Preparation and storage of Ready-To-Serve (RTS) beverage from Mango (Mangifera indica L.), Citrus (Citrus aurantifolia Swingle.), Aloe vera (Aloe barbadensis Miller.) and Ginger (Zingiber officinale Rosc.) blends

Harendra and Bhagwan Deen

Abstract
The present investigation was carried out at Post Graduate Laboratory of Department of Fruit Science, College of Horticulture and Forestry, A.N.D. University of Agriculture & Technology, Kumarganj, Ayodhya (U.P.) during the year 2019-2020. Mango, citrus (kagzi lime), aloe vera and ginger have nutritional, spicy, medicinal and therapeutic values. 10 percent of blend comprising 55 percent mango pulp, 25 percent kagzi lime juice, 10 percent aloe vera gel and 10 percent ginger juice was found best on 9- point hedonic scale for the preparation of RTS with 13 percent TSS, 0.20 percent acidity and 70 ppm SO₂; other than other blend combinations viz., 100, 0, 0 and 0 percent (T₁); 0, 100, 0 and 0 percent (T₂); 0, 0, 100 and 0 percent (T₃); 0, 0, 0 and 100 percent (T₄); 25, 25, 25 and 25 percent (T₅); 40, 20, 20 and 20 percent (T₆); 70, 10, 10 and 10 percent (T₇); 20, 40, 20 and 20 percent (T₈) and 50, 20, 15 and 15 percent (T₉), mango pulp, kagzi lime juice, aloe vera gel and ginger juice respectively. During the storage period Total Soluble Solids, acidity, reducing sugars and total sugars increased whereas, vitamin-A, vitamin-C, non-reducing sugar and organoleptic score decreased with the advancement of storage period. The RTS was stored into glass and polypet bottles at ambient temperature (20.1-29.4°C). The beverage was organoleptically acceptable upto 4 months of storage in case of both glass and polypet bottles. This study indicated that mango, kagzi lime, aloe vera and ginger can be utilized for palatable RTS beverage making which can be beneficial for the consumers in terms of taste, colour, flavor, medicinal and therapeutic properties.

Keywords: RTS, Mango pulp, Kagzi lime juice, Aloe vera gel, Ginger juice, Blend combination, Glass and Polypet bottles, Storage, Organoleptic quality

Introduction
A beverage is a liquid intended for human consumption, in addition to their basic function of satisfying thirst, beverages play an important role in human culture (Wikipedia, 2019) [1]. Beverages are of two types- unfermented (non-alcoholic) and fermented (alcoholic). Blended beverages with using different fruits, vegetables, spices extract and plants of medicinal values as new food products will definitely attract the consumers in the interpretation of sensory and nutritional characteristics. Mango is the king among tropical fruits which is botanically known as Mangifera indica L. and belongs to the family Anacardiaceae. It is also known as Aam, National fruit of India, Bathroom fruit and Symbol of love. It is originated in South-East-Asia, particularly in Indo-Burma region. On the basis of analysis of different varieties of mango, it is reported that mango fruit contains moisture 73.0 – 86.7%, carbohydrate 11.6 – 24.3%, protein 0.3 – 1.0%, fat 0.1 – 0.8%, fibers 0.8%, minerals 0.3 – 0.7%, Vitamin A 650 – 25940 I.U., Vitamin C 3 – 83 mg/100g, calcium 0.01%, phosphorous 0.02% and iron 4.5 mg/100g (Anon., 1966) [2]. Ripe mango fruits are utilized in preparation of pulp, juice, syrup, squash, jam, jelly, preserve, nectar, canned slices, dried powder, RTS, baby food, mango leather (Aam Papar), toffee, candy and many other products. These conventional type of mango products have been developed to a considerable level and a significant demand has been built up by the processing industry, both for domestic and export market (Sadhu and Bose, 1976; Rameshwar et al., 1979; Kalra et al., 1981; 1982) [42, 40, 22, 23]. Citrus (Citrus spp.) is a genus of flowering trees and shrubs, belonging to the family Rutaceae. Citrus fruits are used extensively in food processing industry to prepare a wide varieties of

Keywords: RT, Mango pulp, Kagzi lime juice, Aloe vera gel, Ginger juice, Blend combination, Glass and Polypet bottles, Storage, Organoleptic quality

Introduction
A beverage is a liquid intended for human consumption, in addition to their basic function of satisfying thirst, beverages play an important role in human culture (Wikipedia, 2019) [1]. Beverages are of two types- unfermented (non-alcoholic) and fermented (alcoholic). Blended beverages with using different fruits, vegetables, spices extract and plants of medicinal values as new food products will definitely attract the consumers in the interpretation of sensory and nutritional characteristics. Mango is the king among tropical fruits which is botanically known as Mangifera indica L. and belongs to the family Anacardiaceae. It is also known as Aam, National fruit of India, Bathroom fruit and Symbol of love. It is originated in South-East-Asia, particularly in Indo-Burma region. On the basis of analysis of different varieties of mango, it is reported that mango fruit contains moisture 73.0 – 86.7%, carbohydrate 11.6 – 24.3%, protein 0.3 – 1.0%, fat 0.1 – 0.8%, fibers 0.8%, minerals 0.3 – 0.7%, Vitamin A 650 – 25940 I.U., Vitamin C 3 – 83 mg/100g, calcium 0.01%, phosphorous 0.02% and iron 4.5 mg/100g (Anon., 1966) [2]. Ripe mango fruits are utilized in preparation of pulp, juice, syrup, squash, jam, jelly, preserve, nectar, canned slices, dried powder, RTS, baby food, mango leather (Aam Papar), toffee, candy and many other products. These conventional type of mango products have been developed to a considerable level and a significant demand has been built up by the processing industry, both for domestic and export market (Sadhu and Bose, 1976; Rameshwar et al., 1979; Kalra et al., 1981; 1982) [42, 40, 22, 23]. Citrus (Citrus spp.) is a genus of flowering trees and shrubs, belonging to the family Rutaceae. Citrus fruits are used extensively in food processing industry to prepare a wide varieties of

Keywords: RT, Mango pulp, Kagzi lime juice, Aloe vera gel, Ginger juice, Blend combination, Glass and Polypet bottles, Storage, Organoleptic quality
products such as RTS, juice, squash, chutney, slices, pickles and cordial. Kagzi lime (Citrus aurantifolia Swingle) is said to be originated in India. Vitamin C content is the maximum in acid lime (15-65 mg/100 g). The fruit is very sour because of high quantity of acid; hence fresh fruits are not consumed whereas, fresh juice mixed with water and sugar makes a delicious drink during summer season.

Aloe vera (Aloe barbadensis Miller) is perennial, drought resistant succulent plant commonly known as ‘Ghrit-kumari’ and ‘Gheegwar’ belongs to the Asphodelaceae or Liliaceae family, which historically has been used for a variety of medicinal purpose. There are 275 species of aloe vera grown all over the world. The most widely used species of aloe vera are Aloe barbadensis Miller and Aloe aborescens (Ramachandra and Rao, 2008., Dubick and Michsel, 1983) [38, 16]. Aloe vera gel is colorless, transparent and slippery mucilage containing water and bioactive polysaccharides mainly acemannan and glucomannan. Aloe vera gel is used to treat constipation, coughs, ulcers, diabetes, headaches, arthritus, and immune-system deficiencies (Bozzi A. et al., 2007) [39]. In food industry, it has been used as an ingredient for preparation of functional foods and production of gel-containing health drinks, energy drinks and different type of beverages like RTS, squash, syrup, tea, milk, ice-cream and confectionary.

Ginger is an ancient medicinal as well as spicy plant belonging to Zingiberaceae family which is botanically known as Zingiber officinale Rosc, and is indigenous to South-Eastern-Asia. Since a very long time ginger is known for its medicinal value as a digestive aid, spiritual beverage, aphrodisiac, antiemetic, anticancer, anti-oxidant, anti-inflammatory and immune stimulating properties (Malhotra and Singh, 2003) [32]. The fresh ginger is widely used in pickles and candies making whereas fresh ginger juice is used in RTS, squash, syrup, nectar and different type of beverages preparation while ginger powder, oleoresin, essence, soft drink, non-alcoholic beverages and ginger oil are manufactured from dry ginger. Ginger ale and the ginger beer are two most popular ginger drinks which are carbonated ginger, flavored with soft drinks.

The demands of natural beverages rich in nutrients and having therapeutic as well as medicinal values, are increasing because of changing life style, health consciousness and purchasing capacity of the consumers. The present studies were carried out because the blend beverages of fruits, medicinal plants and spices are rich source of nutrients, medicinal properties and flavors to meet the consumers demand in National and International markets.

Materials and Methods

Raw materials

Mango (var. Dashehari), Kagzi lime purchased from local market, Aloe vera (var. Samsheetal) purchased from National Botanical Research Institute, Lucknow and Ginger (Local variety) purchased from local market were used for the RTS preparation.

Extraction of mango pulp, Kagzi lime juice, aloe vera gel and ginger juice

The methods applied to extract the mango pulp, kagzi lime juice, aloe vera gel and ginger juice are shown as flow sheets in Fig. 1, Fig. 2, Fig. 3 and Fig. 4, respectively.
Fig 3: Flow chart for extraction of aloe vera gel

1. Aloe vera leaves
2. Keeping in vertical position for 12 hours.
3. Washing
4. Cutting into pieces of 20 cm size
5. Peeling with sharp knife and getting gel
6. Mixing of gel into mixier cum grinder
7. Staining through muslin cloth
8. Aloe vera Gel

Fig 4: Flow chart for extraction of ginger juice

1. Ginger
2. Washing
3. Peeling
4. Grating
5. Addition of water (1 part grated material: 2 part water)
6. Mixing in mixier cum grinder
7. Straining through muslin cloth
8. Keeping one hour for setting
9. Siphoning off clear juice
10. Straining through muslin cloth
11. Ginger Juice
Standardization of blends for RTS

The following combinations of mango pulp, kagzi lime juice, aloe vera gel and ginger juice were evaluated to standardize the blend for the development of palatable and quality RTS:

T₁ 10% blend comprising 100% mango pulp + 0% kagzi lime juice + 0% aloe vera gel + 0% ginger juice and adjusted to 13% TSS, 0.20% acidity and 70 ppm SO₂.
T₂ 10% blend comprising 0% mango pulp + 100% kagzi lime juice + 0% aloe vera gel + 0% ginger juice and adjusted to 13% TSS, 0.20% acidity and 70 ppm SO₂.
T₃ 10% blend comprising 0% mango pulp + 0% kagzi lime juice + 100% aloe vera gel + 0% ginger juice and adjusted to 13% TSS, 0.20% acidity and 70 ppm SO₂.
T₄ 10% blend comprising 0% mango pulp + 0% kagzi lime juice + 0% aloe vera gel + 100% ginger juice and adjusted to 13% TSS, 0.20% acidity and 70 ppm SO₂.
T₅ 10% blend comprising 25% mango pulp + 25% kagzi lime juice + 25% aloe vera gel + 25% ginger juice and adjusted to 13% TSS, 0.20% acidity and 70 ppm SO₂.
T₆ 10% blend comprising 40% mango pulp + 20% kagzi lime juice + 20% aloe vera gel + 20% ginger juice and adjusted to 13% TSS, 0.20% acidity and 70 ppm SO₂.
T₇ 10% blend comprising 70% mango pulp + 10% kagzi lime juice + 10% aloe vera gel + 10% ginger juice and adjusted to 13% TSS, 0.20% acidity and 70 ppm SO₂.
T₈ 10% blend comprising 20% mango pulp + 40% kagzi lime juice + 20% aloe vera gel + 20% ginger juice and adjusted to 13% TSS, 0.20% acidity and 70 ppm SO₂.
T₉ 10% blend comprising 55% mango pulp + 25% kagzi lime juice + 10% aloe vera gel + 10% ginger juice and adjusted to 13% TSS, 0.20% acidity and 70 ppm SO₂.
T₁₀ 10% blend comprising 50% mango pulp + 20% kagzi lime juice + 15% aloe vera gel + 15% ginger juice and adjusted to 13% TSS, 0.20% acidity and 70 ppm SO₂.

Preparation of RTS

RTS comprising 10% blend, 13% TSS, 0.20% acidity and 70 ppm SO₂ were prepared from different treatments. The prepared RTS were organoleptically evaluated on a 9-point Hedonic scale to find out the best combination of blend for large scale preparation. The technique used for RTS making is shown in Fig-5.

Storage studies

Finally 5 liters of RTS was prepared with best combination of blend, and filled into 350 ml polypet and glass bottles of 200 ml capacity leaving 2 cm head space, capped, pasteurized and put for storage studies under ambient condition (20.1-29.4°C). During storage observation on changes in TSS, acidity, vitamin-A, vitamin-C, reducing sugars, non-reducing sugar, total sugars and organoleptic quality were recorded at monthly interval. Observations were recorded for changes in TSS, acidity and vitamin-C (Rangana, 2010) [41], vitamin-A (AOAC, 1970) [3], sugars (Lane and Eynone, 1923) [28] and organoleptic quality (Amerine et al., 1965) [1] at monthly intervals.

Fig 5: Flow sheet for preparation of mango + kagzi lime + aloe vera + ginger blended RTS.
intervals during 4 months of storage period and are described as follows.

The Total Soluble Solids of sample was determined with the help of model (ERMA INC. TOKYO JAPAN) hand refractometer (0-32% and 28-62%) in terms of percentage. The value of TSS recorded at ambient temperature were corrected at 20°C with the help of reference table and the mean value was expressed as per cent TSS content of the sample whereas, the acidity was determined by titrating known quantity of sample against 0.1 N sodium hydroxide solution using phenolphthalein as an indicator and expressed in percent anhydrous citric acid. Vitamin-A determined by preparing sample in acetone, then in petroleum ether and thereafter in sodium sulphate till the appearance of dark yellow-greenish colour and measured the optical density (OD) at 452 nm and 503 nm by Spectrophotometer whereas, Vitamin-C content was estimated by preparing sample in 3 percent metaphosphoric acid solution and titrating against 2, 6 dichlorophenol indophenols dye solution till the appearance of light pink colour. The reducing, non-reducing and total sugars were analysed by using Fehling’s solution A and B and methylene blue as an indicator. A panel of 9 semi trained judges evaluated RTS for its colour, flavour, taste, appearance and overall acceptability on 9-point Hedonic scale.

Statistical analysis

The experiments were conducted in 3 replications and the statistical analysis of the data was done by computer software as the method described by Punse and Sukhatne (1985) [36] for CRD experiment.

Results and Discussion

Chemical attributes of fresh mango pulp, kagzi lime juice, aloe vera gel and ginger juice

The data pertaining to chemical attributes of fresh mango pulp, kagzi lime juice, aloe vera gel and ginger juice is presented in Table-1 and revealed that the mango pulp used in RTS making contained 19.00 percent Total Soluble Solids, 1.36 percent acidity, 2650.17 I.U. vitamin-A, 17.33 mg/100g vitamin-C, 4.24 percent reducing sugars, 12.66 percent non-reducing sugar and 16.90 percent total sugars. Similarly Dangi et al. (2019) [32] observed 16.12 percent TSS, 0.50 percent acidity, 32.50 mg/100 g vitamin-C, 5.52 percent reducing sugars, 8.44 percent non-reducing sugar and 13.96 percent total sugars in mango pulp. Kagzi lime juice contained 5.00 percent Total Soluble Solids, 7.68 percent acidity, 2.78 I.U. vitamin-A, 59.80 mg/100ml vitamin-C, 1.43 percent reducing sugars, 1.08 percent non-reducing sugar and 2.51 percent total sugars whereas, Thamilselvi et al. (2015) [49] revealed 6.00’/B TSS, 4.50 percent acidity, 2.12 pH, 27.60 mg/100ml vitamin-C and 4.50 percent total sugars in kagzi lime juice. Aloe vera gel contained 1.88 percent Total Soluble Solids, 0.24 percent acidity, 0.00 I.U. vitamin-A, 2.53 mg/100g vitamin-C, 0.53 percent reducing sugars, 1.18 percent non-reducing sugar and 1.71 percent total sugars whereas, Lavanya et al. (2018) [29] observed 2.14 percent TSS, 0.34 percent reducing sugars, 0.29 percent non-reducing sugar, 0.59 percent total sugars, 0.02 percent acidity, 4.00 pH and 2.00 mg/100g vitamin-C in aloe vera gel. Ginger contained 2.20 percent Total Soluble Solids, 0.26 percent acidity, 0.00 I.U. vitamin-A, 1.90 mg/100g vitamin-C, 0.63 percent reducing sugars, 1.12 percent non-reducing sugar and 1.75 percent total sugars similarly Singh et al. (2017) [47] reported 2.40 percent TSS, 0.25 percent acidity, 2.00 mg/100g vitamin-C, 2.30 percent reducing sugars, 3.50 percent non-reducing sugar and 5.80 percent total sugars in ginger.

Standardization of blends for RTS

A quality blended RTS with 10 percent blend comprising 55 percent mango pulp and 25 percent kagzi lime juice, 10 percent aloe vera gel and 10 percent ginger juice with 13 percent TSS, 0.20 percent acidity and 70 ppm SO2 (T3) was organoleptically found best for preparation of blend RTS (Table-2). Similarly Sangma et al. (2016) [44] found that the RTS containing 60 percent aloe vera gel, 5 percent ginger juice, 20 percent sweet lime juice and 15 percent amla juice has secured maximum organoleptic score. Sharma et al. (2017) [45] reported that the RTS prepared from 80:20 (jamun:mango) blends was found superior during organoleptic evaluation. Chandra et al. (2018) [9] found that the RTS containing 35 percent amla juice, 40 percent aloe vera gel, 20 percent ginger juice and 5 percent mint juice has secured maximum organoleptic score.

Biochemical changes during storage

Data pertaining to biochemical changes during storage of RTS into glass and polypet bottles is presented in Table-3 and Table-4, respectively which indicates that the Total Soluble Solids of RTS increased gradually after one month of storage from 13.00 percent to 14.00 percent into glass bottles whereas, from 13.00 percent to 15.05 percent into polypet bottles. This change might be due to the conversion or hydrolysis of polysaccharides into simple sugars (monosaccharides and oligosaccharides). The conversion rate was comparatively higher in polypet container than glass bottles which might be due to container effects. Similarly an increasing trend in TSS during storage was reported in mango-aloe vera blended RTS (Chaudhary, 2014) [10], orange based blended RTS beverages (Malav et al., 2014) [31], aloe vera-lemon blend RTS drink (Kaiser et al., 2016) [124], aloe vera based RTS drinks (Mishra and Sangma, 2017) [34] and turmeric-orance blend RTS beverage (Mane et al., 2019) [133] which are in agreement of present observations. The acidity of RTS increased gradually during storage period. Total acidity was increased from 0.20 percent at initial day to 0.55 percent at final day of storage into glass bottles while, from 0.20 percent at initial day to 0.60 percent at final day of storage into polypet bottles. Degradation of pectic substances and formation of organic acid have been reported to increase the acidity of fruit products (Conn and Stunf, 1976) [118]. Similarly an increasing trend in acidity during storage was observed by Hirdyani (2015) [20] on kinnow-basil-ginger blend RTS, Tiwari and Deen (2015) [50] on bael and aloe vera blended RTS, Hariharan and Mahendran (2016) [19] on ginger-lime RTS, Mishra and Sangma (2017) [24] on aloe vera based RTS drinks, Sindhumati et al. (2017) [46] on papaya-mango RTS and Begum et al. (2018) [16] on mixed fruit juice from mango, orange and pineapple. Vitamin-A content was continuously decreased from the first day (262.85 I.U.) to the end of storage (259.93 I.U.) throughout the storage period into glass bottles whereas, from the first day (262.85 I.U.) to the end of storage (259.64 I.U.) throughout the storage period into polypet bottles. This decrease in vitamin-A content might be due to the auto-oxidative degradation during storage and/or due to oxidative breakdown, isomerization or enzymatic destruction of the pigments. The loss of vitamin-A in RTS of different fruits based beverages during storage at ambient temperature was also reported in other studies (Balaswamy et al. [29]).
al., 2013; Sindhumati et al., 2017; Divyasree et al., 2018 and Avhad et al., 2019) [5, 46, 14, 4]. Vitamin C content was continuously decreased from the first day (9.22 mg/100ml) to the end of storage (8.29 mg/100ml) throughout the storage period into glass bottles whereas, from the first day (9.22 mg/100ml) to the end of storage (8.12 mg/100ml) throughout the storage period into polypet bottles. This decrease in vitamin C content might be due to the oxidation of ascorbic acid into dehydro-ascorbic acid by oxygen. The loss of vitamin C in RTS of different fruits based beverages during storage at ambient temperature was also reported in older studies (Chaudhary, 2014; Bolaji and Akanbi, 2017; Devra et al., 2017; Begum et al., 2018 and Mahnoori et al., 2020) [10, 7, 13, 6, 30]. The reducing sugars and total sugars of blended RTS, increased gradually and it was increased from 0.71 percent to 2.12 percent and 12.05 percent to 12.45 percent, respectively into glass bottles whereas, from 0.71 percent to 2.26 percent and 12.05 percent to 12.36 percent, respectively into polypet bottles. The increase in total and reducing sugars of processed fruit products could be due to inversion of non-reducing sugar into reducing sugars. These finding were supported by Sakhe et al. (2012) [31] in blended RTS of whey and mango, Malav et al. (2014) [32] in orange based RTS beverages, Priyanka et al. (2015) [33] in jamun based RTS beverages, Hamid et al. (2017) [34] in Mulberry RTS, Mishra and Sangma (2017) [35] in aloe vera based RTS drinks and Inthuja et al. (2019) [21] in cabbage-lime blend RTS beverage. The non-reducing sugar of blended RTS, decreased continuously throughout the entire period of storage and it was decreased from 11.34 percent to 10.33 percent into glass bottles whereas, from 11.34 percent to 10.10 percent into polypet bottles. The decrease in non-reducing sugar of processed fruit products might be due to inversion of non-reducing sugar.

This finding was supported by Tiwari and Deen (2015) [50] in bael and aloe Vera blended RTS, Singh et al. (2018) [48] in mango and aloe vera blended RTS and Mane et al. (2019) [33] in turmeric-orange blend RTS beverage. Organoleptic score of blended RTS decreased gradually with the storage period at room temperature (20.1-29.4°C). The acceptability of RTS was maintained up to four months. The score was significantly decreased from 8.35 at first day to 7.09 at final day of storage into glass bottles whereas, from 8.35 at first day to 7.05 at final day of storage into polypet bottles. The loss in organoleptic quality of beverages after certain period is obvious because of undesirable changes in the products. Temperature plays an important role in biochemical changes that leads to development of off flavour as well as discolouration in the beverages. Reduction in organoleptic quality are also reported in mango, lime and cardamom blended RTS (Ramdevputra et al., 2009) [39], aloe vera, lemon juice and ginger extract blended beverage (Kulthe et al., 2012) [26], kiinnow-basil-ginger blend RTS (Hirdyani, 2015) [20], bael and aloe vera blended RTS (Tiwari and Deen, 2015) [50], wood apple RTS (Kumar and Deen, 2017) [27], orange juice (Obasi et al., 2017) [15], jamun based RTS (Khayum et al., 2018) [28] and karonda-beetroot blended RTS beverage (Gupta, 2019) [17]. These reported observations are in the support of the present findings.

Table 1: Chemical attributes of mango pulp, kagzi lime juice, aloe vera gel and ginger juice.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Chemical attributes</th>
<th>Mean value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mango pulp</td>
<td>Kagzi lime juice</td>
</tr>
<tr>
<td>1.</td>
<td>Total soluble solids (%)</td>
<td>19.00</td>
</tr>
<tr>
<td>2.</td>
<td>Acidity (%)</td>
<td>1.36</td>
</tr>
<tr>
<td>3.</td>
<td>Vitamin-A (I.U.)</td>
<td>2650.17</td>
</tr>
<tr>
<td>4.</td>
<td>Vitamin-C (mg/100 g)</td>
<td>17.33</td>
</tr>
<tr>
<td>5.</td>
<td>Reducing sugars (%)</td>
<td>4.24</td>
</tr>
<tr>
<td>6.</td>
<td>Non-reducing sugar (%)</td>
<td>12.66</td>
</tr>
<tr>
<td>7.</td>
<td>Total sugars (%)</td>
<td>16.90</td>
</tr>
</tbody>
</table>

Table 2: Organoleptic quality of RTS prepared from different blends of mango pulp, kagzi lime juice, aloe vera gel and ginger juice.

<table>
<thead>
<tr>
<th>Treatments (Recipe No.)</th>
<th>Different combination of blends</th>
<th>Organoleptic quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mango pulp (%)</td>
<td>Kagzi lime juice (%)</td>
</tr>
<tr>
<td>T1</td>
<td>100</td>
<td>Nil</td>
</tr>
<tr>
<td>T2</td>
<td>Nil</td>
<td>100</td>
</tr>
<tr>
<td>T3</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>T4</td>
<td>Nil</td>
<td>25</td>
</tr>
<tr>
<td>T5</td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>T6</td>
<td>70</td>
<td>10</td>
</tr>
<tr>
<td>T7</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>T8</td>
<td>55</td>
<td>25</td>
</tr>
<tr>
<td>T9</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>T10</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>S.Em*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD at 5%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Biochemical and organoleptic changes of RTS during storage into glass bottles.

<table>
<thead>
<tr>
<th>Storage period (in months)</th>
<th>TSS (%)</th>
<th>Acidity (%)</th>
<th>Vitamin-A (I.U.)</th>
<th>Vitamin-C (mg/100ml)</th>
<th>Reducing sugars (%)</th>
<th>Non-reducing sugars (%)</th>
<th>Total sugars (%)</th>
<th>Organoleptic quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>13.00</td>
<td>0.20</td>
<td>262.85</td>
<td>9.22</td>
<td>0.71</td>
<td>11.34</td>
<td>12.05</td>
<td>8.35</td>
</tr>
<tr>
<td>1</td>
<td>13.40</td>
<td>0.24</td>
<td>262.16</td>
<td>8.90</td>
<td>0.98</td>
<td>11.16</td>
<td>12.14</td>
<td>8.12</td>
</tr>
<tr>
<td>2</td>
<td>13.80</td>
<td>0.33</td>
<td>261.34</td>
<td>8.81</td>
<td>1.26</td>
<td>10.94</td>
<td>12.20</td>
<td>7.78</td>
</tr>
<tr>
<td>3</td>
<td>13.90</td>
<td>0.41</td>
<td>260.88</td>
<td>8.55</td>
<td>1.79</td>
<td>10.53</td>
<td>12.27</td>
<td>7.38</td>
</tr>
<tr>
<td>4</td>
<td>14.00</td>
<td>0.55</td>
<td>259.93</td>
<td>8.29</td>
<td>2.12</td>
<td>10.33</td>
<td>12.45</td>
<td>7.09</td>
</tr>
</tbody>
</table>
### Acknowledgement
The Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, U.P. is gratefully acknowledged for providing all kinds of support and facilitate for this experiment.

### Conclusion
It may be concluded from above findings that RTS prepared from 10 percent blend pulp comprising 55% mango pulp, 25% kagzi lime juice, 10% aloe vera gel and 10% ginger juice containing 13% TSS, 0.20% acidity and 70 ppm SO$_2$ (T$_0$) was found best during organoleptic evaluation. The TSS, acidity, reducing sugars, total sugars was increased, whereas vitamin-A, vitamin-C, non-reducing and organoleptic quality was decreased during storage when stored into both glass and polypet bottles. The RTS can be stored up to 4 months at ambient storage temperature (20.1-29.4°C) into glass and polypet bottles with acceptable quality.

### References

<table>
<thead>
<tr>
<th>Storage period (in months)</th>
<th>TSS (%)</th>
<th>Acidity (%)</th>
<th>Vitamin-A (I.U.)</th>
<th>Vitamin-C (mg/100ml)</th>
<th>Reducing sugars (%)</th>
<th>Non-reducing sugars (%)</th>
<th>Total sugars (%)</th>
<th>Organoleptic Score</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>13.00</td>
<td>0.20</td>
<td>262.85</td>
<td>9.22</td>
<td>0.71</td>
<td>11.34</td>
<td>12.05</td>
<td>8.35</td>
<td>LVM</td>
</tr>
<tr>
<td>1</td>
<td>13.70</td>
<td>0.28</td>
<td>262.18</td>
<td>8.85</td>
<td>1.14</td>
<td>11.10</td>
<td>12.24</td>
<td>7.50</td>
<td>LM</td>
</tr>
<tr>
<td>2</td>
<td>14.10</td>
<td>0.37</td>
<td>261.50</td>
<td>8.71</td>
<td>1.37</td>
<td>10.92</td>
<td>12.29</td>
<td>6.00</td>
<td>LM</td>
</tr>
<tr>
<td>3</td>
<td>14.60</td>
<td>0.48</td>
<td>260.73</td>
<td>8.40</td>
<td>1.88</td>
<td>10.45</td>
<td>12.33</td>
<td>7.29</td>
<td>LM</td>
</tr>
<tr>
<td>4</td>
<td>15.05</td>
<td>0.60</td>
<td>259.64</td>
<td>8.12</td>
<td>2.26</td>
<td>10.10</td>
<td>12.36</td>
<td>7.05</td>
<td>LM</td>
</tr>
<tr>
<td>S.Em±</td>
<td>0.03</td>
<td>0.02</td>
<td>0.07</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td>0.02</td>
<td></td>
</tr>
</tbody>
</table>

LVM: Like very much, LM: Like moderately

Table 4: Biochemical and organoleptic changes of RTS during storage into polypet bottles.


42. Sadhu MK, Bose TK. Studies on mango cultivars part I: Morphological and physico-chemical studies of some promising mango cultivars of the district Mursidabad, West Bengal. Indian Food Packer 1976;30(5):24-32.


48. Singh PP, Dr Tripathi AD, Rai DC, Kumar N, Singh UP. To study the shelf life of Aloe vera fortified mango RTS with different time and temperature combinations on its organoleptic and functional properties. The Pharma Innovation Journal 2018;7(3):91-97.
