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Preparation and quality evaluation of carrot and sour orange blended juice ready to serve drink

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Abstract
Preparation and quality evaluation of carrot and sour orange blended juice ready to serve drink was studied. Blended juice was prepared using different formulations. Different samples of blended juice were prepared having ratio of carrot and sour orange juice as T_0 (100:0), T_1 (90: 10), T_2 (80:20), T_3 (70:30), T_4 (60:40) and T_5 (50:50). Samples were preserved with sodium benzoate at the rate of 0.1%. Crystal clear plastic bottles used for sample packing and placed at ambient temperature. Physicochemical and sensory evaluation of blended juice was also studied and their value are given as total soluble solid (T_0=11.9, T_1= 11.9, T_2=12.1, T_3=11.8, T_4=11.9, T_5=11.9), pH (T_0=3.97, T_1=3.9, T_2=3.93, T_3=3.86, T_4=3.89, T_5=3.9), vitamin C (T_0=34.6, T_1=46.2, T_2=38.5, T_3=50, T_4=42.3, T_5=38.5), acidity (T_0=0.256, T_1=0.16, T_2=0.256, T_3=0.224, T_4=0.228, T_5=0.352), sugar acid ratio (T_0=46.48, T_1=74.37, T_2=47.65, T_3=52.67, T_4=41.31, T_5=33.8), color (T_0=9, T_1=7, T_2=8, T_3=8.6, T_4=8.3, T_5=8), flavor (T_0=8, T_1=8, T_2=7.6, T_3=8.6, T_4=8, T_5=7.6) and overall acceptability (T_0=8, T_1=8, T_2=7, T_3=8.5, T_4=8, T_5=7.3). The result based on sensory and quality evaluation showed that T_3 (70 % carrot and 30% sour orange) having maximum nutrients and having good quality attributes.

Keywords: blended juice, sour orange, carrot, sodium benzoate

Introduction
Vegetables and fruits are vital for good health at all ages as it is an important part of healthy diet. Moreover, the natural compounds in vegetables and fruits like tannins, flavonoids and polyphenols have shown amazing results against fungus, virus and bacterial infections (Rosnah *et al*., 2012) [15]. Health benefits linked with intake of fruit juices regularly are depends on the usage of bioactive components like polyphenolic compounds and essential vitamins. Accumulating evidences elaborate that polyphenols are found as effective agents for degenerative disorders of humans like inflammation, aging, atherosclerosis and cancer (Leja *et al*., 2013) [13].

In root vegetable Carrot (*Daucus carota*) is important vegetable which is a rich source of β-carotene containing highly nutritional value worldwide and often used for juice production because of its significant amount of minerals and vitamins present (Walde *et al*., 1992; Demir *et al*., 2004) [19, 6]. In many countries carrot juice consumption increases during recent years (Schieber *et al*., 2001) [16]. Carrot juice is a rich source of β-carotene, vitamin A and minerals like potassium and calcium, and it is easily digested than raw or cooked vegetables (Verbeyst *et al*., 2012) [18].

Orange (*Citrus cinensis) on* the other hand, is a distinguished, widely consumed fruit, particularly appreciated for its fresh flavor, vitamin C, and its natural antioxidants source having health benefits (Campos *et al*., 2010) [4]. Orange juice is the most popular juice marketed, recognized and accepted worldwide. Its higher commercial value because of its sensory qualities like taste, color and odor chiefly famous for higher ratio of vitamin C and natural anti-oxidants (Rapisarda *et al*., 2001; Rivas *et al*., 2006) [14].

Juice blending is an amazing method to increase the nutritional value of the juices. It can enhance the quality, mineral and vitamin contents present in vegetables and fruits used in blending (De Carvalho *et al*., 2007) [5]. The blend of orange and carrot is a rich source of antioxidants and also a rich dietetic source of them (Bezman *et al*., 2001) [3]. So, our study aimed to increase the nutritional value by blending different type of juices and isolate the best treatment or combination ratio for citrus and carrot blended juice.

Material and Methods
Research carried out at Hazara Agriculture Research Station Abbottabad, KPK, Pakistan during 2015. The fresh oranges were brought from the orchard and fresh carrots were purchased from the local market. After all preparatory operations carrot and sour orange juice were blended with different concentration as below:

T_0 = control
T_1 = carrot juice 90% + sour orange juice 10%
T_2 = carrot juice 80% + sour orange juice 20%
T_3 = carrot juice 70% + sour orange juice 30%
T_4 = carrot juice 60%+ sour orange juice 40%
T_5 = carrot juice 50% + sour orange juice 50 %

Then packed in 250ml capacity transparent plastic bottles and stored at room temperature for physicochemical analysis by AOAC (2000) [2] methods and organoleptic evaluation by using 9 points hedonic scale of Larmond (1977) [11].

Statistical Analysis
The data obtained were analyzed by using (CRD) and for comparison of mean LSD test was used (Steel *et al.*, 1997) [17].

Results and Discussion

pH

The pH has great importance to maintain shelf stability; pH can also influence the flavor and processing requirements of the beverage. The data about pH value has been presented in Table 1. The data revealed that there was variation in pH within the treatment. It was found that the minimum pH (3.86) was recorded in blended juice of carrot and sour orange at 70:30 while the highest value of pH (3.97). These results are in accordance with the results of Ahmed *et al.* (2008) [1].

Vitamin C

During storage important nutritional content vitamin C degrades. Vitamin C is an important anti-oxidant, helps protect against cancers, heart disease, stress, it is part of the cellular chemistry that provides energy, it is essential for sperm production, and for making the collagen protein involved in the building and health of cartilage, joints, skin, and blood vessels. The highest value for vitamin C was recorded in T_3 (50) then T_1 (46.2). While the lowest value was observed in T_0 (34.6). The results are in line with the results of Jan and Er. Darcous (2012) [8] and Jain and Khurdiya (2005) who found that blended juice boosts their nutritional quality in term of vitamin C.

Titratable Acidity

Titratable acidity is directly proportional and is a measure of shelf life of the product and guard against the attack of micro-organisms. It also helps to ensure some chemical changes during preparation and storage. Results regarding titratable acidity are given in Table 1. T_5 has highest level of acidity that was 0.352 while T_1 has lowest level of acidity that was 0.16 as shown in Table 1.

Total Soluble Solid (TSS)

The result showed that in all treatments the total soluble solid were almost same. There was no

Table 1: Mean Values for Physico-chemical parameter of Carrot and Sour Orange Blended Juice

Treatments	pH	Vitamin C (mg/100g)	Acidity (%)	TSS (%)	Sugar acid ratio
T_0	3.97	34.6	0.256	11.9	46.48
T_1	3.9	46.2	0.16	11.9	74.37
T_2	3.93	38.5	0.256	12.1	47.65
T_3	3.86	50	0.224	11.8	52.67
T_4	3.89	42.3	0.288	11.9	41.31
T_5	3.9	38.5	0.352	11.9	33.8

Significant difference in the treatments. Kausar *et al.* (2012) [9] observed similar trend for cucumber melon blended drink. These findings are linked with the results of Kayshar *et al.* (2014) [10] and Leahu *et al.* (2013) [12].

Sugar Acid Ratio

Sugar acid ratio is a best indicator for measuring relative sweeteners or tartness of the product. The higher the brix in relation to acid contents of the drink then it means higher will be the ratio of sugars and sweeter the taste. Similarly lower the brix in relation to acidity of the drink and product will be sour in taste. The results showed that T_1 has the highest sugar acid ratio and T_5 has the lowest sugar acid ratio. The results are in accordance with the result of Ahmed *et al.* (2008) [1] who revealed that the sugar acid ratio increases as the titratable acidity decreases and brix increases.

Sensory Evaluation

Color

Color is most important factor because the acceptance and rejection of the product depend upon its physical appearance. Highest value was found in T_0 (9) as followed by T_3 (8.6), T_4 (8.3) and T_2, T_5 (8) as shown in Table 2. T_1 depicted the lowest value of color (7).

Table 2: Mean Values for Sensory Evaluation of Carrot and Sour Orange Blended Juice

Treatments	Color (1-9)	Flavor (1-9)	Overall acceptability (1-9)
T_0	9	8	8
T_1	7	8	8
T_2	8	7.6	7
T_3	8.6	8.6	8.5
T_4	8.3	8	8
T_5	8	7.6	7.3

Flavor

Data regarding to flavor has been depicted in Table 2. It was shown that the maximum value (8.6) for flavor found in T_3(8) in T_0, T_1 and T_4 respectively. Similarly, minimum value (7.6) was found in T_2 and T_5.

Overall Acceptability

Overall acceptability is the composite of all the other sensory evaluation principles (flavor, color etc.). Overall acceptability of blended juice shown the significant variation among all the treatments. It was shown that maximum value (8.5) found in T_3. T_0, T_1 and T_4 has the same value that was 8 while in T_5 value recorded was 7.3. Minimum value (7) for overall acceptability was found in T_2.

Conclusion

It was concluded that the carrot and sour orange blended juice prepared at 70:30 was the best treatment and most acceptable as it had higher value of vitamin C and also higher score for sensory evaluation.

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