



## Original Research Article

## Development of powder and ready to health drinks using aloe vera

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## ABSTRACT

Aloe vera is a succulent plant widely used in alternative medicine and foods. There are over 400 species of Aloe vera grown around the world; however only two species viz. *Aloe barbadensis* Miller and *Aloe aborescens* are considered the most potent ones. The former specie is extensively cropped in the middle part of Thailand. In this project, we conducted research and development on healthy beverages and powder products made from the Aloe Vera. The main composition of fresh Aloe leaf gel was fiber 0.13 g, protein 0.06 g and carbohydrate 0.43 g per 100 g. The Aloe Vera product processing was on washing, blanching at 80°C for 2 min to reduce enzyme activity, decrease bitterness and beany flavor as well as remove mucous. The Aloe Vera leaf gel was blended before to formulated drinks. The two Aloe vera drinks were developed. The first formulated drink was prepared with Aloe vera (52 %), concentrated fruit juice (17 %), water (17 %) and fructose (14 %). Second, the Aloe vera drink with fresh fruit juice was consisted Aloe vera (19 %), fresh fruit juice (73 %) and fructose (8 %). The Aloe Vera drink containing concentrate juice exhibited an orange yellow color, pH  $3.49 \pm 0.10$ , viscosity  $9.81 \pm 0.22$  centipoises, total soluble solid  $21.92 \pm 0.21$  and L\*a\*b\* scale  $58.87 \pm 0.33$ ,  $5.47 \pm 0.35$  and  $35.99 \pm 1.34$ , respectively. The Aloe Vera drink mixed with fresh juice expressed light green, pH  $4.02 \pm 0.10$ , viscosity  $2.86 \pm 0.90$  centipoises, total soluble solid  $13.83 \pm 0.25$  and L\*a\*b\* scale  $58.81 \pm 0.51$ ,  $0.56 \pm 0.43$  and  $12.60 \pm 0.99$ , respectively. The overall acceptability of these products was in the level of moderately like. Shelf life of the Aloe vera drink products was at least three months at 4-5°C. The microbial analysis (*E. coli*, coliforms yeast *S. aureus* and mold) of the all drinking products was confronted the Thailand community standard (TCS 107/2003). The Aloe vera powder with bael (*Angle marmelos*) was prepared with Aloe vera powder (0.2 g), bael powder (3 g) and fructose syrup powder (10 g). The Aloe vera powder with Chrysanthemum was mixed with aloe vera powder (0.2 g), chrysanthemum power (2.5 g) and fructose syrup powder (10 g). The water activity ( $a_w$ ) of the dry products was 0.45. Shelf life of the Aloe vera powder products was at least six weeks at 30-40°C. The acceptance evaluation in laboratory by 25 panelists showed that the products was moderately accepted.

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## INTRODUCTION

Thailand is a country where a variety of plants are tremendously grown, especially herbal plants that provide numerous benefits, are easy to grow, and can be processed to make healthy dietary supplement products. Aloe vera, in particular, is a herbal plant popular in Thai people processing it as such products as aloe vera juices, beers, fruit drinks, diet drinks, etc. (Morsy, 1982). The Aloe vera leaf gel is a clear, soft, moist and slippery tissue that consists of large thin-walled parenchyma cells in which water is kept in the form of viscous mucilage. In general, the Aloe vera has been used in the food and cosmetic industry. It can be used as a source of foods and as an ingredient of food products, for the production of gel-containing health drinks and beverages. In the cosmetic industry, it has been used as a raw material for the production of creams, lotions, soaps, shampoos, facial and other products (Hamman, 2008). In addition, medically, aloe vera can be used to treat joint pain, muscle pain, and heat-burnt wound healing because aloe contains cooling properties (Hunsa, 1983). A consumption experiment with aloe revealed that it is capable of treating inflammatory bowel disease, aphthous ulcer, sore throat, and being an effective laxative (Payom, 1986).

Thailand Institute of Scientific and Technological Research (TISTR), by its Food Technology Department, has developed aloe vera drink products using processed aloe as a raw material to make new, value-added products by using domestically developed technologies, resulting in continuous industry that make more use of aloe as a raw material in production.

## MATERIALS AND METHODS

### Analyzing basic properties of aloe vera

The basic properties of aloe vera were analyzed through the analysis of such chemical values as the amounts of protein, ash, fat, fiber, total carbohydrate, amino acid, and residual substances, and the analysis of such physical values as the amounts of moisture and viscosity, the results of which were sent to the Industrial Metrology and Testing Service Centre for analysis.

### Developing recipes for ready-to-drink aloe vera beverages

The aloe vera drink recipes were divided into two parts: Mixed Fruit Juice Ready-to-Drink Aloe Vera Beverage from Fruit Juice Concentrate, and Mixed Fruit Juice Ready-to-Drink Aloe Vera Beverage from Fresh Fruits.

For the concentrated juice recipe, a selection had made for suitable proportions between 3 kinds of concentrated juices, i.e. orange concentrate, pine apple concentrate, and passion fruit concentrate. A mixture design was employed with factors under study being orange concentrate 60-80%; pine apple concentrate 10-30%; and passion fruit concentrate 10-30%, etc.

For the fresh fruit recipe, the main materials included guava, grape and pine apple processed as juice for a mixture to form a mixed fruit.

### Analyzing nutritional facts and microbiological analysis of aloe vera drink products

Nutritional facts were analyzed for mixed fruit juice ready-to-drink aloe vera beverage from fruit juice concentrate, and mixed fruit juice ready-to-drink aloe vera beverage from fresh fruits (AOAC,

2002). The microbial content of the finish products was detected by methods of FDA-BAM (2001).

## RESULTS AND DISCUSSIONS

### Aloe vera basic property analysis

The basic properties of Aloe vera gel were analyzed the chemical and physical qualities such as the amounts of protein, ash, fat, fiber, total carbohydrate, and residual substances, for example, lead, mercury, arsenic, as well as moisture. It was found that the amounts of moisture, carbohydrate, protein and fiber were 98, 0.4, 0.13 and 0.06, respectively as shown in Table 1. Obviously, the main component of the gel was water. Table 1 demonstrated very low concentration of lead, arsenic and mercury. It should be noted that the US Pharmacopoeia (USP) standards recommends that arsenic and mercury must be more than 3 ppm, and 10 ppm, respectively. The Thai Herbal Pharmacopoeia (THP) recommends that heavy metals in herbal medicines should contain no more than 4 ppm of arsenic and no more than 0.3 ppm of lead (<http://www.gpo.or.th/rdi/html/toxic.html>).

**Table 1** Physical and chemical quality values of initial raw materials

Analysis Value	Aloe Vera
Protein, gram/100 grams	0.13
Ash, gram/100 grams	0.23
Total Fat, gram/100 grams	0.00
Fiber, gram/100 grams	0.06
Total carbohydrate, gram/100 grams	0.43
Lead, milligram/kilogram	< 0.05
Arsenic, milligram/kilogram	< 0.01
Mercury, milligram/kilogram	= 0.008
Moisture	98.4252

### Recipe development for ready-to-drink aloe vera beverage

For the concentrated juice recipe, a selection of suitable proportions used 3 kinds of concentrated juices, i.e., orange concentrate, pine apple concentrate, and passion fruit concentrate. The seven recipes were obtained for mixed fruit juice Aloe vera drinks from the concentrated juices. The derived products were then analyzed chemical quality including pH, amounts of water soluble solid, and amounts of acid as shown in Table 2. Flavor adjustment was based on a Brix acid ratio (20.92). As consistency in product recipe was needed, the Brix acid ratio was used to control the production process as shown in Table 2. The mixed fruit juice Aloe vera drinks from concentrated juices shown in Figure 1.

**Table 2** Analysis results of concentrated juice's chemical values at different proportions

Recipe	Orange Juice Concentrate	Pine Apple Juice Concentrate	Passion Fruit Juice Concentrate	pH Value	Amount of Water Soluble Solid	Amount of Acidity	Fructose Filled
1	80	10	10	3.72	13.00	1.02	14.25
2	70	20	10	3.72	12.40	0.98	13.59
3	70	10	20	3.60	12.20	10.49	21.32
4	70	15	15	3.66	12.30	11.31	18.01
5	60	30	10	3.70	12.50	12.48	14.24
6	60	20	20	3.59	12.20	10.40	21.75
7	60	10	30	3.47	11.90	8.93	29.47



**Figure 1** The finish products of the mixed fruit juice Aloe vera drinks from concentrated juices

For the fresh fruits recipe, the main fresh fruits were guava, grape and pine apple.

This study was to find proportion ideal for developing mixed fruit juice ready-to-drink Aloe vera beverage from fresh fruits. With the amount of the aloe gel set to be no more than 20%, the flavor

adjustment was made such that the final sweetness equals 14 Brix (as shown in Table 3). The products were put through sensory test with acceptability scores based on the 9-point Hedonic Scale, in laboratory test with 30 consumers. The statistical analysis used SPSS, as shown in Table 4. The finish products of mixed fruit juice ready-to-drink Aloe vera drinks from fresh fruits shown in Figure 2.



**Figure 2** The finish products of the mixed fruit juice ready-to-drink Aloe vera drinks from fresh fruits

**Table 3** Recipes for mixed fruits Aloe vera juice and fructose amounts

Recipe	Aloe Vera Juice (%)	Guava Juice (%)	Pine Apple Juice (%)	Grape Juice (%)	Fructose (ml)
1	20	40	20	20	8.35
2	20	40	10	30	7.89
3	20	20	40	20	6.81

**Table 4** Average total likeness scores based on 9-point hedonic scale affected by proportions in mixed fruit Aloe vera juice

Recipe	Color	Odor	Sweetened Flavor	Sour Flavor	(Aloe) Pulp Touch	Overall Likeness
1	5.9667b	6.1000ab	6.6667	6.3667	6.1667	6.5333
2	5.8000b	5.8000b	6.6000	6.2000	6.3667	6.5333
3	6.8000a	6.4000a	6.3667	5.9333	6.0667	6.4000

Remark: Averages on same data row with different labeling characters differ with statistical significance of  $P \leq 0.05$ . Averages on same data row is statistically insignificant with reliability level ( $P > 0.05$ ).

### Nutrition and microbial analysis for aloe vera drink products

Table 5 shows the nutrition analyzed of the mixed Aloe vera drinks. According to the microbe measurement results on developed mixed fruit Aloe vera drink products, no microbes potentially harmful to consumers were identified, as shown in Table 6. Hence, the products are safe for consumers.

**Table 5** Nutrition analysis

Sample	Aloe vera 1	Aloe vera 2
Total Calories, Kilocalorie/100 milliliters	84.48	53.24
Calorie Fat, Kilocalorie/100 milliliters	0	0
Moisture, gram/100 milliliters	78.36	86.35
Protein, gram/100 milliliters	0.56	0.31
Ash, gram/100 milliliters	0.52	0.34
Total Fat, gram/100 milliliters	0	0
Solid Waste, gram/100 milliliters	0	0
Fiber, gram/100 milliliters	0.27	0.13
Total fructose, gram/100 milliliters	22.27	13.96
Carbohydrate, gram/100 milliliters	Unidentified	Unidentified
Cholesterol, milligram/100 milliliters	20.56	13.00
Sodium, milligram/100 milliliters*	Unidentified	Unidentified
Calcium, milligram/100 milliliters*	4.55	3.40
Iron, milligram/100 milliliters	33.19	16.60
Vitamin A (all trans-retinol), microgram/100 milliliters	0.25	0.17
Vitamin B1, milligram/100 milliliters	Unidentified	Unidentified
Vitamin B2, milligram/100 milliliters	<0.04	<0.04
Vitamin C (as L-ascorbic) milligram/100 milliliters	<0.02	<0.02

Remark: Aloe vera 1 means the mixed fruit juice Aloe vera drinks from concentrated juices.

Aloe vera 2 means the mixed fruit juice ready-to-drink Aloe vera drinks from fresh fruits.

Analysis Method: AOAC (2000), HPLC, GC, F-AAS, APHA (2001), (2002), ISO 6579 (2002)

\* Tested in Chemical Lab Room, Industrial Metrology and Testing Service Centre for analysis

**Table 6** Microbe analysis results on developed mixed fruit aloe vera drink products

Description of Analysis	Aloe Vera 1	Aloe Vera 2
Total plate count, (CFU/1 milliliter)	~ 24	~ 23
Yeast and Fungi (CFU/1 milliliter)	< 1 (Unidentified)	< 1 (Unidentified)
<i>S. aureus</i> , (CFU/1 milliliter)	< 1 (Unidentified)	< 1 (Unidentified)
<i>E. coli</i> , (MPN/1 milliliter)	< 1.1 (Unidentified)	< 1.1 (Unidentified)
Coliform, (MPN/1 milliliter)	< 1.1 (Unidentified)	< 1.1 (Unidentified)

Remark: Aloe vera 1 means the mixed fruit juice Aloe vera drinks from concentrated juices.

Aloe vera 2 means the mixed fruit juice ready-to-drink Aloe vera drinks from fresh fruits.

Analysis Method: FDA-BAM (2001), (2002), ISO 6579 (2002)

\* Tested in Chemical Lab Room, Industrial Metrology and Testing Service Centre for analysis

### CONCLUSION

There are two recipes in the development of drink recipes: Recipe suitable for making a ready-to-drink aloe vera juice from a fruit concentrate involving aloe vera 52%; mixed fruit juice concentrate 17%; water 17%; fructose 14%; and salt 0.1%; and that suitable for making a ready-to-drink aloe vera juice from fresh fruits involving aloe vera 19%; mixed fruit juice 73%; fructose 8%; and salt 0.1%. Ready-to-drink aloe vera juice from a fruit concentrate gives yellowish-orange color, with pH value of 3.49±0.10; viscosity 9.81±0.22 centipoise; amount of water soluble solid 21.92±0.21; color values L\* a\* b\* equal to 58.87±0.33, 5.47±0.35 and 35.99±1.34, respectively. Ready-to-drink aloe vera juice from natural fruits is a pale green color, with pH value of 4.02±0.1; viscosity 2.86±0.9 centipoise; amount of water soluble solid 13.83±0.25; color values L\* a\* b\* equal to 58.81±0.51, 0.56±0.43 and 12.60±0.99, respectively; microbes 24 colonies per g; *S. aureus* less than 10 colonies per g; and *E. coli* and Coliform MPN less than 1.1.

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