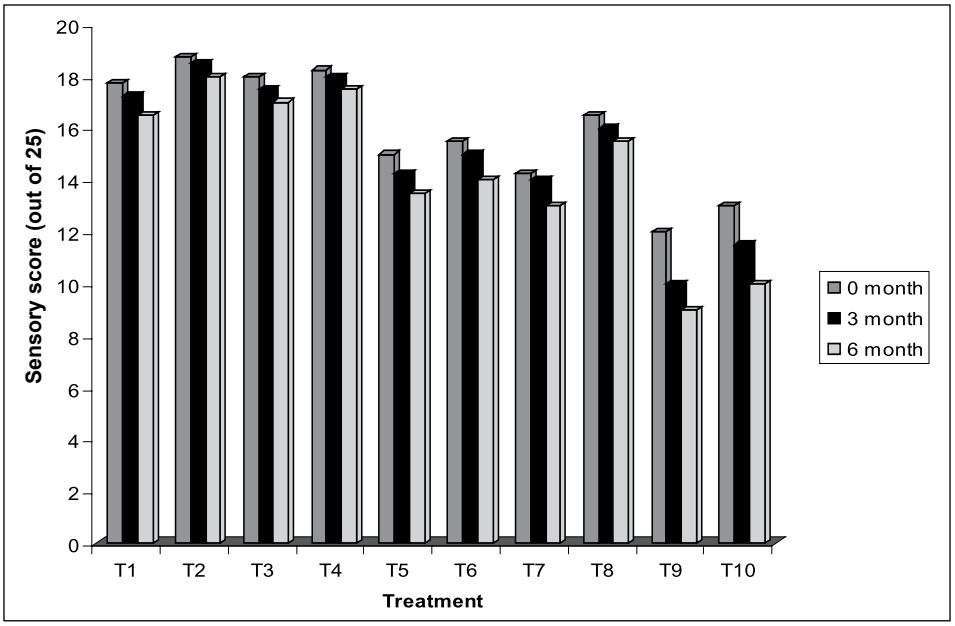


**Fig. 1.** Sensory evaluation of different blended squashes at various storage intervals at ambient temperature.

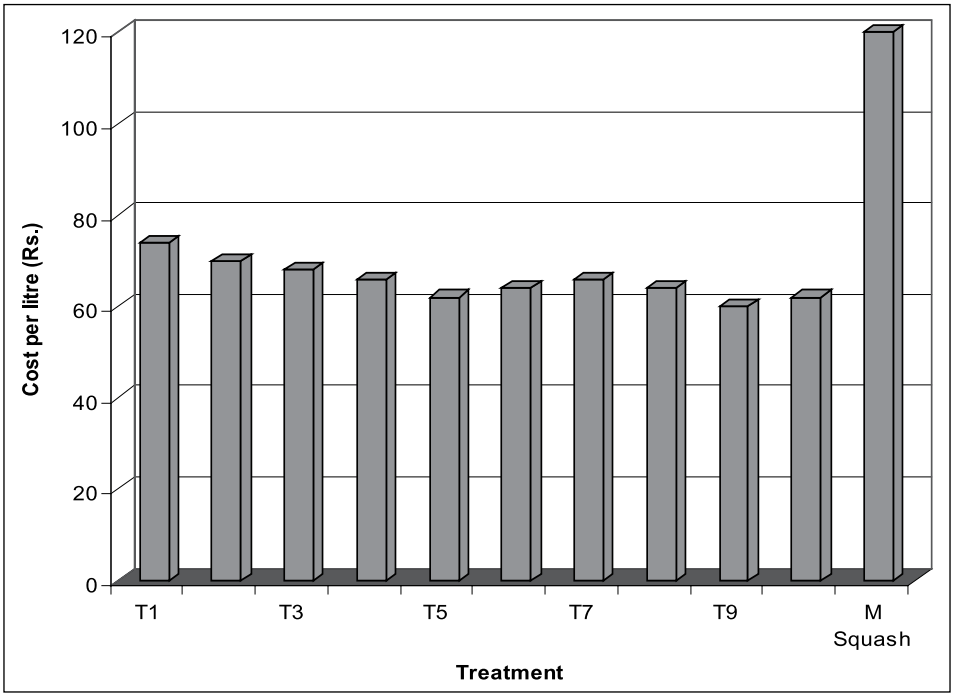


**Fig. 2.** Cost of production of different blended squashes compared with market product (mango squash).

preparation of the products. The final cost of the prepared squashes was recorded as low as 38.33 to 50.00% compared to the similar processed products (mango squash) available in the market. The cost may further be reduced if the production is done on commercial scale by any processing industry.

From the present study it may be concluded that the under-utilized but highly nutritional fruits found growing in the hilly areas of Uttarakhand had ample opportunities to be processed into value-added products of very high quality. The fruits available for a short duration may be processed into products which

can be utilized not only in the areas of production but also in other parts of the country. The rich antioxidant properties of deep red coloured petals of *Rhododendron arboretum* as well as fruits of *Kilmora*, *Ghengharu* and *Galgal* offer an opportunity to the processing industry for preparing the products of high quality. The blended products comprising *Rhododendron* petals yielded the best products having deep red colour. The storage studies also revealed that the prepared products can be stored for 6 months without much change even at ambient storage conditions.

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