PharmacologyOnLine
April 30, 2012
Newsletter • 2012 • vol.1 • 36 - 41

Study of physio-chemical properties and nutritional status of *Aloe*-melon juice

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Abstract

A tasteful juice formulation containing *Aloe vera* gel and water melon juice called Aloe-Melon juice hereafter was developed. Effects of processing and storage on lycopene content, some nutritive parameters (moisture, ash, fat, protein, fibre, total sugar, total solids, pH and % acidity) and alkaloid content of developed formulation are reported here. Lycopene content of processed Aloe-Melon juice was found higher than the raw juice mix. Shelf life study of Aloe-Melon juice revealed that lycopene remained stable over a period of twenty one days. Microbiological assessment of the prepared juice indicated its suitability for human consumption over the period of storage. Moisture, ash and fibre values also did not show any significant change. A negligible increase in the acidity (%) resulted in decrease in pH of the sample. The product exhibited excellent mouth feel, flavour, colour and acceptability during storage period. This juice formulation is containing bio-available lycopene and certain other alkaloids making it good for human health.

Key words: Lycopene, Antibacterial activity, proximate analysis, Aloe vera, alkoloids

Introduction

Plants are an important source of natural products. The tenet, "Let food be thy medicine and medicine be thy food" was embraced 2500 years ago by Hippocrates, the father of medicine. [1] In present times, functional foods prove this theory. Innovative juices like Aloe vera juice having certain functional food components with high nutraceutical value are gaining popularity among healthy as well as health impaired people..

Aloe *vera barbadensis* miller is one of the important medicinal plants that have been used in the field of pharmaceutical and cosmetics for centuries. It is currently one of the most studied herbs among the natural products category. Aloe *vera* contains 200 nutritional substances, which make it the most nutritional plant on the earth. It is power house of nutrition as it contains vitamins like A, C, E, B1, B2, B3, B5 and B6 besides B12 which is rarely found in plants. It contains minerals like calcium, magnesium, sodium, phosphorus, manganese and copper. [2]

Essentially, there are two layers of jell in the Aloe *vera* leaves i.e the the inner clear gel and the aloin which is thin, bitter slimy mucilage layer commonly known as the "a1°yellow sap. The gel contains 99.3% water and the remaining 0.7% is solids. [3] One table spoon of *A. vera* gel contains 75 different bioactive chemicals including sterols, anthraquinones, dihhydroxyanthraquinones, acemannan a polysaccharide, saponins [4] which have been proposed to have direct antimicrobial activity against bacteria, viruses, fungi, and yeasts[5] and certain nutritional substances. [4] Several home remedies of *Aloe vera* have been reported. *Aloe vera* juce is used for consumption and relief of digestive issues such as heartburn and irritable bowel syndrome. [6]

Watermelon (*Citrullus lanatus*) refers to both fruit and a plant of vine-like herb in the cucurbitaceae family. Watermelon contains 92% water by weight and about 6% suger by weight. Like many other fruits, it is a source of vitamin C. The amino acid citrulline was first extracted from watermelon and analysed. [7] Watermelon contains a large amounts of beta carotene. Deep red varieties of watermelon are the richest source of lycopene, an anti-oxidant that protects the human heart, prostate and skin health. Lycopene shows strong antioxidant capabilities as it prevents the oxidation of low density lipoprotein (LDL) cholesterol and reduces the risk of developing atherosclerosis and coronary heart disease. [1]

During present study, it was aimed to develop a value added product using two medicinally important plants i.e *Aloe vera* and watermelon which could be of great public interest and beneficial to both healthy and sick people. Assessment of lycopene contents, nutritional status and microbiological characterization of developed Aloe-melon juice as well as detection of alkaloids from *Aloe vera* leaves were also carried out.

Materials and Methods

Preparation of Aloe-melon juice

Aloe vera plants were procured from herbal garden of PCSIR labs complex Lahore and fresh watermelons were purchased from local market. Clear gel was obtained from leaves of mature *Aloe vera* plant and heated at 80°C for 10 minutes in a temperature controlled water bath to deactivate its enzymes. Allow the gel to cool at room temperature. Equal amount of watermelon pulp and aloe vera gel by weight (50% each) were blended for 2 minutes in an electric blender. Brix° of final formulation was maintained at 12.5 B°. The juice was pasteurized thereafter in a steam jacketed kettle at 80±2°C for 2 minutes. This heat treatment deactivated the enzymes present in the juice. Sodium benzoate was added as a preservative when the juice was cool down to 40°C. The juice was allowed to cool till it reached a temperature of 25±2 °C and filled in 250mL pre-sterilized glass bottles and sealed with plastic screw caps. These bottles were stored at ambient temperature for further testing.

Determination of Lycopene

The Lycopene contents of fresh watermelon, raw

Aloe-Melon juice and processed Aloe-Melon juice at selected time points during storage were determined spectrophotometrically at 502 nm against petroleum ether used as blank. [8]

Proximate analysis

Proximate composition i.e. moisture, ash, protein, fat, crude fiber, total solids and total sugar of raw *Aloe vera* gel and processed Aloe-melon Juice at the initial and final stage of storage were determined according to standard methods of A.O.A.C (1990).[9]

pH, Titerable Acidity and Acid: Brix°ratio

pH, Titrable Acidity and Brix°:Acid ratio of processed Aloe-melon Juice during each week of storage period was determined by following A.O.A.C (1990).[9] pH was carried out by using pH meter (ICM model 41100).Total acidity was calculated as percent citric acid (anhydrous) present in the samples.

Microbiology

Microbiological analysis of Aloe-Melon juice was done just after processing and after final week of storage period. 1mL of juice was taken and serially diluted from 1/10 to1/1000 with ringer solution [10] in McCartney bottles. Total viable count of bacteria was determined by using nutrient agar medium. [8]

Extraction and Detection of Alkaloids

The extraction and detection of alkaloids of the *Aloe vera* leaves were carried out by the method given by Surya and John (2001). [11] Hundred grams fine powder of ground dried *Aloe vera* leaves were soaked in to 400 mL of methanol for 48h following the addition of 100 mL of 5% aqueous acetic acid solution and after one hour, the extract was filtered. Then 50ml of dichloromethane was added to this filtrate in a separating funnel. Aqueous layer was separated and organic layer was basified to pH 10 with 10% aqueous solution of sodium carbonate and extracted again with 50 mL dichloromethane in a separating funnel. Organic layer was separated and was evaporated to get the alkaloid residue. Further a few biochemical tests and TLC were applied for detection of alkaloids.

Results and Discussion

Lycopene content

Table-1 shows the lycopene content of fresh watermelon, raw Aloe-melon juice and processed Aloe-melon juice. The results indicated that fresh watermelon contain 2.38µg of lycopene per100g of fresh watermelon which remained stable up to seven days and its value decreased to 2.30µg/100g after fourteen days of storage followed by 2.10µg/100g after twenty one days of storage. Lycopene content of raw Aloe-melon juice was found to be 0.115µg/100g of juice which is due to the addition of aloe vera gel in the watermelon juice. Lycopene content was increased after processing as heat treatment during processing induces isomerizetion of all-trans to cis-forms due to additional energy input and results in an unstable, energy-rich station (Nguyen *et. al*, 2001) [12]. Therefore, lycopene bioavailability in processed lycopene containing products are higher than unprocessed ones. Hence, processed Aloe-melon juice contained 0.404µg of lycopene per 100g of juice which is % higher than he unprocessed aloe-melon juice. It remained stable through out storage period studied.

see Table 1.

Proximate analysis

The proximate analysis of raw Aloe vera gel revealed that the gel under investigation contained of moisture, ash, protein, fat, crude fiber and total sugar are 98.52 %, 6.79%, 2.54%, 0.149%, 17.07% and 20.46% respectively, results of are shown in Table-2.

see Table 2.

Table-3 shows the proximate analysis of Aloe-Melon juice at initial and final stage of storage in which the values of moisture were 85.65%/ 85.21% and ash were 1.57% /1.47% repectively. This data showed that there was slight decrease in moisture content and in ash content during storage period. The protein values of Aloe-Melon juice at initial and final stage of storage were 1.12% and 1.13% which showed that protein contents were remained almost constant during storage. The values of crude fibre in Aloe-Melon juice at initial and final stage of storage were 17.57% and 17.33% . The values of total sugar at initial stage of storage was 24.21 and at final stage of storage was 24.82. This slight increase in sugar might be due to the hydrolysis of non-reducing sugars to reducing sugars with increase in acidity and decrease in pH as reported by Khan (1997) [13]and Wahla (2000).[14]

see Table 3.

pH, Titrable Acidity and Brix°: Acid ratio

Total soluble solids (Brix°), Acidity and Brix:Acid ratio was shown in Table-4. Data in the table showed increase in °'b0Brix (T.T.S) of Aloe-Melon juice during storage period. The percent acidity of Aloe-Melon juice increased during storage. This increase in acidity might be due to the formation of acidic compounds by degradation or oxidation of reducing sugars present in the sample as reported by Wahla (2000)[14]. As the Brix and acidity values increased therefore, the Brix:Acid ratio were decreased during storage period.

see Table 4.

Microbial analysis

No significant growth of bacteria was observed while taking total viable count on nutrient agar medium. The total viable count was found to be 4.0 x 10^2 CFU/100ml after 48 hours of incubation period, which is a safe limit. This indicated the suitability of the processed juice for human consumption.

Detection of alkaloids

Presence of alkaloids in Aloe *vera* leaves extract were confirmed by the addition of few drops of Mayer'a1¯s reagent to the extract, pale yellow precipitates were obtained. Detection of alkaloids was also done by using TLC. Presence of orange spots on the TLC chromatogram under UV light confirmed the presence of alkaloids in the extract.

Acknowledgement

The authors thank the PCSIR labs complex, Lahore Pakistan for providing facilities to carry out this work.

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Sr. No.	Preparatory stages	Lycopene content (µg /100 gm)		
		Storage time (days)		
		Seven	Fourteen	Twenty one
1.	Fresh watermelon	2.38 ± 0.118	2.30 ± 0.118	2.10 ± 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

Table-1: Determination of lycopene content at various preparatory stages and storage of Aloe-Melon juice

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: Proximate analysis of raw Aloe vera gel

Sr. No.	Parameters studied (%)	Aloe-Melon juice at initial stage of storage	Aloe-Melon juice at final stage of storage
1.	Moisture	85.65 ± 0.056	85.21 ± 0.048
2.	Ash	1.57 ± 0.014	1.47 ± 0.021
3.	Protein	1.13 ± 0.023	1.12 ± 0.012
4.	Crude fibre	17.57 ± 0.01	17.33 ± 0.014
5.	Total Sugar	24.31 ± 0.23	24.82 ± 0.235

Table-3: Comparative Proximate analysis of Aloe-Melon juice at initial and final stage of storage

Sr. No.	Parameters Studied	Storage Time (days)		
		Seven	Fourteen	Twenty one
1.	Brix° (%)	12	12.45	12.75
2.	Acidity (%)	0.07 ±0.0019	0.075 ± 0.0014	0.075 ± 0.0019
3.	Brix°:Acid ratio	171	166	170

Table-4: Effect of Storage on Total Soluble Solids (Brix°'bo), Titerable Acidity and Brix°:Acid ratio of Aloe-Melon juice