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Studies of physicochemical characteristics of carrot and tomato juice blend

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Abstract
The freshly harvested carrot and tomato are taken for preparation of carrot and tomato juice blend 70:30. Various physico-chemical attributes of the carrot and tomato like TSS, titratable acidity and pH. The color was found to orange red which was most acceptable for carrot and tomato beverage. Further, the physicochemical of the juice blend is carried out.

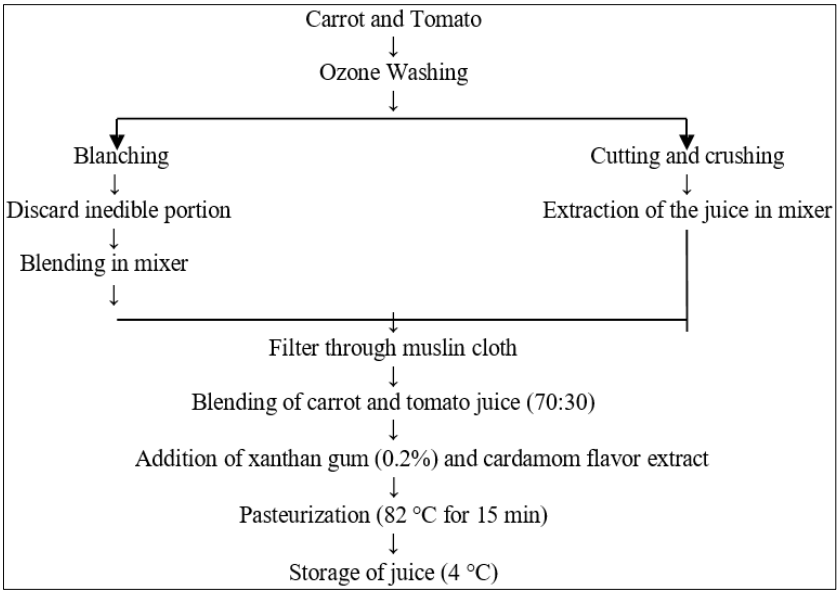
Keywords: Carrot juice, Tomato juice, pH, TSS and acidity

1. Introduction
Carrot (*Daucuscarota* L.) is the most important crop of Apiaceae family. It is a root vegetable that has worldwide distribution. Carrots were first used for medical purposes and gradually used as food. Written records in Europe indicated that carrots were cultivated prior to the tenth century. The colors of the carrot root flesh may be white, yellow, orange, red, purple, or very dark purple. Orange carrots, today more popular, were developed in the 15th and 16th centuries in Central Europe. A rapid rise in the popularity of orange carrots was observed with the recognition of its high pro vitamin A content. Carotenoids and anthocyanin's are the major antioxidant pigments found in carrots. Carotenoids are the yellow, orange, or red colored phytochemicals found in most yellow and orange fleshed cultivars. The widely used orange carrot is high in α- and β-carotene and is a rich source of pro vitamin A. Yellow carrot color is due to lutein which plays an important role in prevention of macular degeneration.
The red water-soluble anthocyanin pigment and the red water insoluble lycopene pigment present in the roots of some cultivars do not contribute to the pro vitamin A content.
Carrots have also a unique combination of three flavonoids: kaempferol, quercetin and luteolin. They are also rich in other phenols, including chlorogenic, caffeic and p-hydroxybenzoic acids along with numerous cinnamic acid derivates. Among hydroxycinnamic acid and its derivates, chlorogenic acid represents 42.2% to 61.8% of total phenolic compounds detected in different carrot tissues. Bioactive polyacetylenes, such as falcarinol (synonymous with panaxynol), and falcarindiol are found in carrots. The concentration of falcarinolin fresh carrots depends on carrot tissue cultivar and water stress. Falcarinol is the most bioactive phytochemical of the carrot polyacetylenes. It is though that this compound may stimulate cancer-fighting mechanisms in the human body. The mode of action behind the favorable effect of falcarinol may be due to its hydrophobicity and its ability to form an extremely stable carbocation with the loss of water thereby acting as a very reactive alkylating agent toward proteins and other biomolecules. A bitter coumarin compound is formed when carrots are stored.
Among 39 fruits and vegetables carrots have been ranked 10th in nutritional value. Carrot is a good source of dietary fiber and of the trace mineral molybdenum, rarely found in many vegetables. Molybdenum aids in metabolism of fats and carbohydrates and is important for absorption of iron. It is also a good source of magnesium and manganese. Magnesium is needed for bone, protein, making new cells, activating B vitamins, relaxing nerves and muscles, clotting blood, and in energy production. Insulin secretion and function also require magnesium. Potassium and magnesium in carrots help in functioning of muscle (Joao *et al.*, 2014) [2].
Carrot juice contains carbohydrates, dietary fiber, protein, fat, Vitamins A, C, B1, B2, B3, B6 and E. It also contains traditional antioxidants such as ascorbic acid, phytonutrient and beta-carotene (Gopalan *et al.*, 1996) [1].

Tomato (*Solanum lycopersicum* Mill.) belonging to the family Solanaceae and is the most important warm season fruit vegetable both nutritionally and economically grown throughout the world. It is one of the most important "protective foods because of its special nutritive value and its widespread production (Kavya, 2013) [3]. Over 20 million metric tons of tomatoes are produced each year on a world basis. Tomatoes contain abundant health- promoting related components such as lycopene, provitamin A, ascorbic acid, vitamin E, folate, flavonoids and potassium. Among the processed tomatoes, juices may also be considered as health-promoting beverages (Naga *et al*., 2016) [5].

2. Materials and Methods

Carrot having local variety and tomato having variety *Vaishali* from Parbhani local market were used for extraction of juice by two different ways that *viz* unblanched fresh carrot and tomato and secondly blanched carrot and tomato by using domestic mixer. The temperature if blanching used was 950C for 5 min and method of blanching is water blanching which was inferred to be better and selected for enzyme activation (Shivhare *et al.*, 2009) [8]. The damaged carrot and tomato were removed and healthy carrot and tomato of uniform size and appearance were washed with water and wiped completely dry. To obtain juice, the first method consisted of manually cutting into small pieces of the carrot and tomato and after removing unwanted portion, extracting the juice by a household mixer (blending of pieces). While in the second method, carrot and tomato were blanched firstly and the juice was immediately extracted using household domestic mixer. The juice obtained was strained through muslin cloth (Miguel *et al.*, 2004) [4]**.** Then add xanthan gum 0.2% and cardamom flavor extract in juice. This juice was pasteurized at 820 C for 15 min. Store the juice at 40C (Thakur and Sharma 2017) [10]. For preparation of carrot and tomato juice flow sheet given:



Flow sheet 1: Preparation of carrot and tomato juice

2.1 Physico-Chemical characteristics of carrot and tomato juice

Chemical constituents like TSS, titratable acidity, pH, ascorbic acid, reducing sugar, total sugar, non - reducing sugar, color of fresh carrot and tomato juice were determined (Ranganna, 1991) [7].

2.1.1 Otal soluble solids (T.S.S.)

The juice was thoroughly mixed. Two to three drops of mixed juice were placed on the fixed prism of hand refractometer (ERMA make) and immediately movable prism was adjusted. The Total Soluble Solids was recorded as °Brix.

2.1.2 Titratable acidity

Measurement of titratable acidity was carried out by using the method given by Ranganna (1991) [7]. 5 mL of thoroughly mixed sample was diluted with distilled water and transferred to a 50 mL volumetric flask and volume was made. The sample was filtered and 5ml of aliquot was titrated against standard 0.1 N NaOH using 1 per cent phenolphthalein indicator till faint pink colour persists for 15 seconds. The per cent titratable acidity was expressed in terms of anhydrous citric acid by using following formula.

$$\% \text{ Acidity} = \frac{\text{Titre value x Normality of x Volume made x Eq. Wt. of alkali up acid}}{\text{(As citric acid content) Aliquot taken for x Wt. or volume of sample x 1000 estimation taken}} \text{ x } 100$$

2.1.3 pH

The pH was determined by using a digital pH meter (ELICO LI612) after standardizing it with buffers of pH 4.0 and 9.0.

2.1.4 Estimation of Total Sugars

Total carbohydrate/sugars was determined by standard procedure using phenol sulphuric acid (Nielsen, 2010) [6]. Sample (100 mg) was taken into a conical flask; 5 mL of 2.5N HCl was added into the flask and reflux it into water bath for 3 h to facilitate hydrolysis. After cooling and centrifuging, neutralize the clear hydro lysate with the addition of sodium carbonate until pH of hydro lysate reached to 7.0.Then the

final volume of solution was made to 100 ml with distilled water and subjected to centrifugation. 0.1ml aliquot was taken for analysis; to this, 0.1mL of phenol reagent and 5 mL of 96% H2SO4 were added. The standard curve was prepared from serial dilution of standard glucose solution to 0, 0.2, 0.4, 0.6, 0.8 and 1 mL corresponding to 0, 20, 40, 60, 80 and 100 µg respectively. The intensity of colour was measured at 490 nm by spectrophotometer. From the standard curve, the concentration of total sugar was calculated.

2.1.5 Estimation of Reducing Sugar

The amount of non-reducing sugar of fresh juice was determined by Nelson – Somogyi method (Syed *et al.*, 2007) [9]. The reducing sugars when heated with alkaline copper tartarat e reduce the copper from cupric to cuprous state and yields cuprous oxide. When cuprous oxide is reacted with arsenomolybdic acid, the blue colour is developed by the reduction of molybdic acid to molybdenum. The resultant colour can be measured quantitatively at 620 nm.

$$\text{Reducing sugars } (\%) = \frac{\text{Sugar value from graph (µg) x (Total volume of alcohol-Free extract)}}{\text{Aliquot sample used (0.1 mL) x weight of sample (100 mg)}} \text{ x } 100$$

2.1.6 Estimation of Non-reducing sugars

The amount of non-reducing sugar of the carrot and tomato juice was obtained by subtracting reducing sugars from total sugars.

2.1.7 Ascorbic acid (Vitamin C)

Ascorbic acid content was determined by titration of a known weight of sample with 2, 6-dichlorophenol indophenol dye using metaphophoric acid (Ranganna, 1991) [7]. The 2, 6-dichlorophenol indophenol dye which is blue in alkaline solution and red in acid solution reduces ascorbic acid to a colorless form. Ascorbic acid was expressed as mg/100 g by using given formula:

Dye Factor = 0.5 / Titre

$$\text{Ascorbic acid} = \frac{\text{Titre x Dye factor x Volume made up}}{\text{Aliquot of extract taken x Wt. or volume of sample for estimation taken for estimation}} \text{ x } 100 \text{ (mg/100gm)}$$

3. Result and Discussion

The physicochemical properties of the carrot and tomato juice blend (70:30) after blanching analyzed and studied under the given Table 11.

The data presented in the Table 11 demonstrated that the TSS, titratable acidity, pH, total sugar, reducing sugar, non-reducing sugar and ascorbic acid of the blanched carrot and tomato juice blend were 9, 0.13, 4.80, 9.68, 8.43, 1.3 and 17.13 respectively.

Table 1: Physicochemical characteristics of carrot and tomato juice blend

Sr. No.	Parameter(s)	Carrot and tomato juice blend
1	Total Soluble Solids (□Brix)	9.0
2	Titratable acidity (% citri acid)	0.13
3	pH	4.80
4	Total sugars (%)	9.68
5	Reducing sugars (%)	8.43
6	Non-reducing sugars (%)	1.3
7	Ascorbic Acid (mg/100 g)	17.13

Each value is an average of three determinations

4. Conclusion

The present investigation focuses on the development of which imposes potential health benefits. It was concluded that prepared carrot based beverage having good organoleptic quality and high nutritional value. The pasteurized carrot and tomato juice (70:30) was very tasty and nutritious as well. Results showed that the chemical parameters were in sufficient amount for providing nutrition and bioactive components to consumers.

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