

Effect of Aloe-gel and bignay fruit proportions to acidity, total dissolved solids, and color of Aloe-bignay beverage

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Abstract. The functional beverage made from natural ingredients is in great demand and a trend during the covid-19 pandemic because contributes to health. One of the potential products is the aloe-bignay beverage which is made from aloe-gel and bignay fruit. Aloe-gel contains 75 functional compounds, and bignay is known for its antioxidant, antibacterial, and antidiabetic properties. The aloe-bignay formula determines its characteristics and shelf life. This study aims to determine the effect of aloe-gel and bignay proportion on acidity, total dissolved solids, and the color of the aloe-bignay beverage. This study used a completely randomized design with three replications. The ratio between aloe-gel and bignay (3:1; 1:1, 1:3) on temperature (12±1) °C and storage time of 0, 3, 6, 9, 12, and 15 days, that used to observe the acidity, total dissolved solids, color, flavor, and taste. The results showed that the proportion of aloe-gel and bignay fruit affected the acidity, total dissolved solids, and color of the Aloe-bignay beverage. The best aloe-bignay beverage formula is a 1:1 ratio.

Keywords: aloe vera; bignay; functional beverage; shelf-life, storage

1 Introduction

Functional food innovation is experiencing fast development currently. Stimulated by the requirement for food and beverage that can improve health. A functional beverage made from aloe vera gel and bignay fruit is one product that contains bioactive compounds that have the potential to be developed. Aloe vera is very easy to grow in Indonesia. In the manufacture of beverages, the part used is part of the aloe vera mucilage called the gel (Ozturk et al., 2019) (Parven et al., 2020) (Liu et al., 2021) (Sonawane et al., 2021).

According to (Luh Suriati, Made Supartha Utama, et al., 2020), the components contained in aloe vera gel include water which reaches 99.5% with total dissolved solids 0.49%, fat 0.67%, carbohydrates 0.043%, protein 0.038%, vitamins A 4.594% IU, and vitamin C 3,476 mg. Another agricultural product that is rich in nutritional value is bignay (Lizardo et al., 2015) (Barcelo et al., 2016)(Shariful Islam et al., 2018). The part that is most often processed is the fruit (Hamidu et al., 2018)(Profile & Activity, 2019). Bignay fruit is known to have pharmacological activity as anti-dysentery, antioxidant, anti-cancer, and antidiabetic (Udomkasemsab et al., 2018) (Yusuf et al., 2021) (Aksornchu et al., 2021). Bignay fruit is usually processed into beverages such as syrup, tea, jelly, jam, fermented beverages (wine), coloring agents, and can even be consumed directly because of its sour and sweet taste (Shariful Islam et al., 2018) (Ngamlerst et al., 2019) (Hardinasinta et al., 2020).

Bignay fruit in the Philippines is also known as a fruit that has antioxidant properties and is good for health. Several studies have reported that bignay fruit extract exhibits antibacterial properties (Barcelo et al., 2016), -glucosidase inhibitory activity (Lawag et al., 2012), antidiabetic properties (Lawag et al., 2012) (El-Tantawy et al. 2015) (Aksornchu et al., 2021), and important antioxidant properties (Lizardo et al., 2015) (Ngamlerst et al., 2019)(Yusuf et al., 2021). The formulation of aloe vera gel and bignay fruit into refreshing beverages that provide health effects is a step to diversify beverage products and improve composition (Devianti & Wardhani, 2018)(Suriati et al., 2020)(Yusuf et al., 2021). This method has never existed in previous studies and needs to be done in-depth research.

The weakness in aloe-bignay beverage products is the occurrence of precipitation because the total flavonoid content in bignay fruit is quite high (Hardinasinta et al., 2020). The stability of beverages from aloe vera gel and bignay fruit is a fundamental thing that needs to be considered to extend the shelf life (Suriati & Utama, 2019) (Suriati & Suardani, 2021). To find out the best composition of the health beverage, it is necessary to research the proportion of aloe vera (*Aloe barbadensis* M.) and bignay fruit (*Antidesma bunius*) on the quality of the Aloe-bignay health beverage.

Based on this, it is necessary to research the effect of the proportion of aloe vera gel and bignay fruit on some characteristics of Aloe-bignay beverage. The objectives of this study are as follows: To determine the effect of the proportion of aloe (*Aloe barbadensis* M.) and Bignay (*Antidesma bunius* L.) to acidity, total dissolved solids, color, flavor, and taste of Aloe-bignay beverage. Determine the best formula for Aloe-bignay beverage products.

2 Research Methods

This research was carried out from January to November 2021 at the Processing Laboratory of the Faculty of Agriculture, Warmadewa University. The analysis was carried out at the Food Analysis Laboratory, Faculty of Agriculture, Warmadewa University. The tools used are digital scales, blender, basin, knife, tablespoon, mixing spoon, filter, plastic cup, plastic bottle, cutting board, chiller, beaker, measuring cup, dropper, analytical balance, petri dish, Erlenmeyer, funnels, test tubes, test tube racks, pH-meters, viscometers, and incubators. The main ingredients used are aloe vera leaf (*Aloe barbadensis*, Miller) and bignay fruit (*Antidesma bunius* L.).

The materials used in the analysis are NaCl, distilled water, diluent solution, agar medium, NaOH. This study used a completely randomized design with treatment with the proportions of Aloe-gel and bignay fruit 3:1, 1:1, 1:3. Other treatments were storage times of 0, 3, 6, 9, 12, and 15 days at $12 \pm 1^\circ\text{C}$. From these treatments, the combination treatment becomes $3 \times 5 = 15$

treatment combinations. Each treatment was repeated 3 times so that 45 experimental units were obtained.

Research Implementation

Aloe vera gel was extracted from the leaves of the aloe vera plant, which was 1 year old, then the gel was blended for 5 minutes and blanched at 80 C for 5 minutes as well. Optimal ripe bignay fruit with an age of 125 days from flowering, was extracted to obtain a filtrate without pulp. The sugar used as a natural sweetener in this beverage is granulated sugar. Sugar is heated with water until sugar dissolves and boils. The formulation was done by mixing aloe vera gel extract, bignay fruit extract and added 30% sugar. Samples of Aloe-bignay beverage with different proportions, namely the difference between Aloe-gel extract and bignay fruit extract (3:1, 1:1, 1:3) were placed in a chiller with a temperature of $12 \pm 1^\circ\text{C}$. Then observations were made on days 0, 3, 6, 9, 12, and 15.

The pH value of Aloe-bignay beverage was measured with a pH meter by standardizing the pH meter before. Total dissolved solids were measured using a hand refractometer. The beverage is placed on a refractometer prism, then readings are taken. Before and after readings, the refractometer prism was cleaned with alcohol. The refractometer number shows the total dissolved solids content ($^\circ\text{Brix}$). Color, aroma, and taste tests were carried out using a hedonic scale to determine the panelist's assessment of the sensory value of the resulting product. This organoleptic test on a scale of (5) very much like, (4) like it, (3) like it a little, (2) don't like it, and (1) don't like it very much.

3 Results and Discussion

3.1 Acidity

Describes the amount of acid in a substance. An acid is a chemical that gives off hydrogen ions in water and forms salts by combining with certain metals. The acidity value indicates the hydrogen ion concentration which depicts the acidity level. Acidity is measured on a scale called the pH scale. The results of the research on the acidity variable of aloe-bignay beverage showed that the proportion treatment and storage time were non-significant, but the interaction had a very significant influence.

The larger proportion of bignay fruit compared to aloe-gel resulted in a decrease in the acidity value. This is because the content of organic acids and total phenol content in bignay is relatively high and can contribute to increasing the acidity of aloe-bignay beverages (Profile & Activity, 2019).

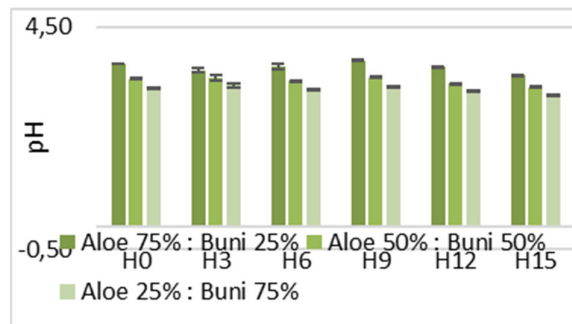


Fig 1. pH Aloe-bignay beverage

3.2 Total dissolved solids

The components in the fruit consist of water-soluble components, such as glucose, sucrose fructose, and water-soluble proteins (pectin). Total dissolved solids (TDS) are a measure of the dissolved combined content of all inorganic and organic substances present in a liquid in molecular, ionized, or micro-granular (colloidal sol) suspended form. The treatment of aloe-gel and bignay proportions showed a very significant effect on the TDS of aloe-bignay beverages. (Hamidu et al., 2018) argue that the bignay fruits are rich in nutritional components such as carbohydrates, sugars, organic acids, proteins, minerals, and vitamins that effect on TDS of Aloe-bignay beverages.

The interaction between proportion and storage time treatments was non-significant. The proportion of aloe-gel and bignay 1:1 produced a higher TDS than the others. This shows that aloe-gel and bignay synergize to produce higher TDS. TDS 12±1°C storage was relatively stable. The results indicate that anthocyanin and total phenol in bignay fruit juice that contributes to TDS are much more stable during heating (Hardinasinta et al., 2021).

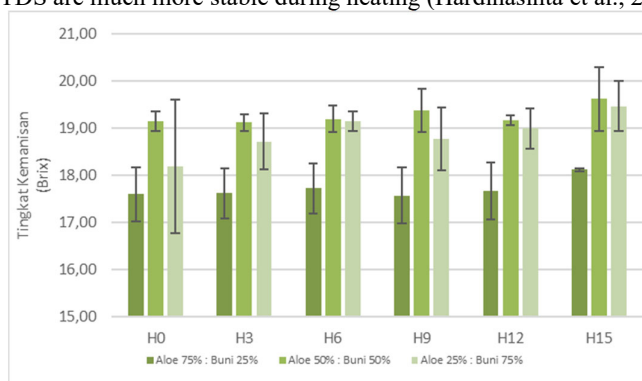


Fig 2. TPT (°Brix) Aloe-bignay beverage

3.3 Color

Red fruits are good for the eyes, the heart, digestion, and cells. Orange fruits are good for the eyes, your immune system, cells, and the heart. Yellow fruits are good for the skin, eyes, circulation, and immune system. Green fruits help lower cholesterol and are good for your organs. The results showed that the proportions of aloe-gel and bignay treatment, as well as temperature, showed a very significant effect on the hedonic test of aloe-bignay beverage color. The larger proportion of bignay compared to aloe-gel increases the color value of the aloe-bignay beverage.

This is caused by the red color, namely the anthocyanin from the bignay fruit which is added to produce a more attractive color (bright red). Phytochemical analysis of the *Antidesma bunius* has confirmed the presence of different kinds of flavonoids, terpene, sugar, saponin, tannin, toxic alkaloids, phenolic acids, procyanidin B1, procyanidin B2 and anthocyanins (Shariful Islam et al., 2018). The longer the storage, the lower the color value. This means that storage time results in greater anthocyanin pigment breakdown (Hardinasinta et al., 2021).

Table 1. Color, flavor and taste of Aloe-bignay beverage

Treatment	Day 0	Day 3	Day 6	Day 9	Day 12	Day 15
Color						

3:1	4.20	b	2.90	b	3.50	b	5.00	a	3.90	ab	3.30	c
1:1	5.20	ab	5.20	a	5.20	a	4.40	a	5.10	a	5.20	ab
1:3	6.30	a	5.10	a	5.60	a	5.20	a	5.00	a	5.10	ab
Flavor												
3:1	4.30	a	3.90	ab	3.90	abc	4.00	a	4.50	a	0.00	
1:1	4.90	a	4.40	ab	4.70	a	4.50	a	4.30	ab	0.00	
1:3	4.90	a	4.80	a	4.30	ab	4.10	a	4.50	a	0.00	
Taste												
3:1	5.40	a	4.80	a	4.70	a	3.90	b	4.10	b	0.00	
1:1	5.10	a	4.30	a	5.10	a	4.90	ab	3.50	b	0.00	
1:3	5.40	a	4.80	a	4.50	a	4.60	ab	5.60	a	0.00	

Flavor

Flavor is defined as a complex combination of the olfactory, gustatory, and trigeminal sensations perceived during a tasting. The flavor may be influenced by tactile, thermal, painful, and/or kinesthetic effects. The research result shows that proportion treatment significantly different of the flavor of Aloe bignay beverage after day 3 storage. This is because storage time can degrade the quality of Aloe-bignay drinks and so can its flavor (Butkhup & Samappito, 2008)(Yusuf et al., 2021).

Another study reported that a combination of several herbal extracts resulted in a synergistic effect of its bioactive compounds against the research of diabetes on cells and animals as models. Even phytochemical compounds exhibit favorable effects in various studies in vitro (Yusuf et al., 2021).

Taste

Perceptual discrimination of taste is fundamental to rational choice in many product categories. Taste receptors in the mouth sense the five taste modalities: sweetness, sourness, saltiness, bitterness, and savories (also known as savory or umami). Aloe vera gel is known to be tasteless while bignay has a sweet taste with a strong sour sensation. The results showed that the proportion of Aloe-gel and bignay exerted a noticeable effect after storage of day 6. This is due during storage to the degradation of the flavor component in aloe-bignay drinks. The manufacture of A. vera products such as beverages is vital to the economy and continues to increase from year to year (Sonawane et al., 2021).

In addition, A. vera has been widely used as a source of functional food, especially beverages (Swami Hulle et al., 2017) (Suriati, et al., 2020). Currently, aloe vera juice with a certain mixture is very popular, for example, lemon juice, sherbet, as well as bignay fruit. However, the mucilaginous gel obtained from fresh A. vera leaves have a bitter taste and produce an unpleasant taste sensation. The addition of bignay fruit which has a sweet taste with a sour sensation is an easy technique to reduce the bitter taste of drinks (Sánchez-Machado et al., 2017) (Piayura & Ratchasima, 2021).

4 Conclusion

From the results of the study, it can be concluded that the proportion of aloe vera gel and bignay fruit affects the variable pH, the total dissolved solids of aloe-bignay beverages at all storage times. The best formula of aloe-bignay health beverage products is with a 1:1 proportion or 50% aloe vera gel and 50% bignay fruit extract. Aloe-bignay health beverage is still worth consuming until the 12th day.

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