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Formulation of recipe and organoleptic evaluation of carrot and sweet lime blended nectar beverage

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Abstract
An experimental study on development and organoleptic evaluation of carrot and sweet lime blended nectar was conducted at the laboratory of Vegetable Science Department, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). Nectar is a type of non-fermented fruit beverage which is prepared from fruit juice/ pulp of at least 20 percent concentration and 15 percent total soluble solids and about 0.3 percent of acidity. Nectar is consumed directly without diluting with any kind of liquid. This nectar prepared from blending of pure carrot and sweet lime juice contains loads of nutrients and antioxidant properties. Six different treatment combinations (T_0 to T_5) with different concentrations of carrot and sweet lime juice were prepared and organoleptic evaluation was done on the basis of 9 point hedonic scale rating test to standardize the recipe. Among all the treatment combinations T1 (Carrot 80% + Sweet lime 20%) was found to be the best blended combination by scoring highest value (7.8) in hedonic scale for overall acceptability. Large-scale industrial manufacturing of the created blended nectar, which is packed with several health advantages, has a tonne of potential.

Keywords: Blended nectar, organoleptic evaluation, recipe standardization

Introduction
One of the most prized root vegetable crops in the Apiaceae (Umbelliferae) family, the carrot (*Daucus carota* L.) is grown all over the world. Carrots are one of the most amazing gifts from nature to humankind among all the root vegetables. It is a popular root vegetable that is grown globally. Carrots contain a lot of β-carotene, which is a precursor of vitamin A and gives the root its distinctive orange colour (Poudyal *et al.*, 2010; Eskicioglu *et al.*, 2015) [7, 2]. Along with being high in carbs, antioxidants, and minerals including calcium (80 mg), iron (0.6 mg), phosphorus (30 mg), and magnesium (14 mg), it is also high in dietetic fiber (Gill and Kataria 1974; Holland *et al.*, 1991) [3, 4]. A 100 g serving of carrot contains between 0.8-1.1 grammes of protein, 1.2 grammes of fibre, 0.2 grammes of fat, 12000 IU of vitamin A, 0.04 mg of vitamin B1, 0.05 mg of vitamin B2, 1.2 mg of vitamin B3, 0.1 mg of vitamin B6, and 5.7 mg of vitamin C. In addition to these, reports of succinic acid, α-ketoglutaric acid, lactic acid, and glycolic acid in trace amounts have been made (Rasheed *et al*., 2022) [9]. The main type of endogenous sugar that is prevalent in the roots is sucrose. The root contains somewhere between 6000-54,800 µg of total carotenoids per 100 g. Due to the presence of glutamic acid, carrots have a distinctive flavour that can range from mild to strong depending on the cultivar and environment. Due to the presence of such nutrients in huge quantities carrot is one of the best root vegetable providing abundant health benefits (Zaini *et al.*, 2011) [10].

People all across the world enjoy and consume the citrus fruits especially, sweet lime (*Citrus limettioides* L.). Despite being called as "sweet lime," it differs greatly from what we often associate with a lime. Sweet limes have a distinctive flavour that is gentle and energizing and is best consumed as juice or straight from the tree. In India, it is referred to locally as "mosambi" and is regarded as the highest-nutrient citrus fruit. It contains a variety of bioactive substances that have medicinal advantages. Ascorbic acid, Vitamin-B complex, amino acids, and numerous secondary metabolites like flavonoids, polyphenols, hesperetin, and naringenin are abundant in the juice and pulp of citrus fruits (Patel *et al.*, 2016) [6]. Citrus's antioxidant property aids in the treatment of chronic inflammatory diseases such osteoarthritis, asthma, and rheumatoid arthritis. The citrus fruit compound limonene can lower the risk of malignancies of the skin, lungs, mouth, stomach, breast, and colon. By lowering the production of calcium oxalate, the nutritious content of fruits can lower the incidence of kidney stones (Igimi *et al.*, 1991) [5]. Citrus juice consumption lowers the risk of typhoid and assists in reducing the formation of stomach ulcers (Codoñer *et al.*, 2010) [1].

Processing is a fantastic way to consume seasonal surplus fruits and vegetables. The preservation of perishable fruits and vegetables is greatly reduced by value addition. Consumers are constantly on the lookout for novel goods that are tasty and nutrient-rich. Drinks are becoming more popular due to their amazing taste and nutritional value.

Table 1: Treatment Combinations of Carrot and Sweet lime blended Nectar

Treatments	Carrot (%)	Sweet lime (%)
T_0	100	0
T_1	80	20
T_2	60	40
T_3	40	60
T_4	20	80
T_5	0	100

Materials and Method

Carrot and sweet lime were purchased from nearby local market. Other raw materials used in preparation of the nectar was water, sugar, citric acid, sodium benzoate, juice glass bottles, knives, a peeler, trays, a power mixer-grinder, an electronic balance.

Extraction of Carrot juice

Carrots that were clean, fresh, and nutritious were purchased from the market. To get rid of any dust, soil, or fine hairs, carrots were washed under running water after being sorted. Then, to make them fit more readily in the mixer jar, carrots were peeled with a peeler and cut into little pieces with a sharp knife. Using an electric mixer-grinder, the grinding was done. The pure juice was then collected after the pulp had been strained through a double-layered muslin cloth.

Extraction of Sweet lime Juice

Fresh and juicy sweet lime were purchased from the neighborhood fruit market. They were completely rinsed with clean water after washing. The fruit's skin was physically peeled off with the help of knives, and the seeds were extracted. The sweet lime was separated into pieces, and using a mixer, short pulses were used to extract the juice. To achieve pure juice that had not been tampered with, juice was extracted using a double layer of muslin cloth.

Preparation of Carrot + Sweet lime based blended Nectar

Pure carrot and sweet lime juices were combined for preparing the nectar at varying concentrations based on the different treatments. In total 20% of carrot and sweet lime juice were used up as part of the nectar manufacturing procedures. Six distinct treatment combinations were created using different ratios of the juices of carrot and sweet lime (Table 1), and each treatment was homogenized. The required ratio of juices from each treatment was added to a filtered syrup solution of sugar, water, and citric acid, which was then heated just long enough to dissolve it. Preferred TSS of 15% was maintained, 3 g of citric acid and 0.6 g of sodium benzoate as a preservative was added to each litre of the manufactured product. The prepared nectar was once again filtered through muslin cloth before being put in sterile glass bottles, cooled, and airtightly sealed with a crown corker. The filled bottles were pasteurized in boiling water for 15 to 20 minutes, or until the product reached an internal temperature of 80 °C. After cooling of filled bottles, they are stored at room-temperature.

Organoleptic Evaluation

This test determines whether a product is acceptable to the consumer. In this procedure, a semi-trained panel of judges were assembled to assess the product's sensory attributes such as colour & appearance, flavour, taste and overall acceptability. The judges were divided into groups according to their ages and eating preferences. The sensory qualities were assessed using a 9-point hedonic rating scale ranging from 1 (extremely dislike) to 9 (extremely like) Ranganna (2001) [8]. For rating a score card was provided to each panel member. The judgement was quantified by appropriate analysis for determining the significance of variations of average scores and the contribution of the individual quality characteristics to the overall quality.

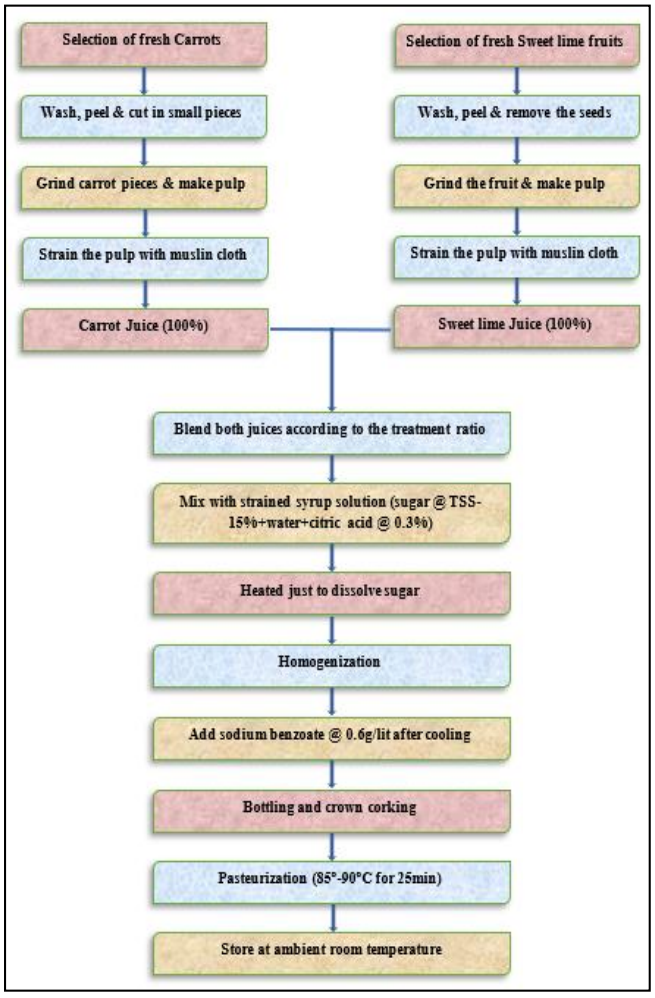

Fig 1: Flowchart for Preparation of Carrot and Sweet lime Blended Nectar

Result and Discussion

Standardization of RTS

The purpose of the recipe standardization was to determine the ideal ratio of ingredients for preparing the blended Nectar beverage. All the ingredients, including juice, sugar, citric acid, sodium benzoate, and water, were chosen at their ideal concentrations. The ideal mixture of 20 percent juice (carrot+sweet lime), sugar according to 15 percent TSS, 3 g citric acid, 0.6 g sodium benzoate, and 800 ml water for 1000 ml nectar beverage were standardized.

Organoleptic Evaluation

The data regarding organoleptic evaluation of freshly prepared nectar beverage from blends of carrot and sweet lime juice is presented in Table 2. Six samples of blended nectar was prepared by combining carrot and sweet lime juice in different concentrations and are presented to a group of panelist for evaluation of organoleptic attributes. The result was obtained on a 9 point hedonic scale where 9 indicated like extremely, 8- like very much, 7- like moderately, 6- like slightly, 5- neither like nor dislike, 4- dislike slightly, 3- dislike moderately, 2- dislike very much and 1- dislike extremely. According to the results of hedonic rating test, T_1 was the best blending combination and most acceptable in terms of its organoleptic attributes. T_1 was comprised of 80 percent carrot juice and 20 percent sweet lime juice.

Table 2: Organoleptic Evaluation of Carrot and Sweet Lime blended Nectar

Treatments	Colour and Appearance	Flavour	Taste	Overall Acceptability	Rating
T_0: Carrot (100%) + Sweet lime (0%)	7.5	6.5	6.0	6.6	Like Slightly
T_1: Carrot (80%) + Sweet lime (20%)	7.0	8.0	8.6	7.8	Like Very Much
T_2: Carrot (60%) + Sweet lime (40%)	6.5	6.5	7.5	6.8	Like Moderately
T_3: Carrot (40%) + Sweet lime (60%)	5.0	7.0	7.0	6.3	Like Slightly
T_4: Carrot (20%) + Sweet lime (80%)	5.5	6.5	7.0	6.3	Like Slightly
T_5: Carrot (0%) + Sweet lime (100%)	6.5	6.0	6.0	6.1	Like Slightly

Conclusion

This blended nectar beverage is being made with the intention of improving the product's nutritional value so that it can be taken by people of all ages. Blending such medicinally potent juices might be a good source for those with gastrointestinal issues and other illnesses. It can be concluded that T_1 (80% carrot juice and 20% sweet lime juice) was the best treatment combination among all treatments after evaluating all organoleptic attributes, such as colour and appearance, flavour, taste, and overall acceptability. T_1 received the highest organoleptic score, was well-liked, and was found to be the most acceptable combination for blending.

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