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# Physico-Chemical Properties and Shelf-Life Study of Aloe-Melon Juice

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## Abstract

Keeping in the view the nutritional value of the Aloe vera and watermelon a formulation of a tasteful Aloe-Melon juice was prepared. The effects of storage and prior processing on lycopene content of juice as well as three weeks shelf-life study of developed Aloe-Melon juice was done. For further satisfaction proximate analysis (moisture, ash, fat, protein, fibre, total sugar, total solids, pH, and acidity) of Aloe *vera* gel and raw Aloe-Melon juice were also conducted. Spectrophotometric method was employed to measure the lycopene value of the product. It was found that the lycopene value of the raw Aloe-Melon juice was minimum but after processing lycopene value was increased. It happened because by nature in raw Aloe-Melon juice, lycopene is present in trans form but during the processing of the juice, trans form was converted into cis form. Additional research validated the shelf-life analysis of Aloe-Melon juice, demonstrating that lycopene levels were consistent, indicating lycopene's stability. Moisture, ash, and fibre values of Aloe-Melon juice were slightly decreased during storage while protein values remained constant. The sample's increasing acidity and decreasing pH caused the values of total sugar to slightly rise. Additionally, the juice's shelf-life testing showed that it kept fresh for three weeks at room temperature. Alkaloids in aloe vera gel were also detected and extracted. The product showed better acceptability, texture, and flavour during storage period. The slight decline in the nutritional values of Aloe-Melon juice amended its taste on small scale but juice did not expire till three weeks.

**Keywords:** Aloe vera gel, Aloe-melon juice, Lycopene value, Nutritional value

## 1. Introduction

The medicinal plant Aloe vera (Aloe *barbadensis* miller) has a rich history of use in medicine and cosmetics dating back centuries. Aloe vera was used by the Chinese and Egyptians in ancient times to heal burns, wounds, and fever (Massoud et al., 2023). Its reputation as a valuable remedy for various diseases, functional disorders, and nutritional conditions, both internally and externally, has persisted for thousands of years worldwide (Vithalkar et al., 2022). Aloe vera is known to enhance metabolism, the process responsible for energy production in the body. This improvement in overall function results in increased energy levels. Remarkably, Aloe vera boasts a composition of 200 nutritional substances, making it one of the most nutrient-rich plants on Earth. Its nutritional profile includes essential vitamins such as B1, B2, B3, B5, and B6; A, C, E, as well as the rare B12. Additionally, it is a rich

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source of minerals, including calcium, magnesium, zinc, manganese, chromium, and selenium, all of which can positively influence brain performance (Shayganfard et al., 2022)

Twenty of the twenty-two amino acids needed for the synthesis of cells and tissues are found in aloe vera. Because anthraquinones are present, it functions as a natural antibacterial, pain reliever, and its gel has a little laxative action (Malik et al., 2016). Watermelon, on the other hand, is a versatile fruit enjoyed in numerous ways, often used to flavor summer drinks and smoothies. With 92% water content and about 6% sugar by weight, watermelon is not only hydrating but also a delicious treat. It is rich in beta-carotene, and deep red varieties supply a substantial amount of lycopene, a powerful antioxidant that supports heart, prostate, and skin health. Cherries and strawberries lack the carotenoid pigment lycopene, which is present in tomatoes, watermelons, as well as other red fruits and veggies including papayas and red carrots. Beyond its antioxidant properties, lycopene may have additional benefits, including effects on gap-junction communication, hypocholesterolemic, anti-cancerous, and anti-atherogenic effects, potentially lowering the likelihood of certain chronic illnesses (Khan et al., 2021). The current study aims to create a delectable Aloe-Melon juice recipe, evaluate its nutritional value, and look into how processing and storage affect the juice's lycopene content.

## 2. Materials and Methods

Following reagents were used in the research 1.25 % $H_2SO_4$, 1.25% NaOH, N/70 HCl, 40 % NaOH, 6 N HCl, 0.1 N NaOH, Acetic acid ( 5 % aq. soln. ), $Na_2CO_3$( 10 % aq. soln. ), Benedict's solution, Mayer's reagent, Dragondroff's reagent.

Preparation of Aloe Melon juice was done by the extraction of Aloe gel followed by extraction of Melon juice then formulation of Aloe-Melon juice. (Khan et al., 2012). A sample was prepared as; 4 to 5 leaves of mature aloe vera plant were taken and cut the skin off and rinsed the yellow sap off with water. Clear gel was obtained. Using an electric blender, the equal weight of watermelon purée and aloe vera gel were mixed for two minutes. Then, 0.05% sodium benzoate along with few drops of strawberry essence was thoroughly mixed in small amount of Aloe-Melon juice and after mixing, this juice was poured in bulk amount of juice during constant stirring. ˚Brix was adjusted to 12 by adding sugar in it and juice was poured in sterile bottles.

### 2.1. Physico-Chemical analysis

Various physico-chemical characteristics such as moisture, residual ash, fat, protein, crude fiber, total solids, titerable acidity, brix: acid ratio, pH and total sugar were determined by the methods described by (Appaiah et al., 2015). Lycopene content from juice was extracted by the method reported by (Martínez-Hernández et al., 2016) Alkaloids were detected and extracted by the method (Gul et al., 2017)

### 2.2. Extraction of Lycopene

A combination of acetone and petroleum ether was used to extract the lycopene. Initially, 10 grams of the sample were weighed and placed in a pestle mortar. A small volume of acetone (20-25 mL) was combined with the sample, and the mixture was ground until the residue became colorless. Whatman filter paper that had been soaked with acetone before the filtration process was used to filter the resultant mixture through a Buchner funnel. The filtrate obtained was collected and used for the later separation step. In the ultimate step of sample preparation, the filtrate was poured into a 125 mL separating funnel holding 15 mL of petroleum ether and 50 mL of distilled water. Two separate layers were allowed to develop in the solution by letting it sit for over five minutes after gently mixing it. The bottom layer,

making up unwanted components, was carefully separated and discarded, leaving the upper layer holding lycopene. This upper layer was collected into a labeled clean beaker and covered with aluminum foil. The volume of the sample was measured, and a small amount of $Na_2SO_4$ (0.5 gm) was added to the solution. A spectrophotometer was used to quantify the amount of lycopene inside a 1 cm cell at 503 nm. Petroleum ether was used as the blank (standard). The link between the absorbance of a 1 cm cell and 3.1206 µg of lycopene per mL was used to compute the sample's lycopene value (Poojary and Passamonti, 2015).

**2.3. Detection and Extraction of Alkaloids**

The process of extracting Aloe vera leaves involved several steps:

Preparation of Aloe Vera Powder: Dried Aloe vera using a mortar, leaves were pulverized into a fine powder.

2.3.1. Methanol Extraction: 400 ml of methanol were used to extract 100 grams of powdered aloe vera leaves. The extraction process took place for approximately 2 days with continuous swirling.

To get rid of solid particles, the extract was then filtered via Whatman No. 1 filter paper after two days.

2.3.2. Solvent Removal: The solvent was removed from 200 mL of the filtrate by allowing it to stand at room temperature for one day.

2.3.3. Acidic Extraction: Following solvent removal, 100 ml of 5% aqueous acetic acid were used to extract the residue. The extract was filtered an hour later.

2.3.4. Dichloromethane Extraction: The filtrate from the acidic extraction was further extracted with 50 mL of dichloromethane using a separating funnel.

2.3.5. Basification and Second Dichloromethane Extraction:The organic layer was basified to pH 10 using a 10% aqueous solution of sodium carbonate in order to separate the aqueous layer from the organic layer.

The mixture was then extracted once again using a separating funnel and 50 mL of dichloromethane.

2.3.6. Evaporation: To remove the alkaloid residue, the organic layer from the second extraction was isolated and allowed to evaporate. Alkaloids were extracted and isolated from Aloe vera foliage as a result of this procedure.

Detection of alkaloids in dichloromethane extract was treated with Mayer's reagent.

**2.4. Thin-Layer Chromatography**

The following procedures were used to perform the Thin-Layer Chromatography (TLC) examination of the Aloe vera extract:

- TLC Plate Preparation: Aluminum TLC plates coated with silica gel were used for the analysis.
- Spotting the Mixture: A small amount of the Aloe vera extract mixture was spotted near the end of the TLC plate.
- Developing Chamber Setup: The TLC plate was set inside a developing chamber that held a 10:90 solvent combination of methanol and chloroform. Using capillary action, the solvent moved progressively up the TLC plate in its role as the mobile phase.
- Solvent Movement: As the solvent moved up the plate, it carried the components of the Aloe vera extract with it.
- Plate Drying: The TLC plate was taken out of the developing chamber once the solvent had reached the top of it, which took about an hour.
- Spraying with Dragondorff's Reagent: The dried TLC plate was sprayed with Dragondorff's reagent, a chemical solution used for alkaloid detection.
- Visualization under UV-Light: The separated components of the Aloe vera extract were visualized under UV light in the range of 200-380 nm.

**Table 1** Raw Aloe vera gel, proximate analysis

| Sr. No. | Parameters studied (%) | Raw Aloe vera gel |
|---|---|---|
| 1. | Moisture | 98.52 ± 0.002 |
| 2. | Ash | 6.79 ± 0.141 |
| 3. | Protein | 2.54 ± 0.032 |
| 4. | Fat | 0.149 ± 0.020 |
| 5. | Crude Fibre | 17.07 ± 0.019 |
| 6. | Total sugar | 20.46 ± 0.165 |

**Table 2** Aloe-Melon juice at early point of storage, proximate analysis

| Sr. No. | Parameters studied (%) | Aloe-Melon juice at preliminary step of storage |
|---|---|---|
| 1. | Moisture | 85.65 ± 0.056 |
| 2. | Ash | 1.57 ± 0.014 |
| 3. | Protein | 1.13 ± 0.023 |
| 4. | Crude fibre | 17.57 ± 0.01 |
| 5. | Total Sugar | 24.31 ± 0.231 |

**Table 3** Aloe-Melon juice at finishing step of storage, proximate analysis

| Sr. No. | Parameter studied ( %) | Aloe-Melon juice at finishing step of storage |
|---|---|---|
| 1. | Moisture | 85.21 ± 0.048 |
| 2. | Ash | 1.47 ± 0.021 |
| 3. | Protein | 1.12 ± 0.012 |
| 4. | Crude fibre | 17.33 ± 0.014 |
| 5. | Total sugar | 24.82 ± 0.235 |

This process allowed for the separation and detection of alkaloids in the Aloe vera extract, with Dragondorff's reagent aiding

in the visualization of the separated components. (Chowbey et al., 2022) (Poojary et al., 2015)

## 3. Results and Discussion

The goal of this study was to create a palatable Aloe-Melon juice formulation so that the impacts of production and packaging on the juice's lycopene concentration and physico-chemical characteristics could be investigated, along with a three-week shelf life study. Lycopene value was less in the raw Aloe-Melon juice and increased in the processed Aloe-Melon juice as shown in Table 6. The analysis demonstrated that cooking effectively enhanced the lycopene contents in Aloe-Melon juice as reported by (Khan et al., 2012). Following processing, the juice's lycopene concentration rose because of heat-induced isomerization over all to cis-forms. An unstable, energy-rich condition is produced during processing, which leads to this isomerization. As a result, processed lycopene products have a greater bioavailability of lycopene than unprocessed ones.

The proximate evaluation of crude Aloe vera gel is provided in Table 1. The proximate investigation of Aloe-Melon juice at the beginning and end of storage is displayed in Tables 2 and 3, respectively. The moisture parameters were 85.65 at the first stage and 85.21 at the final stage, showing a slight decrease in moisture content during the storage period. There was a little drop in ash content throughout storage, as seen by the

**Table 4** Outcome of storage time on determination of Total Solvable Solids (˚Brix), Aloe-melon juice's tierable acidity and Brix:Acid ratio

| Sr. No. | Parameters Studied | Storage Time | | |
|---|---|---|---|---|
| | | 1st week | 2nd week | 3rd week |
| 1. | Brix (%) | 12 | 13 | 12.75 |
| 2. | Acidity (%) | 0.07 ±0.0019 | 0.057 ± 0.0014 | 0.070 ± 0.0019 |
| 3. | Brix: Acid ratio | 171 | 228 | 182 |

**Table 5** Effect of storage time on quality attributes of Aloe-Melon juice

| Sr. No. | Quality attributes | Storage Time | | |
|---|---|---|---|---|
| | | 1st week | 2nd week | 3rd week |
| 1. | pH | 5.28 | 5.38 | 4.93 |
| 2. | Colour | Melon red | Melon red | Melon red |
| 3. | Consistency | Homogenous with no separation | Homogenous with no separation | Homogenous with no separation |
| 4. | Taste | Highly acceptable | Acceptable | Slightly acceptable |
| 5. | Flavour | Pleasant | Pleasant | Pleasant |

**Table 6** Determination of lycopene content of Aloe-Melon juice and effect of storage period on lycopene stability

| Sr. No. | Parameters studied | Lycopene values/100 gm Storage time | | |
|---|---|---|---|---|
| | | 1st week | 2nd week | 3rd week |
| 1. | Fresh watermelon | 2.38 ± 0.118 | 2.3 ± 0.118 | 2.1 ± 0.024 |
| 2. | Raw Aloe-Melon juice | 0.115 ± 0.0001 | 0.115 ± 0.0001 | 0.114 ± 0.0002 |
| 3. | Processed Aloe-Melon juice | 0.404 ± 0.0008 | 0.404 ± 0.0008 | 0.402 ± 0.0003 |

ash content values at the beginning and end of storage, which were 1.57 and 1.47, respectively. Protein amounts in Aloe-Melon juice were nearly consistent during storage, as seen by the protein values of 1.12 and 1.13 for the juice at the beginning and end of storage, respectively.

Crude fiber content decreased in Aloe-Melon juice as measured by crude fiber values, which were 17.57 and 17.33 at the beginning and end of storage, respectively. The decrease in crude fiber was associated with a reduction in ash content. At the beginning of storage, the total sugar content was 24.21; at the end of storage, it had somewhat grown to 24.82. This little rise in sugar might be explained by the transformation of non-reducing sugars into reducing sugars, which also results in a drop in pH and an increase in acidity. The information for acidity, Brix: Acid ratio, and total soluble solids (^Brix) is shown in Table 4. The table indicates a rise in ^Brix (T.S.S) of Aloe-Melon juice throughout the course of storage, which may be related to the enzymatic or hydrolysis-induced inversion of sucrose. This finding aligns with the results reported by (Khan et al., 2012) During storage, the percentage acidity of the Aloe-Melon juice rose, possibly as a result of the oxidation or breakdown of the sample's reducing

sugars, which produced acidic chemicals, as reported by (Rasmussen et al., 2014).

One of the most important metrics for evaluating the quality of juice is the Brix: Acid ratio, which is the proportion of ˚Brix to the grams of dried citric acid in 100 g of concentrate or citrus juice. For example, if a juice sample has 12 ˚Brix and 0.07 acidity in the 1st week of the study, the Brix: Acid ratio would be 171, indicating that for every 171 parts of soluble solids (mostly fruit sugar), there is one part of acid. The Brix: Acid ratio increased during storage as both the ˚Brix and acidity values increased.

Table 5 presents the quality attributes of Aloe-Melon juice. The pH of the juice remained almost constant during the 1st and 2nd weeks of storage but decreased in the 3rd week, likely in response to the increasing acidity in the juice during storage. The production of acidic chemicals because of the oxidation or breakdown of the juice's reducing sugars may be the cause of the pH drop.

There was no considerable change in the colour of Aloe-Melon juice, and its consistency remained homogeneous without separation. The taste quality of the juice was highest in the 1st week of storage
and lowest in the 3rd week. This variation in flavour might be caused by the passage of time and the temperature at which the food is stored, which can break down ascorbic acid and produce furfural, as reported by (Wadhwa et al., 2016). The flavour quality remained high throughout the storage period.

Through a variety of techniques, the existence of alkaloids in Aloe vera leaves was verified. Pale yellow precipitates were produced when some drops of Mayer's reagent were introduced to the Aloe barbadensis extract, suggesting the presence of alkaloids (Jha et al., 2019). Additionally, the detection of alkaloids was performed using Thin-Layer Chromatography (TLC). The TLC analysis of the Aloe vera extract revealed orange spots on the chromatogram, further confirming the presence of alkaloids in the extract (Khan et al., 2015). These orange spots on TLC plates are attributed to the presence of steroids in the Aloe vera gel extract.

## 4. Conclusion

The product showed better acceptability, texture, and flavour during storage period. The slight decline in the nutritional values of Aloe-Melon juice

amended its taste on small scale but juice did not expire till three weeks.

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