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**Mujahid Shagiwal**
Research Scholar, Department of Fruit Science, College of Horticulture & Forestry Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

**Bhagwan Deen**
Professor and Head, Department of Post-Harvest Technology, Department of Fruit Science, College of Horticulture & Forestry Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

**Corresponding Author:**
**Mujahid Shagiwal**
Research Scholar, Department of Fruit Science, College of Horticulture & Forestry Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

# Studies on preparation of squash from strawberry (*Fragaria ananassa* Duch), ginger (*Zingiber officinale* Rosc.) and aloe vera (*Aloe barbadensis* Miller) blend

**Mujahid Shagiwal and Bhagwan Deen**

**Abstract**
The present investigation was carried out at Post Graduate Laboratory, Department of Fruit Science and Department of Post Harvest Technology, College of Horticulture & Forestry, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya-224229, U.P. India during 2021. Strawberry *(Fragaria ananassa* Duch), ginger (*Zingiber officinale* Rosc) and aloe vera (*Aloe barbadensis* Miller) have nutritional, spicy, medicinal and therapeutic values. In the present studies, strawberry pulp, aloe vera gel and ginger juice were blended in different ratios *viz*., 100:0:0 ($T_1$), 0:100:0 ($T_2$), 0:0:100 ($T_3$), 33.33:33.33:33.33 ($T_4$), 40:30:30 ($T_5$): 50:25:25 ($T_6$), 60:20:20 ($T_7$), 70:15:15 ($T_8$), 80:10:10 ($T_9$) and 90:5:5 ($T_{10}$) for the preparation of squash. 25 percent of blend comprising 80% strawberry pulp, 10% aloe vera gel and 10% ginger juice was found best on 9-point hedonic scale for the preparation of squash with 50% TSS, 1.20% acidity 350 ppm $SO_2$ than other blend combinations. During the storage period TSS, acidity, reducing sugars, total sugars and browning increased whereas, ascorbic acid (vitamin-C), non-reducing sugar, pH and organoleptic quality decreased with the advancement of storage period. The squash was stored at ambient (22.8-34.0ºC) as well as low (4-6ºC) temperatures. The beverage was organoleptically acceptable upto 5 months of storage in case of both ambient and low temperatures. The present study indicated that strawberry, aloe vera and ginger can be utilized for palatable squash making which can be beneficial for the consumers in term of taste, colour, flavour, nutritional, medicinal and therapeutic properties.

**Keywords:** Squash, Strawberry pulp, Aloe vera gel, Ginger juice, Blend combination, Storage, Ambient and Low temperatures, Organoleptic quality

## Introduction
Beverage is a liquid used for the utilization of human beings. Moreover to their primary function of quenching thirst, they have a key role in human culture. The beverages can be classified into two main groups- non-alcoholic beverages and alcoholic beverages. The non-alcoholic beverages containing no alcoholic whereas, alcoholic beverages contain ethyl alcohol and resulting from the alcoholic fermentation of carbohydrates rich raw materials by yeasts. Incorporation of natural compounds in the fruits, rhizomes, vegetables such as phyto-chemicals, flavonoids, anti-oxidants and vitamins together without harmful to human consumption is one of the new product development strategy in functional beverage industry to attract customer; the development of such health beneficial beverage is a demand of time (Wikipedia, 2022; Bhuiyan *et al.*, 2012) [33, 4].

Strawberry (*Fragaria ananassa* L.) is an important fruit crop which belongs to family Rosaceae. It is characterized by fruity, sweet and tart flavor and is widely appreciated for its characteristic aroma, bright red fruit color and juicy texture (Mehriz *et al.*, 2013) [18]. Colour is one of the most important quality attributes of strawberries and one of the first parameters evaluated by the consumer, which is directly related to the anthocyanins' content of the fruit (Crecente-Campo *et al.*, 2012) [9]. It is monoecious, short day, non-climactric, aggregate, temperate type fruit. It is rich source of vitamin C, sugar, organic acids, anthocyanin, phosphorus, iron, flavonoids, fructose, glucose, sucrose and other minerals (Mehriz *et al.*, 2013; Sturtz *et al.*, 2011) [18, 32]. Whole fruit of strawberry contains 89.9% moisture, 0.7% protein, 0.5% fat, 5% total sugars, 1.3% crude fiber and energy value of 37 Kcal per 100 g of fruits. It has 0.52 to 2.26% acidity (as citric acid) and it contains 0.5% total minerals (Chavan, 2015) [7]. Strawberry is a commercial fruit having a great potential for processing and is widely used for preparation of purees, squash, juice, jams, preserves, candy, and alcoholic beverages (Sharma *et al.*, 2009) [29].

Ginger (*Zingiber officinale* Rose) is one of the important medicinal crops belongs to the family Zingiberaceae. Ginger is a valued spice known for its taste, aroma, flavour and medicinal value. It is originated in the Indo-Malayan region, is now widely distributed across the tropics of Asia, Africa, America and Australia. It was domesticated in India and China, which represent the centre of origin of the species. The Arabs introduced ginger to East Africa in the 13th century CE (common or current era) and the Portugese spread it to West Africa and the Pacific islands for commercial cultivation. (Kizhakkayil and Sasikumar, 2011; Ravindran *et al.*, 2006; Mukherjee *et al.*, 2014) [15, 24, 20]. Ginger is herbaceous aromatic perennial plant which possesses medicinal properties due to its bioactive compounds (Sanwal *et al.*, 2010) [28]. Ginger has received growing interest because of its anti-inflammatory (Minghetti *et al.*, 2007) [19] and antidiabetic (Afshari *et al.*, 2007) [1] properties. Ginger shows potential antipyretic, antiallergenic, analgesic, antitussive (Gurdip *et al.*, 2008) [11] and chemo preventive activities (Sabulal *et al.*, 2007) [26].

Aloe vera (*Aloe barbadensis* Miller) is perennial, drought resistant succulent plant commonly known as 'Ghrit-kumari' and 'Gheegwar'. It belongs to the Asphodelaceae or Liliaceae family, which historically has been used for a variety of medicinal purpose (Ramachandra and Rao, 2008) [23]. The name of aloe vera is originated basically from Arabic and Latin Language. "Alloeh" is the Arabic word which means "shining bitter substance", from that Aloe word is generated, while "Vera" is derived from the Latin meaning "true". It belongs to the Asphodelaceae family and is related to onions and asparagus. This plant grows best in large variety of climate including tropical and low-rainfall areas (Sahu *et al.*, 2013) [27]. The aloe gel is transparent slippery mucilage containing bioactive polysaccharides, mainly partially acetylated glucomannans in addition to desired vital nutrients (Rodriguez *et al.*, 2010) [25]. Aloe vera leaf contains 95-98 per cent of water, 75 nutrients, 200 active compounds, 20 minerals, 18 amino acids, 12 vitamins and 92 enzymes. It can be used as the source of vitamins like A, $B_1$, $B_2$, $B_6$, $B_{12}$, C, E, folic acid, niacin etc. Owing to its succulent properties, it is a rich source of nutrients and essential minerals (Basmatker *et al.*, 2011) [3].

The blend beverages can be prepared from blends of different fruits and extracts of plants having medicinal, nutritional and therapeutic values with acceptable palatability. The development of beverages from the blends of strawberry, ginger and aloe vera would provide the opportunities for best use of these perishable raw materials with less post harvest loss and simultaneously availability of palatable drinks of medicinal values to the consumers. The consumers are becoming health conscious and more careful to their health and fitness subsequently demands for natural beverages with medicinal properties over synthetic one increasing in the market. The availability of palatable recipes, processing methods storage life for drinks rich in nutritional and medicinal properties is one of the major constraints before the beverages processing industries.

## Materials and Methods

### Raw materials

Strawberry (var. Wenter dawn) purchased from farmer field Faizabad, ginger (Local variety) purchased from local market Kumarganj and aloe vera (IC-285629) purchased from Horticultural Main Experiment Station, Department of Medicinal and Aromatic Plants, Acharya Narendra Deva University of Agriculture & Technology, Narendra Nagar Kumarganj and were used for the preparation of squash.

**Extraction of strawberry pulp, aloe vera gel and ginger juice:** The methods which are used for the extraction of strawberry pulp, aloe vera gel and ginger juice are shown in Fig.-1, Fig.-2, and Fig.-3, respectively.

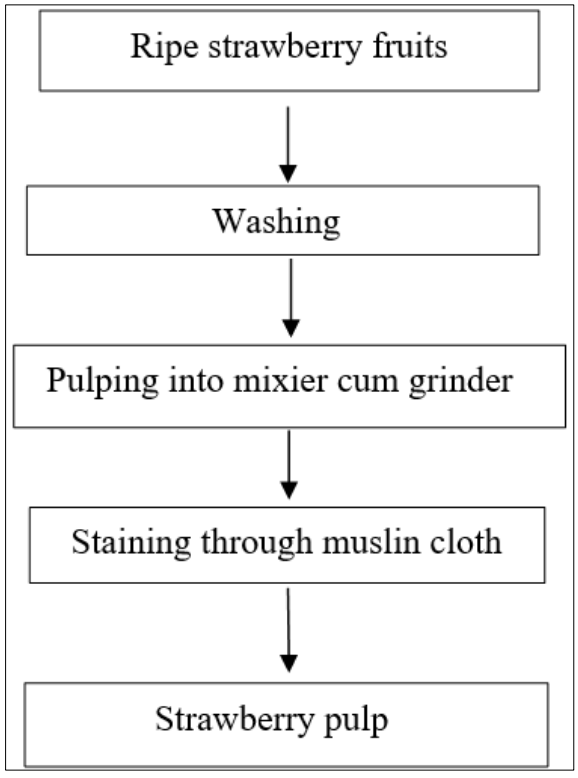


**Fig 1:** Flow chart of pulp extraction from strawberry fruits

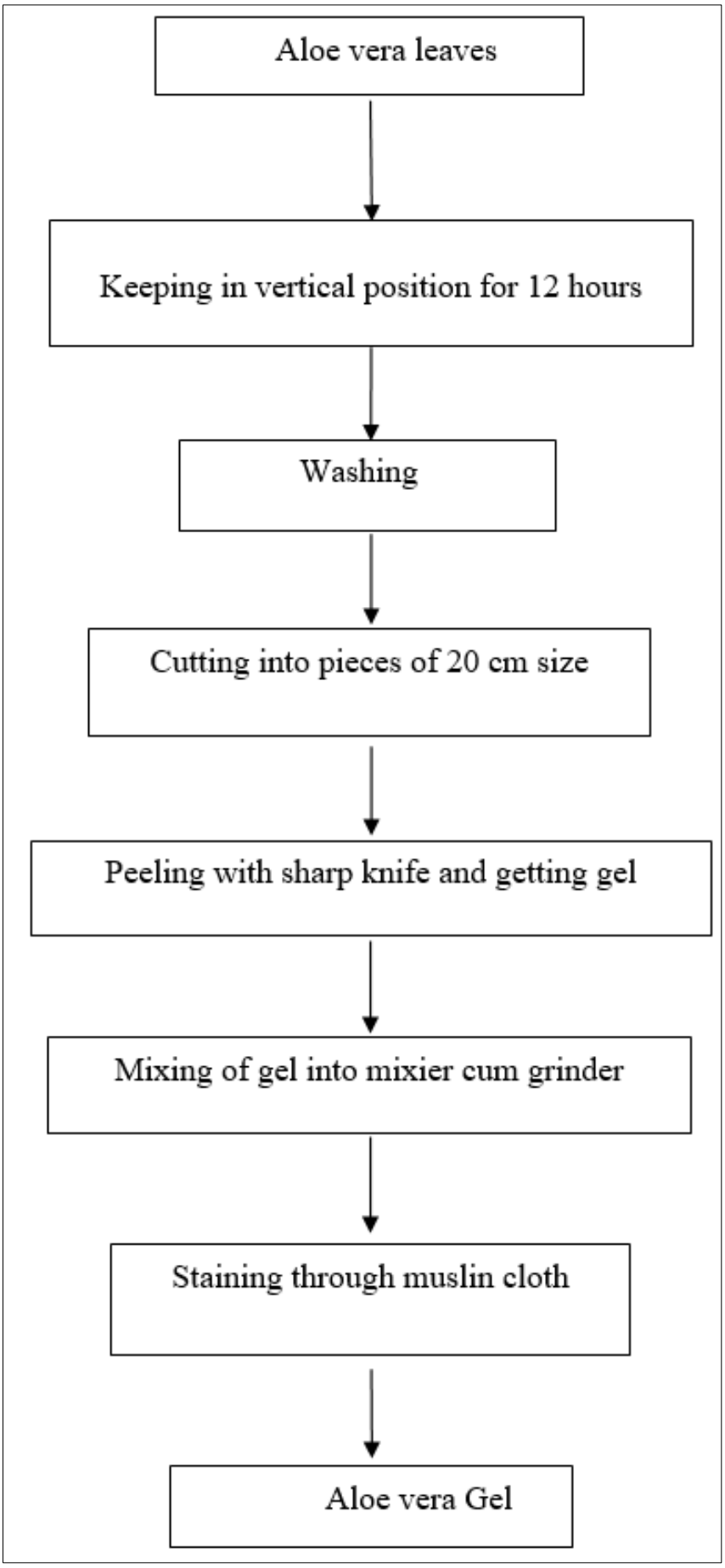


**Fig 2:** Flow chart of aloe vera gel extraction

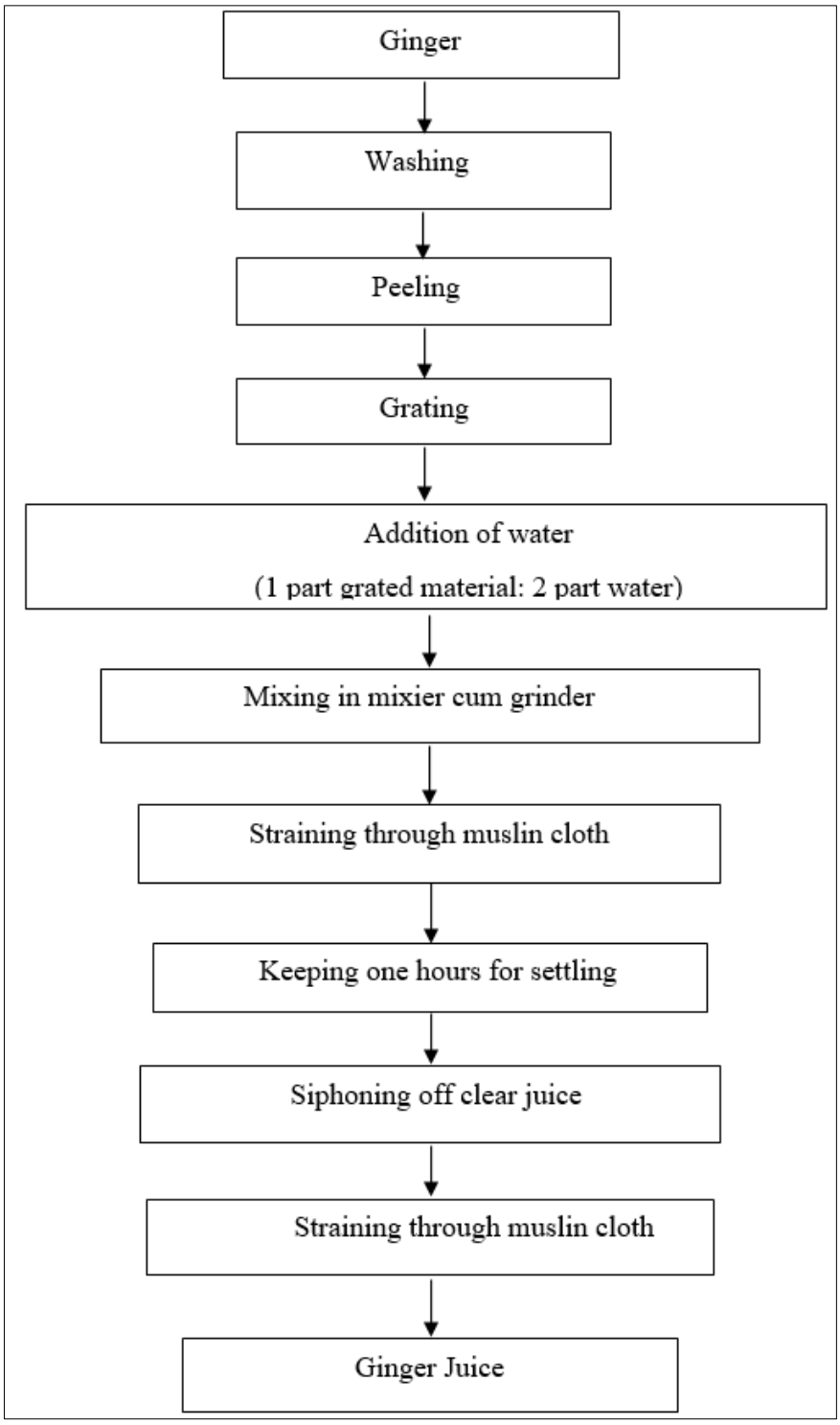


**Fig 3:** Flow chart of ginger juice extraction

**Standardization of blends for squash**:

For the preparation and evaluation of palatable squash beverages, the squash comprising 25% blends, 50% TSS, 1.20% acidity and 350 ppm $SO_2$ were prepared from various combinations of strawberry pulp, aloe vera gel and ginger juice to find out the best combination from the following combination treatments:

$T_1$ - 25% blend comprising 100% strawberry pulp + 0% aloe vera gel + 0% ginger juice with 50% TSS, 1.20% acidity and 350 ppm $SO_2$.

$T_2$ - 25% blend comprising 0% strawberry pulp + 100% aloe vera gel + 0% ginger juice with 50% TSS, 1.20% acidity and 350 ppm $SO_2$.

$T_3$ - 25% blend comprising 0% strawberry pulp + 0% aloe vera gel + 100% ginger juice with 50% TSS, 1.20% acidity and 350 ppm $SO_2$.

$T_4$ - 25% blend comprising 33.33% strawberry pulp + 33.33% aloe vera gel + 33.33% ginger juice with 50% TSS, 1.20% acidity and 350 ppm $SO_2$.

$T_5$ - 25% blend comprising 40% strawberry pulp + 30% aloe vera gel + 30% ginger juice with 50% TSS, 1.20% acidity and 350 ppm $SO_2$.

$T_6$ - 25% blend comprising 50% strawberry pulp + 25% aloe vera gel + 25% ginger juice with 50% TSS, 1.20% acidity and 350 ppm $SO_2$.

$T_7$ - 25% blend comprising 60% strawberry pulp + 20% aloe

vera gel + 20% ginger juice with 50% TSS, 1.20% acidity and 350 ppm $SO_2$.
$T_8$ - 25% blend comprising 70% strawberry pulp + 15% aloe vera gel + 15% ginger juice with 50% TSS, 1.20% acidity and 350 ppm $SO_2$.
$T_9$ - 25% blend comprising 80% strawberry pulp + 10% aloe vera gel + 10% ginger juice with 50% TSS, 1.20% acidity and 350 ppm $SO_2$.
$T_{10}$ - 25% blend comprising 90% strawberry pulp + 5% aloe vera gel + 5% ginger juice with 50% TSS, 1.20% acidity and 350 ppm $SO_2$.

**Preparation of squash**

Squash containing 25% blend, 50% TSS, 1.2% acidity and 350 ppm $SO_2$ were prepared from different combinations of strawberry pulp, aloe vera gel and ginger juice. The prepared squash were organoleptically evaluated on 9-point Hedonic scale to find out the best combination of blend for large scale preparation. The method used for squash making is shown in Fig-4.

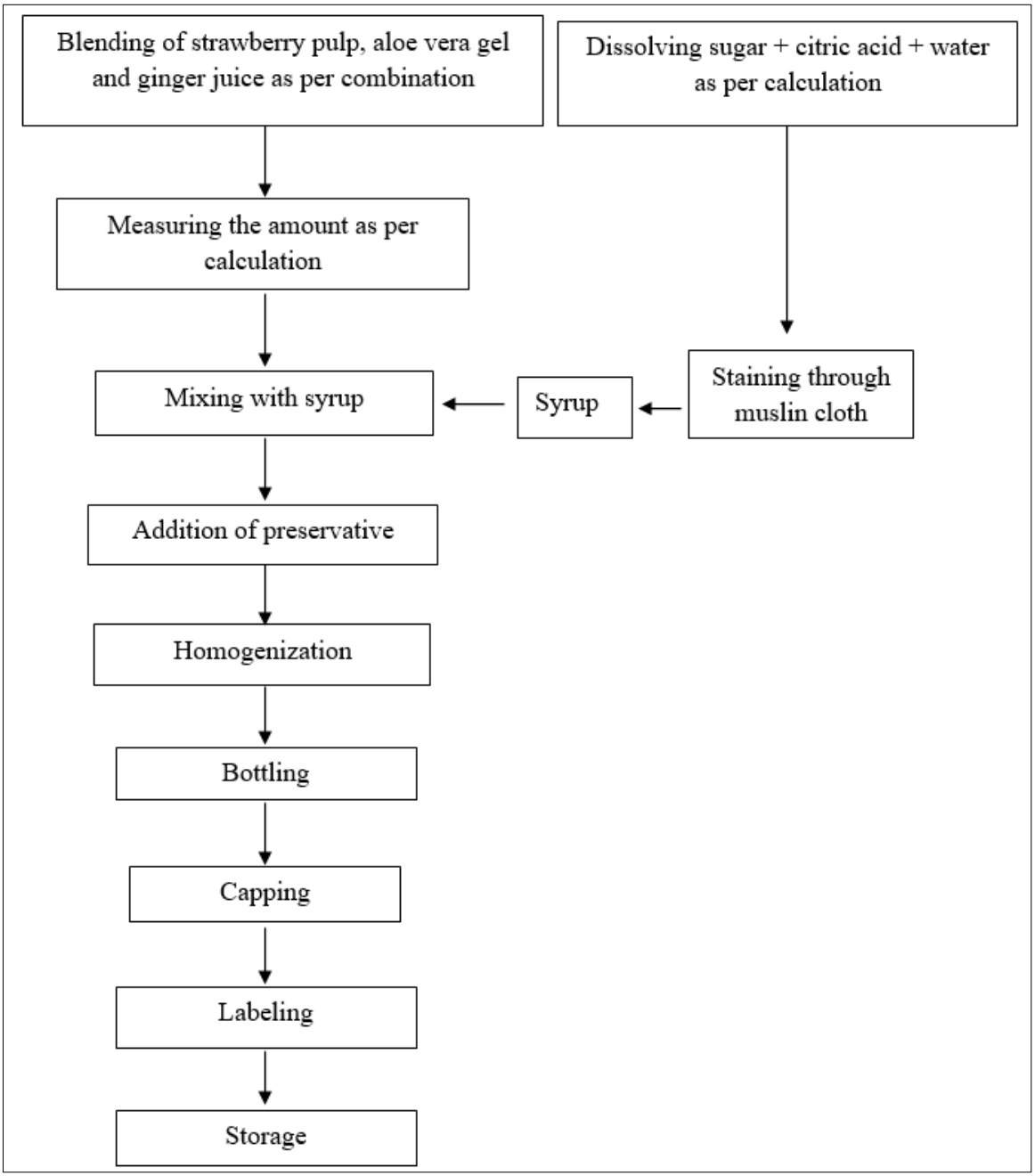


**Fig 4:** Flow chart for the preparation of strawberry, aloe vera and ginger blended squash.

**Storage studies**

Finally five liters of squash were prepared with best combination of blend, filled into 1000 ml capacity polypet bottles, leaving 2cm head space, capped and put for storage studies under ambient (22.8 - 34.0° C) and refrigerated (4-6°C) temperatures. During storage observation on changes in TSS, acidity, ascorbic acid (vitamin-C), reducing sugars, non-reducing sugar, total sugars, pH, browning and organoleptic quality were recorded at monthly intervals during five months of storage and are described as follows.

The TSS of the sample was determined by using hand refractometer (Erma Inc. Tokyo Japan, 0-32% and 28-62%) in terms of percentage. The values of TSS recorded at ambient and low temperatures were corrected to 20° C with the help of

reference table and the mean value of the sample was expressed as per cent TSS content. The acidity was estimated by titrating known quantity of sample against standard N/10 NaOH solution using 2-3 drops of phenolphthalein indicator and expressed in per cent anhydrous citric acid. Ascorbic acid (vitamin-C) content was determined by preparing sample in 3% $HPO_3$ (metaphosphoric Acid) solution then determined by 2, 6- dichlorophenol indophenol dye solution till the appearance of light pink colour. The reducing, non-reducing and total sugars were estimated by using Fehling's solution A and B and methyl blue as an indicator in boiling stage. For the measurement of pH, INSIF digital pH meter model (IE-702) was used, which was standardized and calibrated with different buffers of pH 4.0 and pH 7.0. To determine the non-enzymatic browning sample was taken and mixed with 30 ml 60% alcohol thoroughly then centrifuged for 15 minutes at 1500 rpm, filtered through whatman filter paper No. 1 to obtain clear solution. Thereafter the absorbance of sample was recorded on "Igene Labserve" model UV vis Double Beam spectrophotometer at 440 nm wave length using 60% aqueous alcohol as blank. The increase in O.D. of a sample at 440 nm was expressed as non-enzymatic browning. For the evaluation of organoleptic quality of squash a semi trained panel of 9 judges was conducted, who scored on the 9.0 point Hedonic Rating Scale to assess the colour, flavour and texture of the beverages.

**Statistical analysis**

The experiments were conducted in 3 replications and the observations were recorded at monthly intervals. The statistical analysis of the data was done by computer software with completely randomized design (CRD) that described by Panse and Sukhatne (1985) [22].

## Results and Discussion

**Chemical attributes of strawberry pulp, aloe vera gel and ginger juice**

The data on the chemical attributes of strawberry pulp, aloe vera gel and ginger juice recorded and presented in Table-1 observed that TSS, acidity, vitamin-C, reducing sugars, non-reducing sugar, total sugars, and pH of strawberry pulp used in squash making comprised 7.00 per cent, 1.28 per cent, 56.87 mg/100g, 3.15 per cent, 2.70 per cent, 5.85 per cent and 3.40, respectively. Similarly Hossain *et al.* (2015) [14] considered that strawberries pulp contains 8.50% TSS, 1.02% acidity, 61.65 mg/100g ascorbic acid, 3.37% total sugars and 3.44 pH. Aloe vera gel contained 1.83% TSS, 0.20% acidity, 2.44 mg/100g vitamin-C, 0.49% reducing sugars, 1.11% non-reducing sugar, 1.60% total sugars and 4.48 pH, respectively. Whereas Harendra and Deen (2022) [13] observed that aloe vera gel contains 1.88% TSS, 0.24% acidity, 2.53 mg/100g vitamin-C, 0.53% reducing sugars, 1.18% non-reducing sugar and 1.71% total sugars. Ginger juice contained 2.22% TSS, 0.28% acidity, 1.97 mg/100g vitamin-C, 0.60% reducing sugars, 1.14% non-reducing sugar, 1.74% total sugars and 5.65 pH, respectively. Whereas, Harendra and Deen (2022) [13] revealed that ginger juice contains 2.20% TSS, 0.26% acidity, 1.90 mg/100g vitamin-C, 0.63% reducing sugars, 1.12% non-reducing sugar and 1.75% total sugars.

**Standardization of blends for squash**

A palatable quality blended squash with 25% blends comprising 80% strawberry pulp, 10% aloe vera gel and 10% ginger juice adjusted to 50% total soluble solids, 1.20% acidity and 350 ppm $SO_2$ ($T_9$) was found to be best for preparation of squash (Table-2). Similarly Harendra and Deen, (2021) [12] found that 25% of blend consisting 55% mango pulp, 25% kagzi lime juice, 10% aloe vera gel and 10% ginger juice was found best for the preparation of squash. Kumar and Deen (2018) [16, 17] observed that 25% wood apple pulp with 50% TSS and 1.00% titratable acidity was best for palatable squash. Sherzad *et al.* (2017) [30, 31] reported that Strawberry based blended squash beverages containing 30% blended juice with 40ºB TSS and 1% acidity was found best as compared to other recipes. The product was free from spoilage microbes during storage period.

**Table 1:** Chemical attributes of strawberry pulp, aloe vera gel and ginger juice

| S. No. | Chemical attributes | Mean values | | |
|---|---|---|---|---|
| | | Strawberry pulp | Aloe vera gel | Ginger juice |
| 1. | Total soluble solids (%) | 7.00 | 1.83 | 2.22 |
| 2. | Acidity (%) | 1.28 | 0.20 | 0.28 |
| 3. | Vitamin-C (mg/100 g) | 56.87 | 2.44 | 1.97 |
| 4. | Reducing sugars (%) | 3.15 | 0.49 | 0.60 |
| 5. | Non-reducing sugar (%) | 2.70 | 1.11 | 1.14 |
| 6. | Total sugars (%) | 5.85 | 1.60 | 1.74 |
| 7. | pH | 3.40 | 4.48 | 5.65 |

**Changes during storage life of prepared squash**

Data recorded on biochemical changes of squash during storage is tabulated in Table3 and Table-4, which observes that TSS of squash increased continuously under both ambient (22.8-34.0ºC) and refrigerated (4-6ºC) temperatures from 50.00% to 51.77% and from 50.00% to 50.82%, respectively. The changes in TSS content might be due to inversion or hydrolysis of polysaccharides into simple sugars. The conversion rate was higher in ambient temperature compare to refrigerated temperature, which might be due to temperature effects. The present findings are in agreement with the considerations of prior research worker like Harendra and Deen, (2021) [12] on mango, citrus, aloe vera and ginger blended squash, Hossain *et al.* (2015) [14] on strawberry squash, Gautam (2015) [10] on guava and aloe vera blende RTS, squash and syrup beverages and Chaudhary (2014) [5] on blended RTS and squash beverages prepared from mango and aloe vera. Acidity content in blended beverages of squash increased continuously during storage under both ambient as well as refrigerated temperatures. It was increased from 1.20% to 1.74% and from 1.2% to 1.61%, respectively. An increase in the acidity content might be due to degradation of pectic substances and formation of organic acid (Conn and Stumf, 1976) [8]. The formation of citric acid is more under ambient storage as compare to refrigerated storage conditions which might be because of higher rate of pectic substances degradation under higher temperature storage. Similar results that an increase in acidity content during storage of products were reported by Harendra and Deen, (2021) [12] in mango, citrus, aloe vera and ginger squash, Kumar and Deen (2018) [16, 17] in squash beverage prepared from wood apple pulp, Hossain *et al.* (2015) [14] in strawberry squash and Anand (2012) [2] in aonla and aloe vera blended RTS and squash. Vitamin-C content of squash prepared from strawberry, aloe vera and ginger blends gradually decreased up to the end of storage time and content was found to be significantly

reduced from 15.14 mg/100ml to 14.60 mg/100ml and 15.14 mg/100ml to 14.70 mg/100ml at ambient as well as low temperatures, respectively. The depletion in ascorbic acid (vitamin- C) content might be due to oxidation of ascorbic acid into dehydro-ascorbic acid by oxygen ($O_2$) trapped into containers and intramolecular space of the product. The present results on changes in ascorbic acid (vitamin-C) content during storage of beverages are also supported by the findings of Harendra and Deen, (2021) [12] on mango, citrus, aloe vera and ginger blended squash, Sherzad *et al.* (2017) [30, 31] on strawberry based blended squash, Hossain *et al.* (2015) [14] on strawberry squash and Gautam (2015) [10] on guava and aloe vera blende RTS, squash and syrup beverages. The decreasing trend of ascorbic acid content shows that ascorbic acid content was more under low temperature conditions that might be due to temperature influence on ascorbic acid oxidation. The reducing sugars content of squash increased continuously up to the termination of storage period under both ambient and low temperatures and it was increased from 1.00% to 1.87% and from 1.00% to 1.46%, respectively. The increase in reducing sugars of products might be due to conversion of non reducing sugar into reducing sugars. Similar considerations were also reported by the older workers like Harendra and Deen, (2021) [12] in blended squash of mango, kagzi lime, aloe vera and ginger, Kumar and Deen (2018) [16, 17] in wood apple squash, Sherzad *et al.* (2017) [30, 31] in strawberry based blended squash beverages and Gautam (2015) [10] in guava and aloe vera blended RTS, squash and syrup beverages. These findings support the results of present investigation. The non-reducing sugar content of squash showed gradual decreasing trend stored under ambient temperature (From 48.22% to 47.68%) and refrigerated temperature (From 48.22% to 47.91%). Antithesis to reducing and total sugars, reduction in non reducing sugar might be due to conversion of non reducing sugar. The results are similar with the prior results of Kumar and Deen (2018) [16, 17] in wood apple squash, Hossain *et al.* (2015) [14] in strawberry squash and Chaudhary (2014) [5] in blended RTS, squash and syrup beverages of mango and aloe vera. These considerations support are in conformity to present findings on changes in non-reducing sugar content of products during storages. The total sugars content of squash increased gradually from 49.22% to 49.55 and from 49.22% to 49.37% when stored under ambient as well as low temperatures, respectively. A rise in total sugars of product might be due to inversion of non reducing sugar into reducing sugars. The present results on increase of total sugars content in squash is also similar to findings of different fruits based beverages (Harendra and Deen, 2021; Kumar and Deen, 2018; Sherzad *et al.*, 2017; Hossain *et al.*, 2015 and Gautam, 2015) [12, 16, 17, 10, 30, 31, 14]. The pH of squash decreased continuously up to the termination of storage period under ambient as well as refrigerated conditions from 0.65 to 0.21 and 0.65 to 0.37, respectively. The cause of decrease in pH content is may be due to increasing in acidity of these products. Similar observations were recorded by Hossain *et al.* (2015) [14] in strawberry squash, and Murtaza *et al.* (2004) [21] in strawberry drink. These reports supports the observations recorded on pH of squash beverage in present studies. The browning in squash increased continuously up to the termination of storage under ambient as well as refrigerated temperatures. It was increased from 0.51 (O.D.) to 0.70 (O.D.) and from 0.51 (O.D.) to 0.65 (O.D.), respectively. An increase in browning of squash could be mainly due to the non- enzymatic reaction (Millard reaction) in which organic acid reacts with sugars and amino acids and leads to the formation of brown pigments. The browning of beverages stored at low temperature was found to be slow in comparison to ambient storage conditions because low temperature might slowed the Millard reaction. The present findings are also in agreement with the findings of previous research workers like Kumar and Deen (2018) [16, 17] on wood apple squash, Chaudhary *et al.* (2017) [6] on mango and aloe vera squash, Gautam (2015) [10] on guava and aloe vera blended RTS, squash and syrup beverages, Chaudhary (2014) [5] on mango and aloe vera blended RTS, squash and syrup and Anand (2012) [2] on aonla and aloe vera blended RTS and squash. The organoleptic quality of squash reduced continuously with the storage period and it was acceptable up to five months of storage under ambient and refrigerated conditions. It was reduced from 8.77 to 7.11 and from 8.77 to 7.33, respectively. It might be cause of temperature, because temperature plays an important role in biochemical changes that leads to development of off flavour as well as discolouration in the beverages. The reduction in organoleptic quality are also reported in previous studies performed by Harendra and Deen (2021) [12] in blended squash prepared from mango, kagzi lime, aloe vera and ginger, Kumar and Deen (2018) [16, 17] in squash prepared from wood apple, Hossain *et al.* (2015) [14] in strawberry squash and Gautam (2015) [10] in guava and aloe vera blended RTS, squash and syrup.

**Table 2:** Organoleptic quality of squash prepared from different blends of strawberry pulp, aloe vera gel and ginger juice

| Treatments | Different combination of blends | | | Organoleptic quality | |
|---|---|---|---|---|---|
| | Strawberry pulp (%) | Aloe vera gel (%) | Ginger juice (%) | Score | Rating |
| $T_1$ | 100 | Nil | Nil | 7.77 | Like moderately |
| $T_2$ | Nil | 100 | Nil | 6.80 | Like moderately |
| $T_3$ | Nil | Nil | 100 | 7.00 | Like slightly |
| $T_4$ | 33.33 | 33.33 | 33.33 | 7.66 | Like moderately |
| $T_5$ | 40 | 30 | 30 | 7.33 | Like moderately |
| $T_6$ | 50 | 25 | 25 | 7.44 | Like moderately |
| $T_7$ | 60 | 20 | 20 | 6.80 | Like slightly |
| $T_8$ | 70 | 15 | 15 | 7.78 | Like moderately |
| $T_9$ | 80 | 10 | 10 | 8.77 | Like very much |
| $T_{10}$ | 90 | 5 | 5 | 6.55 | Like slightly |
| S.Em± | | | | 0.03 | |
| CD at 5% | | | | 0.09 | |

**Table 3:** Changes during storage life of prepared squash under ambient temperature (22.8-34.0 ºC)

| Storage period (Months) | TSS (%) | Acidity (%) | Vitamin-C (mg/100ml) | Reducing Sugars (%) | Non-reducing sugar (%) | Total sugars (%) | pH | Browning (O.D.) | Organoleptic | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Score | Rating |
| 0 | 50.00 | 1.20 | 15.14 | 1.00 | 48.22 | 49.22 | 0.65 | 0.51 | 8.77 | LVM |
| 1 | 50.15 | 1.26 | 15.02 | 1.18 | 48.08 | 49.26 | 0.61 | 0.55 | 8.42 | LVM |
| 2 | 50.46 | 1.34 | 14.93 | 1.35 | 47.99 | 49.34 | 0.52 | 0.57 | 8.05 | LVM |
| 3 | 50.94 | 1.47 | 14.81 | 1.56 | 47.90 | 49.46 | 0.42 | 0.61 | 7.69 | LM |
| 4 | 51.47 | 1.55 | 14.74 | 1.70 | 47.79 | 49.49 | 0.33 | 0.65 | 7.35 | LM |
| 5 | 51.77 | 1.74 | 14.60 | 1.87 | 47.68 | 49.55 | 0.21 | 0.70 | 7.11 | LM |
| S.Em± | 0.02 | 0.02 | 0.05 | 0.03 | 0.04 | 0.04 | 0.01 | 0.02 | 0.03 | |
| CD at 5% | 0.07 | 0.06 | 0.15 | 0.10 | 0.13 | 0.13 | 0.03 | 0.05 | 0.09 | |

LVM: Like very much, LM: Like moderately

**Table 4:** Changes during storage life of prepared squash under low temperature (4-6 ºC)

| Storage period (Months) | TSS (%) | Acidity (%) | Vitamin-C (mg/100ml) | Reducing Sugars (%) | Non-reducing sugar (%) | Total sugars (%) | pH | Browning (O.D.) | Organoleptic | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Score | Rating |
| 0 | 50.00 | 1.20 | 15.14 | 1.00 | 48.22 | 49.22 | 0.65 | 0.51 | 8.77 | LVM |
| 1 | 50.07 | 1.24 | 15.08 | 1.06 | 48.19 | 49.25 | 0.63 | 0.53 | 8.55 | LVM |
| 2 | 50.22 | 1.30 | 14.99 | 1.14 | 48.12 | 49.26 | 0.59 | 0.54 | 8.29 | LVM |
| 3 | 50.35 | 1.39 | 14.88 | 1.25 | 48.05 | 49.30 | 0.51 | 0.57 | 7.95 | LM |
| 4 | 50.56 | 1.48 | 14.81 | 1.34 | 47.99 | 49.33 | 0.44 | 0.61 | 7.62 | LM |
| 5 | 50.82 | 1.61 | 14.70 | 1.46 | 47.91 | 49.37 | 0.37 | 0.65 | 7.33 | LM |
| S.Em± | 0.03 | 0.02 | 0.04 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 | |
| CD at 5% | 0.09 | 0.05 | 0.12 | 0.07 | 0.06 | 0.07 | 0.04 | 0.06 | 0.07 | |

LVM: Like very much, LM: Like moderately

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**Conclusion**

It may be concluded from above findings that 25 per cent of the blend containing 80% strawberry pulp, 10% aloe vera gel and 10% ginger juice was found best on Hedonic Scale by the panel of semi trained judges for the preparation of palatable quality of squash adjusted to 50 per cent TSS and 1.20 per cent acidity with 350 ppm $SO_2$. The TSS, acidity, reducing sugars, total sugars and browning was increased, whereas vitamin-C, non-reducing sugar, pH and organoleptic quality was decreased during storage under both ambient (22.8-34.0ºC) and refrigerated (4-6ºC) temperatures. The squash can be stored with acceptable quality up to 5 months under both ambient as well as refrigerated temperatures.

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