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Development and quality evaluation of lemon juice blended with aloe Vera

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Abstract
In present study the efforts have been made to prepare lemon juice blended with aloe Vera. the blends were prepared by using different proportions of lemon and aloe Vera as 100:0,90:10,80:20,70:30.the prepared beverage was analyzed for nutritional properties as well as sensory evaluation. Sensory evaluation of the samples was carried out using 9 point Hedonic scale for various attributes namely color, taste, flavor and overall acceptability. Firstly, aloe Vera juice is completely safe and it's very versatile. According to the sensory and nutritional analysis the most recommended juice blend formulation is 90% lemon and 10% aloe Vera. Lemon and aloe Vera contains important antioxidant vitamins A, E and C which helps in the production of white blood cells and antibodies in blood. It attacks the pathogenic microorganisms and prevents infection so, they are called protective foods.

Keywords: aloe vera, lemon, blended juice, proximate analysis, sensory evaluation

1. Introduction
Fruits and vegetables are critical to good health, and certainly good for all age categories as it forms an important portion of a healthy diet. Aloe Vera (*Aloe barbadensis* Miller) is a specific species of Aloe. There are over 400 species of Aloe Vera plants in the Lily Family. Aloe Vera has been widely grown as an ornamental plant. Aloe Vera is a stem less or very short-stemmed succulent plant growing to 60-100cm tall, spreading by offsets. The leaves are thick and fleshy. Green to grey-green, with some varieties showing white flecks on their upper and lower stem surfaces. The margin of the leaf is serrated Aloe Vera has been used as medicine from olden days. Even has a growing presence in the food industry as a natural preservative. There are over 400 types of aloe Vera in the world. Aloe Vera Gel includes Vitamins A, B_1, B_2, B_6, B_{12}, C and E, Folic Acid and Niacin. Aloe Vera is a species of aloe that originated in east Africa and in the Mediterranean region.it also grows in the tropics and in several continents. The plant has been used for more than 5,000 years particularly for its cosmetic usage. All traditional medicines made use of aloe Vera to treat diverse and varied problems. Indeed, discoveries have been made of writing and traces of its use in ancient Egypt, Greece, Africa, as well as in the most ancient medicines in the world traditional Chinese medicine and Ayurveda medicine in India.

The lemon is a small evergreen tree native to Asia. The tree's ellipsoidal yellow fruit is used for culinary and non-culinary purposes throughout the world, primarily for its juice, though the pulp and rind are also used in cooking and baking. The juice of the lemon is about 5% to 6% citric acid, which gives lemon a sour taste. The distinctive sour taste of lemon juice makes it a key ingredient in drinks and foods. Lemon is an antioxidant which deactivates the free radicals preventing many dangerous diseases like stroke, cardiovascular disease and cancers. It also fights against infection. It helps in production of WBC's and antibodies in blood which attacks the invading microorganisms and prevents infection. Its healing ability could be due to its bacteria ridding and astringent properties. Lemon juice when applied in the site of bites and stings of certain insects relieves its poison and pain. It relieves chilblains and itchy skin. Its application to acne (pimples) dries the existing ones and prevent from getting more. its main active ingredients are flavonoids, Ascorbic acid (vitamin c), essential oil, caffeine, pectin, minerals especially potassium and calcium, water fibers and sucrose. Lemon juice is also used as a short-term preservative on certain foods that tend to oxidize and turn brown after being sliced (enzymatic browning), such as apples, bananas, and avocados, where its acid denatures the enzymes. The plant is rich in many natural health promoting substances. The raw pulp of Aloe Vera contains approximately 98.5% water, while the mucilage or gel consists of about 99.5% water [1]. The remaining 0.5 – 1% solid material consists of a range of compounds including water-soluble and fat-soluble vitamins, minerals, enzymes, mono and polysaccharides, sugar, lignin, phenolic compounds and organic acids [2, 7, 8].

The aloe Vera gel contains many vitamins including the important antioxidant vitamins A, C and E. Vitamin B1(thiamine), niacin, Vitamin B2 (riboflavin), choline and folic acid are also present [9]. The aloe Vera juice finds wide application in food products like production of ready to serve drink, health drink, soft drink, laxative drink, aloe Vera lemon juice, sherbet, aloe sports drink with electrolyte, diet drink with soluble fiber, hangover drink with B vitamin, amino acids and acetaminophen, healthy vegetable juice mix, tropical fruit juice with aloe Vera, aloe Vera yoghurts, aloe Vera mix for whiskey and white bread, cucumber juice with aloe Vera [1, 10, 11]. A health beverage was prepared from fresh aloe vera

leaves. The leaves were washed, pulped, sterilized and filtered, then mixed with different concentrations of Dangshen and Chinese herbs. Effects of processing conditions e.g. Temperature, pH, sucrose, vitamin C and citric acid on the stability of color and gelatinoids in aloe Vera juice were studied and it was concluded that the stability was negatively affected by increasing sucrose and citric acid concentrations while vitamin C and sodium chloride at low concentrations improved the stability[12].

2 Materials and Methods

2.1 Collections of raw materials

Aloe Vera, lemon procured from the local market in Hyderabad, Telangana.

2.2 preparation of juice

Break off a few aloe Vera leaves from an aloe Vera plant of two or three years Aloe Vera were washed with tap water. Carefully peel the rind from the leaves and discard Peel, the yellow layer just beneath the rind with a sharp knife and discard. Once all the rind and yellow layers have been removed, You should be left with only clear aloe Vera gel Place the gel immediately in to the blender. Blend the juice until it has a smooth appearance. Lemons were cleaned to remove the dart using clean tap water and juice extracted using the squeezer. After that the juice of aloe Vera and lemon should be blended in different ratios of 100:0, 90:10, 80:20, and 70:30 respectively. The product was filled in PET bottles which was sterilized at 110^{0}C for 10 minutes, then sealed.

2.3 Analysis of prepared juice

2.3.1 Proximate analysis of prepared juice

2.3.1.1 Determination of moisture

Moisture content was determined by standard [3]. 2gms of sample were weighed in a porcelain crucible (which was previously cleaned, heated to 1050C cooled and weighed). The crucible with the sample was heated in an electrical oven for about six hours at 1050C. It was then cooled in desiccators and weighed again. The percentage moisture in the oil cakes was calculated from the formula:

$$\text{Moisture} = 100(W1 - W2)/W2\ \%,$$

Where W1 = Original weight of the sample before drying
W2 = Weight of the sample after drying.

2.3.1.2 Determination of ash

Ash content in Aloe Vera powder was determined as described by [4]. About 2gms of Aloe Vera powder sample were weighed in a porcelain crucible (which was previously cleaned, heated to about 100^{0}C, cooled and weighed). The crucible with its content was placed in a muffle furnace for about four hours at about 600^{0}C. It then cooled in a desecrator and weighed. To ensure completion of aching, the crucible was again heated in the muffle furnace for half an hour, cooled and weighed again. This was repeated till two consecutive weights were the same and the ash was almost white in color.

$$\text{Ash\%} = \frac{\text{weight of Ash}}{\text{Original weight of sample}} \times 100$$

2.3.1.3 Determination of protein

Protein in the sample was determined by Micro-Kjeldahl distillation method (AOAC 1990) [4]. The samples were digested by heating with concentrated sulphuric acid (H_2SO) in the presence of digestion mixture, Potassium sulphate (K_2SO) and copper sulphate ($CuSO_4$). The mixture was then made alkaline with 40 % NaOH. Ammonium sulphate thus formed, released ammonia which was collected in 4% boric acid solution and titrated against standard HCl. The percent nitrogen content of the sample was calculated the formula given below. Total protein was calculated by multiplying the amount of percent nitrogen with appropriate factor (6.25).

$$\%\text{Nitrogen} = \frac{1.4\ X\ (\text{mL HCl} - \text{mL blank})\ X\ \text{Conc.of HCl}}{\text{Weight of sample (g)}}$$

$$\%\ \text{Protein} = \%\ N\ X\ \text{Factor (6.25)}$$

2.3.1.4 Estimation of total carbohydrate

Total carbohydrates were estimated following the enthrone method as described by [5]. The Aloe Vera powder sample 100 mg were hydrolyzed with 5 ml of 2.5 N Hall in boiling water bath for 3 hours. The acid digested sample was cooled to room temperature and neutralized by adding sodium carbonate. The final volume is made to 100 ml with distilled water and centrifuge at 5000 rpm for 15 min. The supernatant was then collected and 0.5 and 1 ml aliquots were taken for analysis of total carbohydrates. The green color developed in reaction mixture was read at 630 nm using Spectronic-20 UV-visible spectrophotometer (Thermo Scientific, USA). D-glucose at the concentration of 100 mg ml-1 was used to prepare the standard curve. The amount of carbohydrate present is calculated by following formula.

Amount of carbohydrate present in 100 mg of the sample=

$$\frac{\text{mg of glucose x 100}}{\text{volume of tested sample}}$$

2.3.1.5 Estimation of fat

Fat determination is one of the key analyses used for food labeling and quality control. Fat content in the Aloe Vera powder was determined by petroleum ether extraction followed by Sechelt apparatus [6]. For the present study 5gms of finely ground sample was taken in a motor and anhydrous sodium sulphate of twice the weight of the sample was added into it. Then the mixture was ground until a free flowing powder was obtained. Then the powder was transferred to a thimble and sealed the end. Extraction thimble with the sample was placed in the Sechelt apparatus and fixed a previously dried and weighed round bottom flask. 200 mL of extracting solvent (petroleum ether) was added to the flask containing pumice chips. Then the Flask and the condenser were connected to the Sechelt extractor. Sample was allowed to reflux for about five hours. After the extraction flask was removed from the apparatus and kept in the water bath and then in the oven. Then the flask was cooled and weight was taken. Percent crude fat was calculated using the following formula.

$$\% \text{ Crude fat} = \frac{(X-F)X100}{W}$$

Where, X – Weight of the flask with fat and chips, F – Weight of the flask and chips, W- Weight of the sample

2.3.2 Sensory evaluation

Sensory evaluated to determine the color, flavor, taste and overall acceptability of the product. The samples were analyzed by panelists 30 in number for all parameters stated above. Sensory evaluation is mainly useful to know if Sensory the product reached all the properties of control sample in sensory angle. And it useful to know up to what extent the product satisfied the consumer and what are the benefits and what are the draw backs and to know the comments of the panelists. The sample is evaluated on a 9 point scale using hedonic rating method. Each product is evaluated and given a score by the panelists on the 9 point scale for each parameter for each sample. The scores of all the samples of all the 30 members are taken a mean score and tabulated below.by analyzing this table we can find out which sample is good both in nutritional and sensory

3 Results and Discussion

3.1 Proximate analysis

Moisture content of the formulations increased with the increase in aloe Vera because it has 99% moisture. Aloe Vera and lemon are good sources of vitamins and minerals so daily drinking of this juice will help in body functions. Water soluble vitamins (B complex and C) should incorporate in the daily diet of all age groups. So, aloe Vera used in the food industry as a functional food. Lemon and aloe Vera contains important antioxidant vitamins A, E and C which helps in the production of white blood cells and antibodies in blood. It attacks the pathogenic microorganisms and prevents infection so, they are called protective foods.

Table 1: Proximate analysis of different proportions

sample	Moisture (%)	Protein (%)	Minerals (%)	Fat (%)	Carbohydrates (%)
T_0	91.02	0.43	0.24	0.74	6.98
T_1	91.8	0.37	0.19	0.67	6.36
T_2	92.6	0.34	0.18	0.6	5.72
T_3	93.4	0.31	0.17	0.52	5.08

3.2 Sensory evaluation

10% aloe Vera and 90%lemon accepted well by the panelist than the other three proportions (100:0, 80:20, 70:30). bitterness of the juice increased as the aloe Vera proportion increased in the product.

Table 2: Sensory evaluation of different proportions

sample	color	Flavor	Taste	Overall acceptability
T_0	7.4	8.2	8	8
T_1	7.6	8.7	8.2	8.4
T_2	7.6	8.4	7.9	7.9
T_3	7.8	8.1	7.8	8.1

4 Conclusions

In the present study on the aloe Vera fortified beverage. This work has got satisfactory results in developing a nutritionally fortified and palatably accepted aloe Vera fortified beverage.it has been found that when combined, the juices of aloe Vera and lemon have better sensory and nutritional characteristics than when used individually. According to the sensory and nutritional analysis the most recommended juice blend formulation is 90% lemon and 10% aloe Vera because the bitterness increased with the increase in aloe Vera. The human body simply cannot store water soluble vitamins therefore we need to supplement them regularly through our diets. So better way of drinking a daily dose of this juice, while at the same time building the body's defense system against oxidative stress.

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