# Process Optimization of Soymilk Tea Fortified with Aloe Vera Extract

John David

Department of Dairy Technology, Sam Higginbottom Institute of Agriculture, Technology and Sciences (SHIATS University), Allahabad-211007, India Email: profichendavid06@gmail.com

Email: profjohnd avid 06 @gmail.com

Abstract—Maintenance of optimal nutrition and positive health of the population through assured nutrient intake continues to be a national priority. For a nation to be healthy strong and productive, the nutritional status of its people must be good. In the new millennium there is an upward trend in nutritional and health awareness which has increased the consumer's demand for functional foods. Keeping this in view, industry is forced to bring nutritionally sound products in the market with acceptable sensory characteristics. An investigation was made with an attempt to develop a beverage "tea" by adding different level of an herbal medicine Aloe Vera with highly nutritious soymilk. For control (T<sub>0</sub>), tea was standardized with 1.3% tea leaves, 6.6% sugar in 150 ml soymilk. Treatment T<sub>1</sub> was standardized to 1.3% tea leaves, 6.6% sugar in 150ml soymilk with 2% aloe extract,  $T_{\rm 2}$  was standardized to 1.3% tea leaves, 6.6% sugar in 150ml soymilk with 3% aloe extract and T<sub>3</sub> was standardized to 1.3% tea leaves, 6.6% sugar in 150ml soymilk with 4% aloe extract. The soymilk tea samples for different treatments and control were analyzed for physicochemical properties fat %, total solids, acidity, protein, moisture, ash and carbohydrate. Organoleptic characteristics like (flavour and taste), consistency, colour and appearance were judged by trained panelist using 9 point hedonic scale. The treatments containing 3% level of aloe extract score the highest value. Thus as per product acceptability judged by organoleptic evaluation and therapeutic value, the treatment can be rated as  $T_2 > T_0 > T_1 > T_3$ .

Index Terms—soymilk, Aloe Vera extract, tea

# I. INTRODUCTION

Good food is the fundamental basic requirement for positive health, functional efficiency and productivity. Life cannot be sustained without adequate nourishment. Adequate food is needed for growth, development and to live an active and healthy life along with ensuring proper immune competence and cognitive development. The benefit of Aloe for our health are numerous and astonishing. Adopting Aloe products into our daily nutrition habit is a great way to improve our health, our body's generation and our beautiful appearance [1]. The unique and beneficial for our health components of aloe, prove that this natural dietary, supplement is essential in our nutrition.

It is noteworthy that so many different products in various categories, in the recent years contain a percentage of aloe and there is no wonder why food, health and wellness industries, consider products from aloe as a key to their growth in the decade 2010 to 2020 [2]. The aloe plant is veritable storehouse of nutritional compounds which work together to give its powerful healing properties. Aloe Vera is used in the treatment of various health disorders like Arthritis, Diabetes, blood pressure etc. [3]. It is being topically to heal wounds and various skin conditions [4]. Orally it is taken as a laxative since centuries. Aloe gel can be found in hundreds of skin products including lotions and sun blocks [5]. The FDA has approved Aloe Vera as a natural food flavoring agent. It can be used as a food preservative also. Not only Aloe provides nutrition and produces an antiinflammatory action, it also has a wide range of antimicrobial activities [6]. In-vitro experiments have been carried out on numerous organisms ad have regularly shown that, in normal strength, aloe is either bactericidal or bacteriostatic against a number of common wound pathogens.

It is a species of succulent plant in the genus aloe that has been believed to be originated in "Sudan". It grows in arid climates and is widely distributed in Africa, India, Nepal and other arid areas.

Aloe is a stemless on very short stemmed plant growing 60-100cm tall, spreading by offsets. The leaves are thick and fleshy, green to grey green, with some varieties showing white flecks on the upper and lower stem surface. The margin of the leaf is serrated and has small white teeth. Aloe species are frequently cultivated as ornamental plants both in gardens and in pots. Many aloe species are highly decorative and are valued by collectors of succulents. Aloe Vera is used both internally and externally on humans, and is claimed to have some medicinal effects, which have been supported by scientific and medical research [7]. The gel in the leaves can be made into a smooth type of a cream that can heal burns such as sunburn. They can be also made into type of special soaps. Aloe Vera has marvelous medicinal properties. Scientists have discovered over 150 nutritional ingredients in Aloe Vera. There seems no single magic ingredient. They all work in synergistic way to create healing and health giving benefits [8]. The ten main areas of chemical constituents of Aloe Vera include:

Manuscript received May 7, 2015; revised October 23, 2015.

amino acids, anthraquinones, enzymes, minerals, vitamins, lignins, monosaccharide, polysaccharides, salicylic acid, saponins and sterols. The plant contains vitamins, excluding vitamin D but including the important antioxidant vitamin A, C, F, vitamin B (thiamine), Niacin, vitamin B<sub>12</sub> (riboflavin), Choline and Folic acid [9]. Soymilk is a beverage made from Soybean. Soymilk has the same amount of proteins as cow's milk. Unlike cow's milk it has little saturated fat and no cholesterol [10]. Soy products contain sucrose as the basic disaccharide which breaks into glucose and fructose. Since soy doesn't contains galactose, soy based infant fomulas can safely replace breast milk in children with galactosemia [11]. Soy milk contains no lactose, which makes it good alternative for lactose intolerant people. The presence of isoflavones is the most important and unique benefit of soymilk which is not found in cow's milk [12]. Each cup of soy milk contains about 20mg of isoflavones (mainly genistein and diadzein). Isoflavones have many health benefits including reduction of cholesterols, easing of menopause symptoms, prevention of Osteoporosis and reduction of prostate and breast cancer [13]. Incidents of these cancers are very low in countries with high intake of soy products, including soy milk. Isoflavones are also antioxidants which protects our cells and DNA against oxidation. The soybean (Glycine max) is often called the "golden miracle bean" and is the world's foremost provider of protein and of used for health food, feed sources and industrial products. It contains about 20% oil and 40% high quality protein (as against 7.0% in rice products, 12% in wheat, 10% in maze and 20-25% in other pulses). Soybeans also have portative properties against breast, prostate, colon and lung cancers because of the isoflavones content. Other than the whole seed, many processed soy products are available in the market. They include soy milk, soy flour, soy curd and tofu [14].

Soy protein is a complete protein, meaning it contains all of the indispensable amino acids required by the body in correct proportions and amounts to meet human needs for growth, maintenance and repair of living tissues [15]. Soy protein is the only complete plant based protein which is available to those maintaining a vegetarian lifestyle and is in equal in protein quality to milk, meat and egg proteins. Muscles need protein to repair, rebuild and grow. In accordance with the guidelines given by WHO/FAO/UNO, soy protein used as a whole source of protein in daily diet will support normal muscle formation and maintain nitrogen balance in both children and adults.

India is the largest producer and the largest consumer of tea in the world. Tea constitutes an important part of Indian life. Basically it serves following purposes, as a stimulating hot drink, a trade commodity, a major export item and as daily income for more than one million workers [16].

As special as tea the gardens too could not be developed everywhere but in special climatic conditions. The tea bush known as Camellia Sinensis grows in loose, deep, acid soil, at high altitude, with summer and autumn rain, in a little heat and little wind. In these climatic conditions most of the plants die but tea bush flourishes fantastically. If left to their own devices, the tea bushes grows to a height 50 ft., but this becomes impractical for the tea pickers and hence they are trimmed and kept at a approachable level of 4 ft. The finest tea comes from the elevations of 900 to 2100 meters. A tree plant matures in three to five years and produces a flush, the growth of new shoots. Each shoots consists of few leaves and a bud. At low altitude the growth of the bush is so rapid in the growing seasons that they need picking every few days to ensure that only the best tips are plucked. The best tips are those young and tender. Because of this the tea industry becomes labor intensive. At higher altitude it takes as long as two weeks to grow a flush. Tea plants do not produce flushes in cold weather.

Today tea is grown in more than 25 countries around the world. It is cultivated as a plantation crop, grows well in acidic soil, and a warm climate with at least 50 inches of rain per annum. Tea's flavors, quality and character are completely dependent on the region, the altitude, the type of soil and the climate in which it is grown. Besides factors such as geography and climate, the fate of the tea is also dependent on human touch. Since all tea comes from one plant, the way it is processed is the artistry we taste in the final cup. If the leaves are immediately dried and heated (steamed) or fired, the tea leaves remain green, retaining the distinctive flavors and health benefits green teas are known for. If left to wither the leaves are transformed through a process known as oxidation (also known as fermentation) into black tea, of which there are hundreds of varieties.

The present study is performed by combining different levels of Aloe Vera with soymilk for preparation of tea, which have immense health benefits in normal as well as in therapeutic condition.

# II. MATERIALS AND METHODS

First of all, Soybeans were soaked in water for 14-16 hours using 1% sodium bicarbonate (by weight). The water was decanted and the pulse was washed with fresh water. Soybeans then cooked at 100-120  $^{\circ}$ C for 3-5 minutes. 100g of pulses per liter of water was used for grinding i.e., 1:10 (w/v).

The resulting suspension was filtered through double layered cheese cloth and the filtrate was boiled for 15-20 minutes, with continuous stirring to prevent sticking of solids.

For Aloe Vera gel, its leaves were chosen. The wider, thicker leaves which contain more gel were collected. Leaves were cut at its base close to the ground. Leaves were kept upright condition in a cup to allow the sap to be drained. Leaves were then laid on a cutting board and cut off its tip about 1/2 an inch down. With the help of a fillet knife, it was sliced lengthwise from top to bottom. With the help of a spoon, the gel of the inner side of the leaf was scraped. Collected gel was placed in a jar and stored in the refrigerator. It was kept out of light as much as possible to prevent spoilage. Tea was then prepared in traditional method using 6.6% sugar. The samples were

analyzed for physiochemical, organoleptic quality and antioxidant content as per procedure laid down by [17]-[19].

# III. RESULT AND DISCUSSION

The data collected on different aspects as per plan were tabulated and statistically analyzed as per [20]. Table I showed average data obtained on different parameters.

TABLE I. AVERAGE OF DIFFERENT PHYSIOCHEMICAL PARAMETERS

Parameters (%)	Treatments				
	$T_0$	$T_1$	$T_2$	<b>T</b> <sub>3</sub>	
Carbohydrate	9.04	9.15	9.04	9.39	
Fat	1.35	1.45	1.52	1.56	
Protein	2.99	3.03	3.13	3.19	
Moisture	86.01	85.76	85.67	85.20	
Ash	0.59	0.60	0.62	0.61	
Acidity	0.86	0.82	0.80	0.82	
Total Solids	13.99	14.24	14.53	14.80	

## A. Physiochemical Properties

The highest mean for carbohydrate percentage in soymilk tea with Aloe Vera was  $T_3=9.39$ , followed by  $T_1(9.15)$ ,  $T_2(9.04)$  and  $T_0(9.04)$ . The difference between  $T_0, T_1, T_2$  and  $T_3$  were significant, The highest mean for fat percentage in soymilk tea with Aloe Vera was  $T_3 =$ 1.56, followed by  $T_2(1.52)$ ,  $T_1(1.45)$  and  $T_0(1.35)$ . The differences among treatments were significant. The highest mean for protein percentage in soymilk tea with Aloe Vera was  $T_3=3.19$ , followed by  $T_2(3.13)$ ,  $T_1(3.03)$ and  $T_0(2.99)$ . The difference between  $T_0$ ,  $T_1$ ,  $T_2$  and  $T_3$ were significant. The highest mean for moisture percentage in soymilk tea with Aloe Vera was  $T_0 = 86.01$ , followed by  $T_1(85.76)$ ,  $T_2(85.67)$  and  $T_3(85.20)$ . The highest ash percentage in soymilk tea with Aloe Vera was  $T_2=0.62$ , followed by  $T_3(0.61)$ ,  $T_1(0.60)$  and  $T_0(0.59)$ . The parameters were non-significant. The highest mean for acidity percentage in soymilk tea with Aloe Vera was  $T_0=0.86$ , followed by  $T_1(0.82)$ ,  $T_3(0.82)$  and  $T_2(0.80)$ . The parameters were non-significant. The highest mean for total solids was  $T_3=14.80$ , followed by  $T_2(14.33)$ ,  $T_1(14.24)$  and  $T_0(13.99)$ .

TABLE II. ORGANOLEPTIC PARAMETERS

Parameters (%)	Treatments			
Turuneters (70)	$T_0$	$T_1$	$T_2$	T <sub>3</sub>
Flavour and Taste	7.72	7.80	8.04	7.26
Consistency	7.76	7.68	8.16	7.68
Colour and Appearance	8.12	8.12	8.20	7.96

# B. Organoleptic Parameters

Table II and Fig. 1 show the highest mean for flavour and taste in soymilk tea with Aloe Vera was  $T_2$ =8.04, followed by  $T_1(7.8)$ ,  $T_0(7.72)$  and  $T_3(7.26)$ . Difference between  $T_0$ ,  $T_1$ ,  $T_2$  and  $T_3$  were significant. Fig. 2 shows the highest mean for consistency in soymilk tea with Aloe Vera was  $T_2$ =8.16, followed by  $T_0(7.76)$ ,  $T_1(7.68)$  and  $T_3(7.68)$ . Fig. 3 shows the highest mean for colour and appearance in soymilk tea with Aloe Vera was  $T_2=8.2$ , followed by  $T_0(8.12)$ ,  $T_1(8.12)$  and  $T_3(7.96)$ . The treatment did not differ significantly.



Figure 1. Flavour and taste



Figure 2. Consistency



Figure 3. Color and appearance

TABLE III. OVERALL ACCEPTABILITY OF THE PRODUCT

Doublection	Treatments			
Replication	$T_0$	$T_1$	$T_2$	<b>T</b> <sub>3</sub>
$\mathbf{R}_1$	8.3	8.4	8.1	7.6
$\mathbf{R}_2$	7.6	7.3	7.6	7.2
$\mathbf{R}_3$	7.9	8.1	8.4	7.9
$\mathbf{R}_4$	7.7	7.5	8.2	7.5
$\mathbf{R}_5$	7.5	7.7	8.1	7.5
Mean	7.8	7.8	8.1	7.6

## C. Overall Acceptability

As per Table III and Fig. 4, the highest mean for overall acceptability core recorded in soymilk tea with Aloe Vera was  $T_2$ =8.13, followed by  $T_0(7.86)$ ,  $T_1(7.86)$  and  $T_3(7.63)$ . There were significant differences found among all the treatments. The overall rating of the product was  $T_2$ > $T_0$ > $T_3$ .



Figure 4. Overall acceptability of the product

#### D. Antioxidant Properties

As per Table IV and Fig. 5, the highest mean for Antioxidant content was found in  $T_3(97.57)$ , followed by  $T_2(76.95)$ ,  $T_1(52.12)$  and  $T_0(0.00)$ . The treatments differed significantly.

TABLE IV. ANTIOXIDANT PROPERTIES

D		Treatme	ents	Treatments				
keplication	T <sub>0</sub>	$T_1$	$T_2$	$T_3$				
$\mathbf{R}_1$	0.00	51	75.5	98.2				
$\mathbf{R}_2$	0.00	53	77.4	95.3				
$\mathbf{R}_3$	0.00	52.5	76.7	97.7				
$R_4$	0.00	52.0	78.2	99.1				
Mean	0.00	52.12	76.95	97.57				
100 90 - 80 - 70 - 90 - 90 - 90 - 90 - 90 - 90 - 90 - 9	TO T1 Treatm	T2 T3		>				

### IV. CONCLUSION

The results obtained from the experiment revealed that the Aloe Vera can be satisfactorily added to soymilk for tea making which having a strong therapeutic appeal being rich in antioxidants. Treatment  $T_2$  with 3% Aloe Vera extract was found to be best among the treatments.

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John David is a vibrant university professor in SHIATS University, Allahabad, in the field of Food and Dairy Technology, having a teaching experience of 21 years. He is a passionate research worker having more than 100 research publication in his credit. Prof. David has guided 45 M.Sc./M.Tech and 10 Ph.D. theses. He is a first class post graduate in Dairy Technology, Seed Technology and Business Administration. He has a flair for writing

technical books and already written 7 books of national and international repute in the field of Food and Dairy Technology. Prof. David participated in many national and international conferences and presented research papers. He is an expert in Business Administration too. Prof. David is a regular examiner in number of universities namely,

Allahabad Central University, PUSA Agricultural University, Indira Gandhi Agricultural University, Bihar Agricultural University, Chitrakoot University, U.P. Rajarshi Tandon University etc. An orator having proficiency in 10 different languages and a versatile expert for Food and Dairy Technology in All India Radio and Television (Door Darshan) programmes. He is a life member of several professional bodies like, IDA, DTSI, BRS, AGRO-BIOS, Intensive Agriculture and Progressive Research Journal etc. Several of his articles appeared in Hindustan Times, Times of India and other Indian dailies. Prof. David held many post of recognition like Registrar, Chairman, Editor and Research Coordinator in several committees of university. He has been bestowed with Young Scientist award in the year 2006 for his excellent research in the field of Food and Dairy Technology. In the year 2014, he has been honored with "National Pride" (Rashtriya Gaurav), "Gem of Education" (Shiksha Ratan) award. In the year 2015, he has been awarded with Best Educationist, Golden Citizen, "National Pride of Education" (Rashtriya Vidya Gaurav) and Bharat Vidya Vibhushan award for his distinguished service to the nation in educational field.