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Effect of chemical preservatives on physico-chemical changes of beverages from lime and ginger juice: A review

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Abstract
Over the past decades, considerable attention has been given to reliable methods of processing fruits into valuable beverages such as juice, jam purée, wine and other fruit drinks, as a result of increase in fruit crop farming and varieties of fruits in many tropical countries coupled with the risk of post-harvest wastage. Moreover, farmers are not able to determine the proper time of fruit maturity. In the global market the attractiveness of lime is owing to its stunning colour, striking fragrance, pleasing flavour, good taste and healthy nutritional properties. When we considered the losses of mango fruit after harvesting especially considering the developing countries, then the post harvest losses of mango are extremely conspicuous. Lime and ginger juices are not so pleasant to taste but by addition of appropriate amount of sugar and acid, improves the taste of its beverages which may be consumer acceptable and obviously preferred due to its higher nutritional and health supportive values. Juices from different sources are frequently blended to adjust the sugar to acid ratio of the juice. Different fruit variety or different fruit juices can be blended to get the desired taste, flavour and appearance of the drink.

Keywords: Lime, ginger, preservatives, RTS, maturity and storage

Introduction
Fruits and vegetables are major source of vitamins and minerals. Since, they are highly perishable in nature, they need to be processed into various value added products. India is well-known for its culture and hospitality, natural as well as synthetic beverages are always an important part of guest dine. *Sherbat* consists of sugar syrups flavoured with artificial or natural products like fruits and herbs have been produced in India from immemorial time and well known throughout the country. Historically, the use of fruit juice begins with consumption of orange juice, as a source of vitamin C to prevent scurvy. However, today's markets are flooded with variety of beverages like mango, apple, guava, litchi, grape or pineapple etc. (Anonymous, 2008) [2].

Natural drinks are now-a-days become popular due to its pleasant taste, natural aroma and health supportive role. Natural beverages are very demanding throughout the year, especially during hot summer months demand is much more due to its thirst quenching property. It is also a rich source of minerals, vitamins and many other nutritional compounds. Natural beverages are preferred and appreciated by all age groups at every occasion. It is easily digestible, highly refreshing and nutritionally superior than many synthetic and aerated drinks, but consumption of synthetic beverages are much higher than natural juices/beverages.

Lime is one of the important fruits of citrus group. Lime is excellent source of vitamin C. India produces 15.42 thousand tonnes of lime per year (Anonymous, 2005) [1]. Hundred g of mature yellow lime fruit contains 91 g water, 0.5 g protein, 2.4 g fat, 5.9 g carbohydrates, 0.3 g fibre, 17 IU vitamin A, 46 mg vitamin C, and 150 KJ energy (Sethpakdee, 1992). Lime fruits are perishable in nature and it is often difficult to keep in fresh condition for longer time to fetch good price in market. Making lime juice beverages can alleviate these problems. The technology required for fruit juice/ beverages making is simple.

Since ancient times, gingerhas been used as a spice and medicine in India. Ginger is underground stem of the zingiberous plant and is one of the five important spices of India (Govindarajan, 1982). The total production of ginger is 359.0 thousand tonnes in India (Anonymous, 2006).

Hundred g of fresh ginger contains 2.3 per cent protein, 0.9 per cent fat, 1.2 per cent minerals, 2.4 per cent fibre, 12.3 per cent carbohydrates and 67 k cal energy (Ismail, 2002).

India produces adequate amount of lime and ginger but significant amount of produce were spoiled every year due to its poor keeping quality and perishable nature. Production of value-added product like ready-to-serve beverages may overcome this problem and the product is also more economical than raw produce. As lime and ginger juices are health supportive and refreshing, the ready-to-serve of lime, ginger and their blends will be very important. Blending not only improves the quality and nutrition of basic raw material, but also offers to develop the newer product (Nath, 2005) [15].

Review of literature

1. Physico-chemical composition of lime fruits

Desai *et al*. (1994) [7] studied the physico-chemical composition of lime fruits and found that fruit size is ranged from 22.0 to 70.0 g, juice per cent from 30.0 to 66.66 and skin thickness from 1.0 to 3.0 mm. Vedamani *et al*. (2006) [32] conducted an experiment to evaluate the physico-chemical characteristics of lime fruits and observed the average weight of fruit 48.23 g, rind thickness 1.74 mm, rind per cent 21.02 and 44.09 per cent juice in fresh lime fruits. Desai *et al*. (1994) [7] studied about the physico-chemical composition of lime fruits and found that fresh lime fruit contains 6.0 to 13.0 per cent total soluble solids and 5.37 to 11.64 per cent titrable acidity. Selvaraj and Raja (2000) [7] reported that fresh lime fruit contains 0.82 per cent sucrose and 120.8 mg/100g ascorbic acid.

2. Physico-chemical composition of ginger rhizomes

Tripathi *et al.* (2004) [31] studied about the physico-chemical composition of ginger rhizomes and found that average weight of ginger was 52.75 g and density was 0.89 g/ml. Nath *et al.* (2005) [15] found 57.0 per cent juice and 8.5 per cent peel in fresh ginger rhizome. Chemical composition. Tripathi *et al.* (2004) [31] found that fresh 100 g ginger contain 68.6 per cent moisture and 3.1 mg ascorbic acid.

3. Processed fruit products

Khurdiya (1980) observed that ready-to-serve (RTS) beverage prepared from dried ber contained 33.3 per cent juice, 3.75 pH, 19.6^0 Brix and 0.56 per cent acidity. The ber juice stored successfully for 9 months at room temperature (20-30 ^{0}C) after processing at 80 ^{0}C for 10 minutes and the beverage prepared from the juice was organoleptically acceptable. Kalra and Revethi (1981) [12] noticed that guava pulp was stored for longer time under refrigerated condition as compare to room condition. After six months of storage, juice prepared from the pulp have good acceptability. Sarmah *et al.* (1981) [24] observed that kinnow juice contain 13.5^0 Brix, 0.65 per cent acidity as citric acid and 25 mg ascorbic acid per 100 ml. The juice preserved with sulphur dioxide had superior colour, flavour and higher retention of ascorbic acid as compared to heat-processed juice for 28 weeks of storage. Nath *et al.* (2002) [16] evaluated various ratio of kinnow mandarin and ginger juice for preparation of blended squash and find out 25:5 was ideal ratio for overall acceptability.

4. Ready-to-Serve (RTS)

Anonymous (1955) [1] described that ready-to-serve beverages contained fruit juice minimum 10 per cent and the juice and TSS should not be less than 5 and 10 per cent in case of lime fruits. Sulphur di-oxide (70 ppm) and benzoic acid (150 ppm) used as preservative. Deka (2000) [6] reported that the quality of RTS beverages could be improved by blending of different fruit juice or pulps (Mango, Lime, Aonla, Grape, Pineapple) in appropriate proportion. Lime 95 per cent and Aonla 5 per cent having 10 per cent TSS, 6 per cent juice and 0.3 per cent acidity was found to the best among all beverages. He further reported that addition of spices to the RTS improved the sensory, nutritional and microbial inhibitory quality of the drink. Deka *et al.* (2004) [6] reported that ready-to-serve beverage produced from lime and aonla at 95:05 ratio showed a gradual decrease in sensory quality, acidity, ascorbic acid and tannin contents. Retention of ascorbic acid was more in beverages stored in amber coloured bottles under low temperature condition. Sugahara *et al.* (1987) [28] evaluated various blending combination of Satsuma and Shekwasha mandarins at 9:1, 7:3 and 5:5 ratio. The RTS beverage prepared by taking 10 and 20 per cent of blended juices. The highest score was obtained for the beverage contained 10 per cent of 9:1 blended juice. Tripathi *et al.* (1992) prepared RTS beverages from the blending of pineapple and guava juices in different proportions. The RTS beverages prepared from pineapple and guava (90:10) blend secured 89±1.25 per cent marks for overall quality parameters. Saxena *et al.* (1996) [26] evaluated various blended RTS developed by fruit juices as well as pulps of grape and mango in three different proportions (25:75, 50:50 and 75:25). They found that all the blends were acceptable, but the blends containing juice or pulp in the ratio of 50:50 were liked most due to balanced taste and flavour. Tiwari (2000) [30] tested various blends of guava and papaya juice for RTS beverage preparation and he obtained highest sensory score in guava-papaya blends at 70:30 ratio. It was due to better consistency and flavour. Grewal and Jain (1982) [9] revealed that 1:4 ratio (mango pulp: separated milk) had maximum organoleptic acceptability, while higher or lower ratio showed decreasing acceptability in order of 1:3, 1:5 and 1:2 ratio, respectively.

5. Changes in juice/ beverages during storage

Mehta and Tomar (1980) observed that guava slices steeped in 70^{0}Brix syrup containing 1000 ppm sulphur dioxide gave the best product. But, the retention of ascorbic acid was only upto six per cent. Kaur *et al.* (1995) [14] observed that sugarcane juice could be blended with (0.3%) lemon juice and (0.1%) ginger juice. They found that it improves the flavour of sugarcane soft drink. Chauhan *et al.* (1997) [4] found the best combination of sugarcane juice beverages by blending of (55%) cane juice, (2.5%) lemon juice, (2.0%) ginger juice, (0.4%) mint extract, (0.2%) colour and (40%) water. Ziena *et al.* (2000) evaluated sensory properties of the lime juices stored under refrigeration (5±1 ^{0}C) and freezing (-20±1 ^{0}C) temperature and they found that the juices were acceptable upto 27 and 21 weeks for dark-green and light greenish juices, respectively. Frozen juices were acceptable upto the end of experiment. Kumar and Manimegalai (2001) deliberated that blended RTS beverage of pineapple, pear and pomegranate decline in overall acceptability during ambient storage condition might be due to the degradation in colour, appearance and taste of the stored products. The RTS stored in refrigerator had maintained higher score values throughout the storage period for all the attributes.

Nath *et al.* (2002) [15] evaluated various ratio of kinnow mandarin and ginger juice for blended squash and find out that the ratio 25:5 is ideal for overall acceptability with a score of 8.2. Prasad *et al.* (2002) [20] reported that clarified sugarcane juice could replace sugar upto 100 per cent in the

preparation of the lime ready-to-serve beverage without adversely affecting the quality. Bons and Dhawan (2003) [3] observed that organoleptic evaluation of guava RTS beverages showed maximum score (32.5) when prepared from the pulp treated with KMS 0.07 per cent and stored at freezing temperature followed by a score of 31.8 in the beverage prepared from the pulp treated with KMS 0.1 per cent at low temperature. These beverages were comparable with the beverage from fresh guava pulp. Deka *et al.* (2004) [6] reported that the RTS beverages stored in white and amber coloured bottles for 6 months at ambient temperature (12.5-36 ^{0}C), cool chamber (10-29.6 ^{0}C) and low temperature (4±1 ^{0}C) showed a gradual decrease in sensory quality. Dookeran *et al.* (2004) [8] found that ginger beer made by natural fermentation or by partially controlled fermentation, followed by pasteurization were equally acceptable. Pinto *et al.* (2004) [19] reported that the incorporation of ginger juice at the rate of 4 per cent was advocated in manufacturing of ice-cream. Ginger juice incorporation had superior flavour over vanilla ice-cream.

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