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# Studies on Development of Syrup from Mango (*Mangifera indica* L.) Pulp and Aloe vera (*Aloe barbadensis* Miller.) Gel Blend

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**A B S T R A C T**

Mango (*Mangifera indica* L.) and aloe vera (*Aloe barbadensis* Miller.) gel have nutritional, medicinal and therapeutic values. The mango pulp and aloe vera gel are used to prepare palatable syrup 25 per cent of blend consisting 75 per cent mango pulp and 25 per cent aloe vera gel, 65 per cent sugar, 1.25 per cent acidity. Observation on changes during storage revealed that TSS, acidity, reducing sugars, total sugars contents and browning increased whereas, Vitamin-C, non- reducing sugar and organoleptic score decreased continuously with storage period. The syrup prepared from blend of mango pulp and aloe vera gel could be stored was up to five months under ambient conditions with acceptable quality.

## Introduction

Mango (*Mangifera indica* L.) is one of the important tropical fruits belongs to family Anacardiaceae. This fruit is relished for its succulence, exotic flavor and delicious taste. Mango is a rich source of carotenoids and provides high vitamin A content (Pott *et al*., 2003). Most mangos are consumed fresh, but some non fibrous pulpy mango varieties are used for processing. However, substantial quantities of mangoes are wasted because of poor post-harvest management and lack or appropriate facilities in developing countries. Therefore, the development and application of inexpensive preservation techniques to produce high quality and acceptance products of mango could be beneficial, allowing a better utilization of the fruit. Mango is one of the exporting materials both in fresh and processed form and is being exported to U.K., U.S.A., France, Malasiya, Qatar and Singapore. Mango has also strong antioxidant, anti lipid peroxidation, immunomodulation, cardiotonic, hypotensive, wound healing, antidegenerative and antidileutic activities.

On the basis of analysis of more than 25 varieties of mango, it contains moisture 73.0-86.7 per cent, carbohydrate 11.6-24.3 per cent, protein 0.3-1.0 per cent, fat 0.1-0.8 per cent, minerals 0.3-0.7 per cent, vitamin A 650-25940 I.U., vitamin C 3-83 mg/100g, calcium 0.01 per cent, phosphorus 0.02 per

cent and iron 4.5 mg/100 g. (Anonymous, 1966).

The Aloe vera (*Aloe barbadensis* Miller) is perennial, succulent and drought resistant plant. It is also known as also known as 'Barbados' or 'Curaçao'. Aloe, has been used in traditional and folk medicines for thousands of years to treat and cure a variety of diseases. Aloe vera comes under food related products (Dubick and Michael, 1983) and is being used as an ingredient for functional food, mainly in the development of healthy drinks and beverages like tea (Singh *et al.*, 2009). Aloe vera was incorporated in food products like bread (Agrawal, 1985), jam and jelly (Niramon *et al.*, 1996), Yagurt (Shin Yangseo *et al.*, 1995), cheese (Steinka, 2001), infant formula (Benward, 2000), chewing gum (Jenkins, 2003) and beverages of orange, grape, cranberry, strawberry, raspberry, pineapple etc. (Malhotra *et al.*, 2010). An important distinction has to be made between the strongly laxative and purgative latex derived from the bundles heath cells and the clear mucilaginous gel. This plant is used by Egyptians, Assyrians, and Mediterranean civilizations, as well as in Biblical times. A variety of aloe species are still used in folk medicines of Africa and Asia. Hunters in the Congo reportedly rub their bodies in the clear mucilaginous gel to reduce perspiration; some African tribes apply the gel for chronic conjunctivitis; the gel is used in India for the treatment of asthma. Aloe vera gel is used as an ethnomedicine in Trinidad and Tobago for hypertension. The most common folk use of aloe has been for the treatment of burn wounds and specifically to aid in the healing process, reduce inflammation, and tissue scaring. The gel was described by Dioscorides and used to treat wounds and mouth infections, soothe itching, and cure sores. The use of aloe vera gel as a household remedy in the United States was triggered by reports of its beneficial effect on radiation dermatitis followed by a boom in cultivation in the 1930s; it remains a common plant and for burns and abrasions. Blending of mango pulp with aloe vera gel offers scope to develop healthy blended squash with improve colour, taste, flavor and over all acceptability. The findings of experiment would be useful for growers, processors, marketing agencies and consumers have interest in beverage rich in mango and aloe vera properties.

## Materials and Methods

### Raw materials

The ripe fruit of mango of cultivar Amrapali and mature leaves of aloe vera cultivar SimSheetal were collected from the Main Experiment Station of Horticulture, NarendraDeva University of Agriculture and Technology, Kumarganj, Faizabad and Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow (India), respectively. The chemical characteristics of mango pulp and aloe vera gel used for the preparation of blended syrup were analysed and presented in table 1.

### Extraction of mango pulp and aloe vera gel

The pulp from ripe mango fruits and gel from mature aloe vera leaves were extracted as per flow sheet shown in figures 1 and 2, respectively.

### Preparation of syrup

Different five blend combination: 100 per cent mango pulp, 100 per cent aloevera gel, 50 per cent mango pulp and 50 per cent aloe vera gel, 75 per cent mango pulp and 25 per cent aloe vera gel, 25 per cent mango pulp and 75 per cent aloe vera gel were prepared thereafter syrup from each combination were made consisting 25 per cent blend, 65 per cent TSS, 1.25 per cent acidity. The technique

used for the preparation of syrup is shown in figure 3. The syrup prepared from each combination of blend were evaluated on 9-point Hedonic scale by a panel of semi trained judges for their organoleptic quality to find out the best combination of mango pulp and aloe vera gel for syrup preparation.

## Storage studies

The 3 liters syrup was prepared from the best combination of mango pulp and aloe vera gel, filled into the glass bottles of 750 ml capacity leaving 2 cm head space, capped, and put under ambient condition for its storage studies. During storage data on changes in TSS, acidity, vitamin-C, reducing sugars, non-reducing sugar, total sugars, non-enzymatic browning and organoleptic quality were recorded at monthly interval.

## Chemical analysis

The ERMA made hand refractometer was used to measure total soluble solids at ambient temperature and readings were corrected at $20^0$ C with the help of correction table (Ranganna, 2010) while known quantity of sample was titrated against 0.1 N sodium hydroxide solution using phenolphthalein drops as an indicator to determine acidity and acid content was calculated and expressed in per cent anhydrous citric acid. To determine vitamin-C content sample was prepared in 3 per cent metaphosphoric acid solution and known volume of aliquot was titrated against 2, 6 dichlorophenol indophenols dye solution (Rangnna, 2010). The Fehling's solution A and B were used to determine reducing, non-reducing and total sugars (Lane and Eynone, 1923) whereas sample was prepared in alcohol and optical density (OD) was measured at 440 nm by ELICO made spectrophotometer in the determination of non-enzymatic browning (Ranganna, 2010). A panel of 9 semi trained judges evaluated syrup for its overall acceptability that included colour, flavour, taste and appearance on 9-point Hedonic scale (Amerine *et al*., 1965).

## Result and Discussion

The present findings revealed that the mango pulp used in syrup making contained 23.1 per cent total soluble solids, 0.31 per cent acidity, 16.00 mg/100 g vitamin-C, 7.08 per cent reducing sugars, 12.24 per cent non-reducing sugar, 19.32 per cent total sugars and 14.30236 mg/100 g total carotenoids whereas contained 2.20 per cent total soluble solids, 0.05 per cent acidity, 1.02 per cent reducing sugars, 1.08 per cent non-reducing sugar, 2.10 per cent total sugars and 2.35 mg/100 g vitamin-C. A quality blended syrup with 25 per cent blend of 75 per cent mango pulp and 25 per cent aloe vera gel with 65 per cent sugar, 1.25 per cent acidity was organoleptically found best for preparation of blend syrup (Table 2). Similarly, Tiwari (2012) reported that the syrup prepared from mixing bael and aloe vera gel in ratio of scored highest sensory attribute. Deen and Singh (2012) also reported that karonda squash was found highest acceptable. Observation were recorded on changes during storage of blended syrup indicated that total soluble solids increased gradually after one month of storage (Table 3). Similar trend in change of TSS was found in bael and aloe vera blended syrup (Tiwari, 2012), bael and guava blended squash (Nidhi *et al.*, 2007), Karonda squash (Deen and Singh, 2012). This increase in TSS content in blended syrup during storage was probably due to the conversion of polysaccharides into sugar. In present findings the total acidity of blended syrup increased gradually during storage period that could be attributing to degradation of pectic substances of products into soluble solids (Conn and Stumf, 1976).

**Table.1** Chemical characteristics of mango pulp as well as aloe vera gel

| S. No. | Chemical characteristics | Mango pulp | Aloe vera gel |
|---|---|---|---|
| 1 | Total soluble solids (%) | 23.10 | 2.20 |
| 2 | Acidity (%) | 0.31 | 0.05 |
| 3 | Vitamin-C (mg/100 g) | 16.00 | 2.35 |
| 4 | Reducing sugars (%) | 7.08 | 1.02 |
| 5 | Non-reducing sugar (%) | 12.24 | 1.08 |
| 6 | Total sugars (%) | 19.32 | 2.10 |
| 7 | Total carotenoids (mg/100 g) | 14.30236 | - |

**Table.2** Organoleptic quality of syrup prepared from different blends of mango pulp and aloe vera gel

| Treatments | Different combination of blends | | Organoleptic quality | |
|---|---|---|---|---|
| | Mango pulp (%) | Aloe vera gel (%) | Score | Rating |
| 1 | 100 | Nil | 7.75 | Like very much |
| 2 | Nil | 100 | 6.15 | Like slightly |
| 3 | 50 | 50 | 7.45 | Like moderately |
| 4 | 75 | 25 | 8.10 | Like very much |
| 5 | 25 | 75 | 7.25 | Like moderately |
| CD at 5 % | | | 0.69 | |

**Table.3** Changes in syrup during storage period

| Storage period (months) | TSS (%) | Acidity (%) | Vitamin-C (mg/100 g) | Reducing sugars (%) | Non-reducing sugar (%) | Total Sugars (%) | Browning (OD) | Organoleptic quality | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Score | Rating |
| 0 | 65.00 | 1.25 | 5.50 | 6.23 | 56.72 | 62.95 | 0.82 | 8.10 | LVM |
| 1 | 65.00 | 1.29 | 5.30 | 7.43 | 56.24 | 63.67 | 0.83 | 7.75 | LVM |
| 2 | 65.33 | 1.35 | 5.05 | 8.68 | 55.75 | 64.43 | 0.84 | 7.50 | LM |
| 3 | 66.75 | 1.40 | 4.90 | 9.97 | 55.24 | 65.21 | 0.85 | 7.25 | LM |
| 4 | 67.15 | 1.44 | 4.75 | 11.30 | 54.77 | 66.07 | 0.87 | 7.10 | LM |
| 5 | 67.60 | 1.48 | 4.55 | 12.62 | 54.27 | 66.89 | 0.89 | 6.50 | LM |
| CD at 5 % | 7.66 | 0.14 | 0.44 | 0.91 | 5.11 | 6.99 | 0.07 | 0.64 | |

LVM= Like very much, LM=Like moderately.

**Fig.1** Flow sheet for extraction of pulp from mango fruits

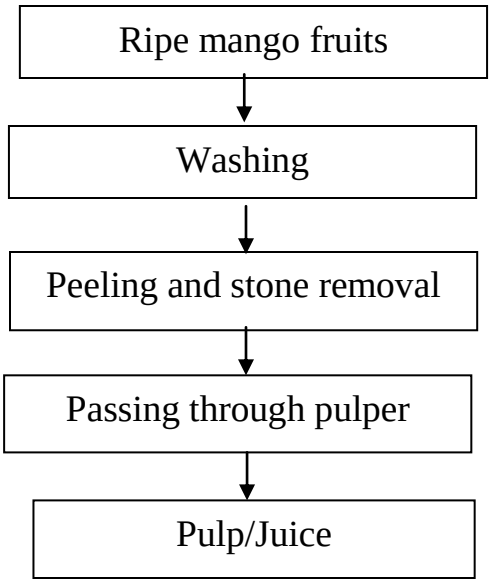



**Fig.2** Flow sheet for extraction of gel from aloe vera leaves

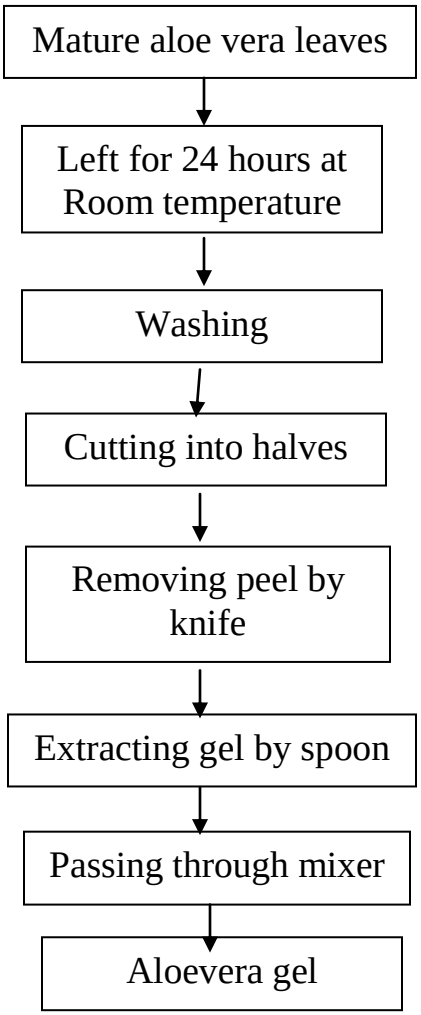
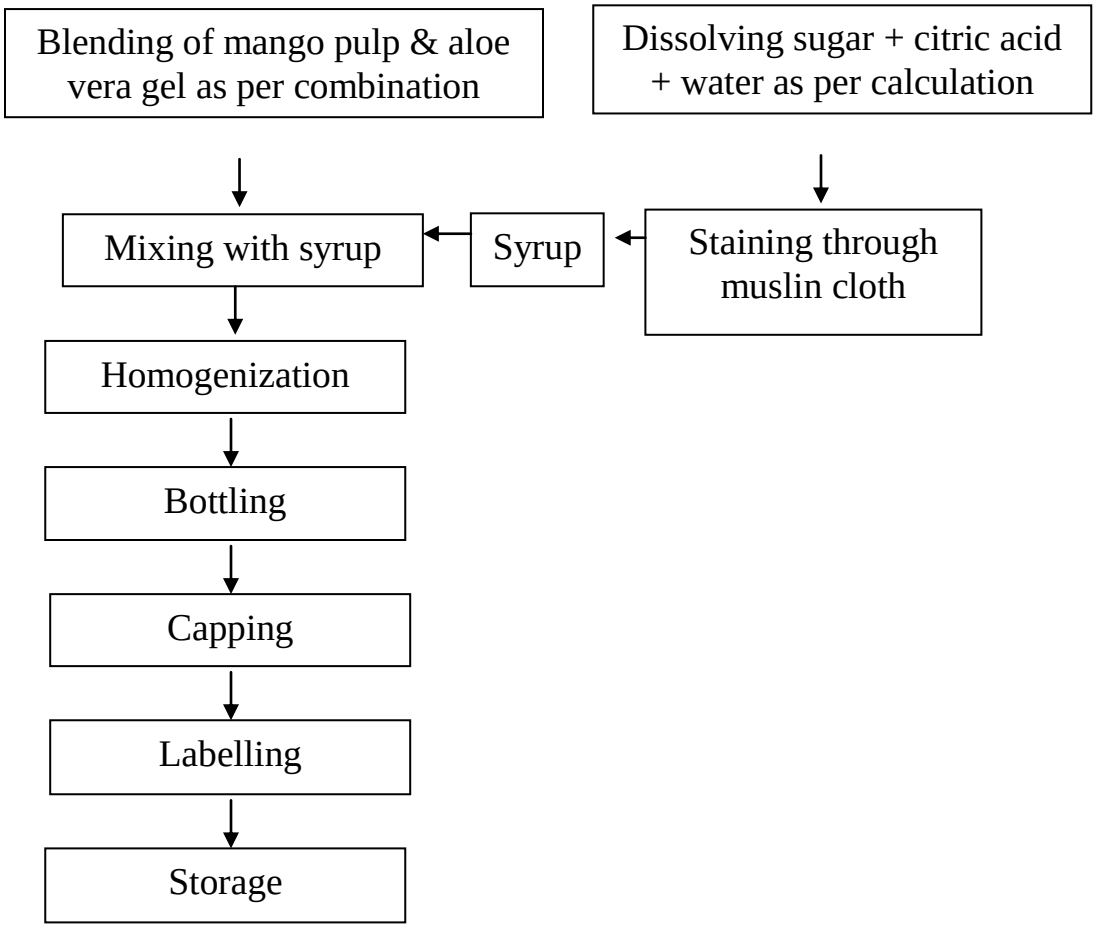


**Fig.3** Flow sheet for preparation of mango+aloevera blended syrup




The present findings are also in agreement with the observations of several earlier workers like Tiwari (2012) on bael and aloe vera blended syrup, Deen and Singh (2012) on Karonda squash, Nidhi *et al.,* (2007) on bael and guava blended squash. The vitamin 'C' content was decreased continuously during storage period which might be due to oxidation of ascorbic acid into dehydro ascorbic acid by oxygen. The finding is consistent with results reported by research papers authers: Tiwari (2012) in bael and aloe vera blended syrup, Nidhi *et al.,* (2007) in bael and guava blended squash, Deen and Singh (2012) in Karonda squash. The study confirmed that that the reducing sugars and total sugars of blended syrup increased continuously throughout entire period of storage. Similar observations were also observed in bael and aloe vera blended syrup Tiwari (2012), in bael and guava blended squash Nidhi *et al.,* (2007), in Karonda squash Deen and Singh (2012), Whereas, non-reducing sugar of blended syrup decreased continuously throughout the entire period of storage which might be because of inversion of non-reducing sugar. Similarly, in bael and aloe vera blended syrup Tiwari (2012), Deen and Singh (2012) in Karonda squash were found reduction in non-reducing sugar. Browning increased gradually in blended syrup after one month of storage. This change could be mainly due to the non-enzymatic reaction with sugars and amino

acids which leads to the formation of brown pigments. Similar results were reported by Tiwari (2012) in bael and aloe vera blended syrup, Zulfakar *et al.*, (2011) in seabukthorn berries squash, Deen and Singh (2012) in karonda squash. The acceptability of blended syrup in terms of organoleptic score decreased gradually during the storage period at room temperature. Similar results on reduction in organoleptic quality have also been reported in bael and aloe vera blended syrup (Tiwari, 2012), mango squash (Kumari and Sandal, 2011) Karonda squash (Deen and Singh, 2012).

In conclusion, mango pulp and aloe vera gel have medicinal and therapeutic values. Palatability quality syrup with 25 per cent blend consisting 75 per cent mango pulp and 25 per cent aloe vera gel was found best for preparation of syrup containing 65 per cent sugar, 1.25 per cent acidity syrup could be stored up to five months under ambient condition with acceptable quality.

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