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RD Walhekar
M. Tech. (Food Technology) Student, College of Food Technology, VNMKV, Parbhani, Maharashtra, India

KS Gadhe
Associate Prof. College of Food Technology, VNMKV, Parbhani, Maharashtra, India

GB Mandalik
Scientist Horticulture, KVK Tuljapur, Maharashtra, India

Correspondence
RD Walhekar
M. Tech. (Food Technology) Student, College of Food Technology, VNMKV, Parbhani, Maharashtra, India

Standardization of jaggery based kagzi lime RTS beverage with incorporation of spice extract

RD Walhekar, KS Gadhe and GB Mandalik

Abstract
There is a great potential for commercialization of spiced RTS beverages with Jaggery as natural health drinks. Lime Health beverages market is fastest growing in the world, due to its nutritional and health benefits. The present study was carried out to Standardization of Kagzi Lime RTS Beverage by using jiggery syrup with incorporation of different proportion of spices. The combined spices extracts such as Cumin+ Cardamom+Clove+Ginger+Mint were blended with Kagzi lime (cv. Sai Sharbati) juice and prepared the RTS beverages. The incorporated Lime RTS was standardized based on organoleptic evaluation. The nutrient content such as Total Soluble Solids (TSS), pH, acidity, ascorbic acid, total sugar, reducing sugar, and non-reducing sugar were analysed. spice extract incorporated lime RTS beverage with 2.5% lime juice + 0.9 % spice extract having TSS 12°Brix and acidity 0.31% level was found to be the best among all the treatments except T1 and T6 beverages.

Keywords: kagzi lime, TSS, pH, jaggery, spice extract

Introduction
Kagzi lime (*Citrus aurantifolia* L.) belongs to family Rutaceae, originated in India. It is commercially grown in tropical and subtropical region of India. Kagzi lime is the third most important fruit after Mandarin and Sweet orange and India ranks fifth among major lime producing countries (Anonymous 2001) [1]. Maharashtra state is leading in acid lime cultivation. Kagzi lime is principle citrus fruits grown commercially in vidarbha and marathwada regions.
The fruits are extensively used for squashes, pickles, syrups and cordials, manufacture of citric acid and for table purpose in daily life of Indians (Cheema *et al*. 1954) [2].
Citrus fruits are well known for their refreshing fragrance, thirst quenching ability and providing adequate vitamin C as per recommended dietary allowance. Phytochemicals which play the role of nutraceuticals, such as carotenoids (Lycopene and β-carotene), limonoids, flavanones (Naringins and rutinoside) and Vitamin-B complex (Ladaniya, 2008) [3]. Lime juice is rich in vitamin C, responsible for a series of health benefits. Lime juice reduces the body heat and increases the appetite. Drinking lime juice with salt reduces the stomach pain. It helps in digestion of foods. Fruit juices and fruit juice beverages are becoming popular due to their pleasant flavour and nutritional characteristics. Beverages are consumed by people of all age group to quench the thirst as a social drink and for good health and medicinal values. The medicinal value of the fruit beverages can be enhanced by the incorporation of herbal extracts. Fruits juice could be enriched by addition of herbal extract for preparation of beverages which improves taste, aroma and nutrition and also contributes to medicinal values.
There is always a demand from the consumers all over the world for new food products which are nutritious with delicate flavour. Productions of RTS beverages have been increasingly gaining popularity throughout the country due to their health and nutritional benefits, apart from pleasant flavour and taste. Fruit based RTS beverages are not only rich in essential minerals, vitamins and other nutritive factors but also are delicious and have good appeal. Herbal beverages in the form of RTS, squashes, appetizers, health drinks are important from the nutritional point of view. (Thamilselvi *et al.* 2015) [6].
Ginger and lemon juices have anti-bacterial and anti-fungal properties and impart refreshing taste and flavour. Pepper mint has refreshing, cooling and flavouring properties. Blending of juices is a novel alternative to improve and preserve the phytochemical quality (Waskar 2011) [7].
The jaggery contains an enormous wealth of minerals, protein and vitamins inherently present in sugarcane juice and this crowns it as one of the most wholesome and healthy sugars in the world. More importantly, jaggery has great nutritive and medicinal value because daily use of jaggery may increase human life span. It has the reputation of being a medicinal sugar and is prescribed as ayurvedic medicine in health problems like dry cough, cough with sputum, indigestion, constipation, etc. There are scanty numbers of reports available on occurrence of

diabetes patient in jaggery consuming areas. Magnesium found in jaggery strengthens the nervous system and potassium conserve the acid balance in the cells and combats acids and acetones. Jaggery is very rich in iron and prevents anemia. So, it supplements the requirement of iron and calcium in women and children and also increases vitality in men and help in digestion. Jaggery contains 28g/kg of mineral salts, as against only 300mg/kg is found in refined sugar. The micronutrients present in jaggery have antitoxic and anticarcinogenic properties. Its dietary intake can prevent the atmospheric pollution related toxicity and the incidence of lung cancer (Rao *et al.*, 2007) [5].

Jaggery based herbal RTS beverage is a nutritious and healthy beverage to improve the palatability of the beverages the present investigation was undertaken for standardizing Lime RTS beverage by using jaggery base syrup with incorporation of spices extract of Cumin, Cardamom, Clove, Ginger and Mint with different proportion.

Materials and Methods

Raw material like lime fruits cv. "Sai Sharbati" was obtained from the central nursery, VNMKV. Parbhani and other material like ginger, mint, cardamom, clove, cumin, jaggery and KMS procured from local market of Parbhani in the year 2017-2018. The lime juice was extracted by using stainless steel squeezer and strained by double fold muslin cloth. The Ginger rhizomes were washed, peeled, cut in to small pieces and grated in grating machine and extract was extracted by squeezing through double fold muslin cloth. The mint leaves ware washed and grated in grating machine then squeezing by double fold muslin cloth and kept in centrifuge machine at 5000 rpm for 5 min. to get supernatant. Cardamom, clove, cumin was cleaned and grind by mixer followed by sieved to get fine powder. Then spice powder were mixed in known quantity of distilled water and allowed to sediment for 24 hours. Then filtered it by doubled fold muslin cloth and kept in centrifuge at 5000 rpm for 5 min. to get supernatant.

Spice extract incorporated lime RTS beverage was prepared by using different proportions of spice extract (T_1 =2.5% lime juice without spice extract, T_2 =2.5% lime juice + 0.5% spice extract, T_3 =2.5% lime juice + 0.7% spice extract, T_4 =2.5% lime juice + 0.9% spice extract, T_5 =2.5% lime juice + 1.1% spice extract, T_6 =2.5% lime juice +1.3% spice extract) for this purpose, the syrup was prepared by addition of jaggery and KMS@750 ppm. After incorporation of spice extract in lime juice TSS were adjusted to 12° Brix and pasteurized at 60° C for 30 min. and cooled by cold water. The prepared RTS filled in PET bottle and label it then RTS were analysed for TSS, acidity, pH, ascorbic acid, total sugar, reducing sugar and non-reducing sugar contents as per the methods of given by Ranganna (1986). Evaluated organoleptically for color, flavour, taste, appearance and overall acceptability by panel of 10 judges who scored on 9-point hedonic scale.

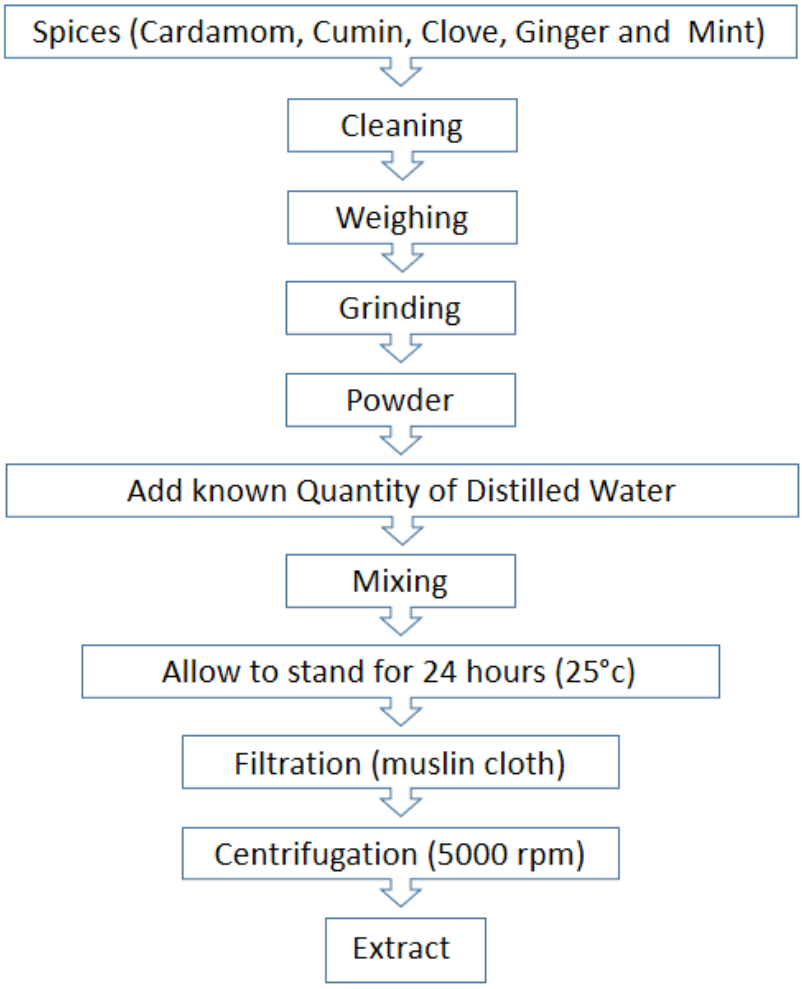

Fig 1: Flow Diagram for preparation of Spice Extract

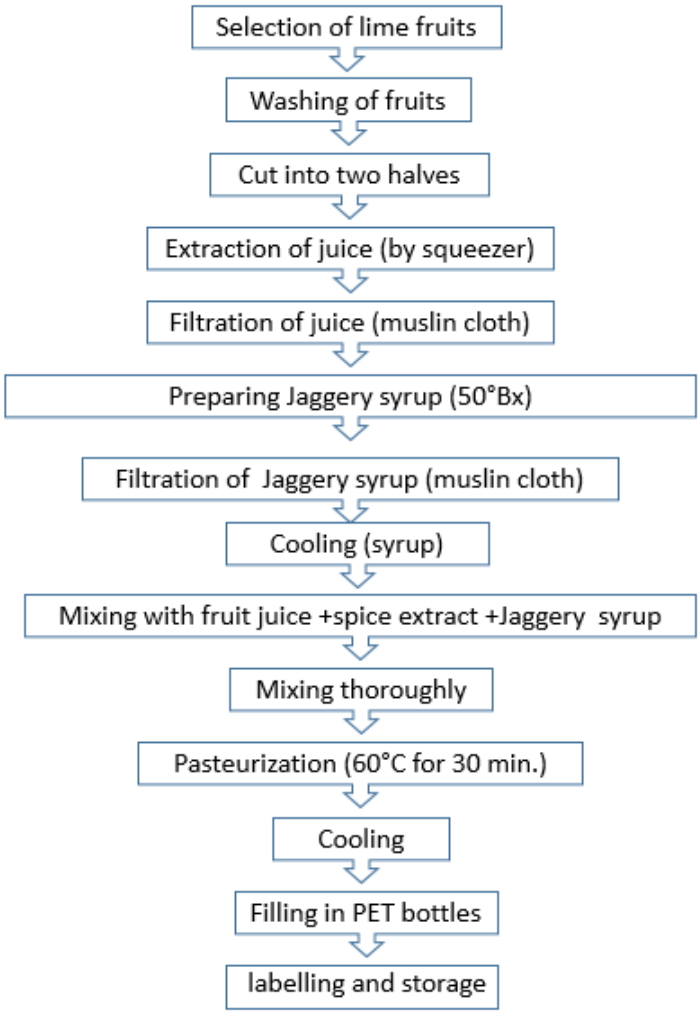

Fig 2: Diagram for preparation of jaggery based spice extract incorporated lime RTS beverage

Result and Discussion

Table 1: Chemical composition of Jaggery based Kagzi Lime RTS Beverage with incorporation of Spice Extract

Treatment	Chemical composition of jaggery based spice extract incorporated lime RTS beverage						
	TSS (%)	Acidity (%)	pH	Total sugar (%)	Reducing sugar (%)	Non-reducing sugar (%)	Ascorbic acid (mg/100 ml of juice)
T1	12	0.31	3.23	17.41	2.67	14.74	2.40
T2	12	0.31	3.23	17.41	2.67	14.74	2.40
T3	12	0.31	3.17	17.41	2.70	14.71	2.42
T4	12	0.31	3.11	17.42	2.72	14.70	3.47
T5	12	0.32	3.07	17.43	2.73	14.70	3.54
T6	12	0.32	3.07	17.44	2.78	14.66	4.27
SE±	NS	0.002	0.028	0.005	0.016	0.011	0.302
CD at 5%	NS	0.008	0.084	0.016	0.047	0.034	0.897

The data presented in table 1 clearly indicated that T_1, T_2, T_3 and T_4 were found to have lower acidity (0.31 %) while the beverage with T_4 and T_6 contained comparatively higher acidity (0.32%). However, pH values were found to be higher in treatment T_1 and T_2 (3.23) whereas pH lower value was observed in T_5 and T_6 (3.07).

The total sugar was observed lowest and same in T_1, T_2 and T_3 (17.41%) whereas highest sugar percentage was observed in T_6 (17.44 %).

The reducing sugar percentage was observed highest in T_6 (2.78%) whereas lowest in T_1 and T_2 (2.67%). The Non-reducing sugar percentage was observed lowest in T_6 (14.66%) whereas highest Non-reducing sugar percentage was observed in T_1 and T_2 (14.74%). The ascorbic acids was observe lowest in T_1 and T_2 (2.40 mg/100 ml of juice) whereas highest value was received in T_6 (4.27mg/100 ml of juice).

Table 2: Organoleptic Evaluation of Jaggery based Kagzi Lime RTS Beverage with incorporation of Spice Extract

Treatments	Organoleptic Evaluation of Spice extract incorporated Lime RTS Beverage (Organoleptic Score 9 Hedonic scale)				
	Color	Flavour	Taste	Appearance	Overall acceptability
T1	8.00	6.00	6.00	7.50	6.88
T2	8.50	6.50	7.00	8.50	7.63
T3	8.50	8.00	7.50	8.50	8.13
T4	9.00	9.00	9.00	9.00	9.00
T5	9.00	9.00	8.50	9.00	8.88
T6	8.50	7.50	6.00	8.50	7.63
SE±	0.177	0.491	0.495	0.248	0.330
CD at 5%	0.526	1.460	1.471	0.737	0.982

The jaggery based Spice extract incorporated Lime RTS Beverage were evaluated organoleptically for color, flavour, taste, appearance and overall acceptability and were found to be acceptable at the time of preparation (Table 2). The treatment T_4 secured the highest score for color (9.00 score). Whereas lowest score was received by Treatment T_1 (8.00). The highest score for flavour was received by T_4 and T_5 (9.00) whereas lowest score was observed in Treatment T_1 (6.00).The treatment T_4 was secure first position for taste score (9.00) whereas T_1 and T_6 received lowest score (6.00). The treatment T_4 and T_5 was received highest score (9.00) for Appearance and lowest score by T_1 (7.50). The overall acceptability score was recvied highest by treatment T_4 (9.00) whereas lowest score was obtained by T_1 (6.88).

Conclusion

From the Present study, it is concluded that jaggery based spice extract incorporated lime RTS beverage with 2.5% lime juice + 0.9 % spice extract having TSS 12°Brix and acidity 0.31% level was found to be the best among all the treatments. However, antioxidant, vitamins, minerals and other health benefits increase by using jaggery base syrup and spice incorporation in lime RTS beverage.

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