Journal of Agriculture and Crops
ISSN(e): 2412-6381, ISSN(p): 2413-886X
Vol. 9, Issue. 3, pp: 357-364, 2023
URL: https://arpgweb.com/journal/journal/14
DOI: https://doi.org/10.32861/jac.93.357.364

Academic Research Publishing Group

Original Research **Open Access**

Characteristics of Aloe-buni Powdered Drinks with the Addition of Arabic Gum and Drying Temperature Variations

Luh Suriati (Corresponding Author)
Department of Food Science and Technology, Faculty of Agriculture, Warmadewa University, Denpasar, Indonesia
Email: suryati_luh@yahoo.com

I Gede Pasek Mangku
Department of Food Science and Technology, Faculty of Agriculture, Warmadewa University, Denpasar, Indonesia

Hanilyn Hidalgo
Department of Agribusiness, Faculty of Economics and Management, Central Bicol State University of Agriculture, Pili, Philippines

Luh Kade Datrini
Accounting Program Study, Economic Faculty, Warmadewa University, Denpasar, Indonesia

Josephine Red
Food Science Department, Faculty of Engineering and Food Science, Central Bicol State University of Agriculture, Pili, Philippines

Bartholomew Elopere
Department of Food Science and Technology, Faculty of Agriculture, Warmadewa University, Denpasar, Indonesia

Anak Agung Sagung Manik Cindrawati
Magister of Science of Agriculture, Postgraduate Program, Warmadewa University, Denpasar, Indonesia

Ni Luh Putu Sulis Dewi Damayanti
Magister of Science of Agriculture, Postgraduate Program, Warmadewa University, Denpasar, Indonesia

Article History
Received: 8 January, 2023
Revised: 11 April, 2023
Accepted: 7 May, 2023
Published: 13 May, 2023

Abstract

Aloe-buni is a functional drink of Aloe vera gel and buni fruit extract, containing fiber and antioxidants that are beneficial to health. Processing of Aloe-buni powder drinks using the foam mat drying method requires arabic gum filler to form powder. The drying temperature also greatly affects the manufacture of powdered drinks. The purpose of this study was to determine the effect of gum arabic concentration and drying temperature on the characteristics of Aloe-buni powdered drink. This study used a two-factor factorial plan, namely the concentration of arabic gum filler material 10%, 20%, 30% and drying temperature consisting of 30°C, 40°C and 50°C. The results showed that the concentration of gum arabic and the drying temperature were different from the characteristics of the Aloe-buni powdered drink. The best characteristics of Aloe-buni powdered drink was obtained of a concentration 30% arabic gum and a heating temperature of 40°C, as for a pH value of 4.30; total dissolve solid 41.33°Brix; color a* 4.86; moisture content 5.61%; solubility 98.56%; antioxidant activity 7.46%; and vitamin C 66.06 mg/100g.

Keywords: Gum arabic; Aloe-buni; Temperature; Antioxidant; Powder drink.

How to Cite: Luh Suriati, I Gede Pasek Mangku, Hanilyn Hidalgo, Luh Kade Datrini, Josephine Red, Bartholomew Elopere, Anak Agung Sagung Manik Cindrawati, Ni Luh Putu Sulis Dewi Damayanti, 2023. "Characteristics of Aloe-buni Powdered Drinks with the Addition of Arabic Gum and Drying Temperature Variations." *Journal of Agriculture and Crops*, vol. 9, pp. 357-364.

1. Introduction

Functional drinks are experiencing rapid development currently, spurred by the need for food and drinks that can improve health. Functional drinks based on aloe vera gel and buni fruit (*Antidesma bunius*) are one of the products that contain bioactive compounds that have the potential to be developed. Aloe vera is a kind of thorny plant that comes from dry areas on the African continent. This aloe vera plant has been known and used for thousands of years because of its properties and benefits extraordinary. The use of aloe vera drink uses the inside of the leaves called Aloe vera gel [1-4] Components in Aloe vera gel include water, carbohydrates, proteins, saponins, sterols, acemannan, as well as vitamins A, B, C, and E. Aloe vera also contains 75 nutrients and 200 active

compounds including sugars, anthraquinones, saponins, vitamins, enzymes, minerals, lignin, salicylic acid and amino acids.

Another potential agricultural product that contains many bioactive components is buni fruit [5, 6]. Buni fruit has pharmacological activity as an anti-dysentery, antioxidant, anticancer, and anti-diabetic [7]. Buni fruit is usually processed into drinks such as syrup, tea, jelly, jam, wine, dyes, and can even be consumed directly because of its sour and sweet taste [8]. Some studies have reported that buni fruit extract contains antibacterial substances, glucosidase inhibition [5], antidiabetics and important compounds that inhibit oxidation [7, 9]. The formulation of blended Aloe vera gel with buni fruit into Aloe-buni powdered drink is a step towards product diversification and composition improvement [10, 11]. This method has never existed in previous studies and needs in-depth research.

The weakness in Aloe-buni drink products is the occurrence of deposition because the flavonoid content in buni fruit is quite high [8]. The stability of drinks from aloe vera gel and buni fruit is a fundamental thing that considered to extend the shelf life [12]. Making powdered drinks is a processing step that can overcome these problems. The filler material in the manufacture of powdered drinks is needed for optimal powder formation. Arabic gum is a filler that can be added to Aloe-buni drinks. The right concentration needs to be determined, besides that the drying temperature greatly affects the characteristics of the Aloe-buni powdered drink. To find out the best characteristics of powdered drinks, it is necessary to conduct research on the utilization of Arabic gum and the drying temperature against the characteristics of Aloe-buni powdered drinks. Production of powder using temperatures below 100°C [13]. The drying method does not require high costs and is easier to apply, but at its manufacture requires more time and labor. One easy drying method is foaming mat drying. The advantage of the foam mat drying method is the short drying time so that there is very little chance of nutrients being degraded due to heat, and can be used in liquid products with a certain level of viscosity [14].

Arabic gum is a hydrocolloid used for the binding of flavors, thickening agents, thin layer forming and emulsion stabilizers. In addition, gum arabic has a higher solubility compared to other hydrocolloids [15]. This type of thickener is also heat resistant in processes that use heat but it is better if the heat is controlled to shorten the heating time, considering that gum arabic can degrade slowly which affects emulsification and viscosity. Arabic gum can be used for the binding of flavors, thickening agents, forming thin layers of emulsion stabilizers. Viscosity will increase in proportion to the increase in concentration [16] . The novelty of this research is about the effectiveness of the use of arabic gum fillers and drying temperature in the manufacture of Aloe-buni powdered drinks. The purpose of this study is to eith analyse the effect of the concentration of Arabic gum filler and drying temperature on the characteristics of Aloe-buni powdered drinks, as well as to finding the concentration of Arabic gum and the most appropriate temperature to produce the best Aloe-buni powdered drink.

2. Material and Methods

The main ingredients used are aloe leaves (*Aloe barbadensis, Miller*) whose trees are over 1 year old and buni fruit (*Antidesma bunius* L.) optimally mature with a lifespan of 125 days from flowering. The ingredients used in the analysis are aquadest, vitamin C reagents, and DPPH. The equipment used in this study was digital scales, stirring spoons, sieves, plastic bottles, baking sheets, beaker cups, measuring cups, drip pipettes, analytical scales, Erlenmeyer, funnels, test tubes, test tube racks, pH meters, spectrometers, and ovens. The research design used random design with factorial patterns. Factor I is the treatment of the concentration of arabic gum fillers 10%, 20%, 30%. Factor II is the drying temperature of 30°C, 40°C, and 50°C, with a replication of 3 times.

2.1. Extraction of Aloe Vera Gel

The leaves of Aloe vera used are washed to remove adhering dirt, followed by a ±10 minute soaking to reduce the yellow sap that will affect the final result of the gel extract. Stripping of aloe leaves is carried out ±3 mm from the surface of the leaves. Cutting and removal of thorns on the leaves is carried out to facilitate stripping and the process of crushing. Aloe vera gel that has been cut and clean from the skin is *blanching* using boiling water for ±5 minutes to minimize the mucus produced by the leaves. The blanched gel is then crushed with blender, then filtered and heated to a temperature of 80°C ±5 minutes. This heating is carried out in order to inactivate the enzymes contained in aloe gel. After warming up, filtered again to get a non-fibrous aloe vera gel.

2.2. Extraction of Buni Fruit

Buni fruits are separated first from the bunch so that the washing process can be carried out optimally. Washing is carried out 3-4 times and drained. Buni fruits in one bunch vary in maturity, so sorting on buni fruits is carried out with the aim of separating between immature, ripe, and very ripe fruits. The fruits used in this drink is a ripe fruit that is red in color. Buni fruits are crushed with a blender, further filtered. This process will produce pulp in the form of buni seeds and buni skin that cannot be destroyed. The buni juice that has been separated with the pulp is then heated. The purpose of this heating is to kill microbes. Heating is carried out at a temperature of 80 ° C for ± 5 minutes, then cooled and then filtered again to separate the buni fruit extract from the buni skins that are filtered in the first filtering.

2.3. Formulations of Aloe-Buni Powdered Drink

The formulation is carried out by mixing gel aloe vera, buni fruit extract and sugar water. The formulation consists of 3 proportions, namely: Formulation 1 is gel aloe vera 50%, buni fruit extract 50%, gum arabic 10%. Formulation 2 is gel aloe vera 50%, Buni fruit extract 50%, gum arabic 20%. Formulation 3 is gel aloe vera 50%,

buni fruit extract 50%, gum 30%. The drink is packaged in sterilized plastic bottles of 100 ml using hot steam. Aloe-buni drink that has been added to the filler, then dried by the *foam mat drying* method at 30°C, 40°C, and 50°C for 48 hours. After drying, the drink is dredged and then mashed using a mortar and filtered to obtain a uniform powder.

2.4. Research Variables

The acidity of Aloe-buni health drinks is measured with a pH meter. Standardization of pH meters is carried out before the measurement of the degree of acidity. L the first number, the pH meter is turned on and then the electrodes are rinsed with aquadest, then dried using tissue paper. Drying the pH meter electrode is enough to attach tissue paper to the edges and ends of the electrode so that the accuracy validation does not change. Vitamin C using reagent by mixing 500 ml of 0.6 M sulfuric acid with 5.322 g of sodium phosphate and 2.471 g of ammonium molybdate. The reagent (3 ml) was mixed with 0.3 ml of the sample and incubated in a water bath at 95°C during 90 min. After incubation, it was cooled in water for 5 minutes before absorbance was measured at 695 nm. Results are expressed as equivalent ascorbic acid in mg/g. Total dissolved solids are measured using a hand refractometer. Aloe-buni functional drink liquid is dripped on the prism of the refractometer, then read. Before and after the readings, the prism of the refractometer is cleaned with alcohol. The hand refractometer number indicates the total level of dissolved solids in °Brix. Analysis of water content by means weighed as much as 2-5 grams on a porcelain dish that has been known to weigh it. The saucer is put in the oven for 5 hours at 100°C -105°C or until the weight becomes constant. The sample is then removed from the oven and put into a desiccator and weighed immediately upon reaching room temperature. Color testing was measured using colorimetry to determine the color level in Aloe-buni drink products.

2.5. Statistical Analysis

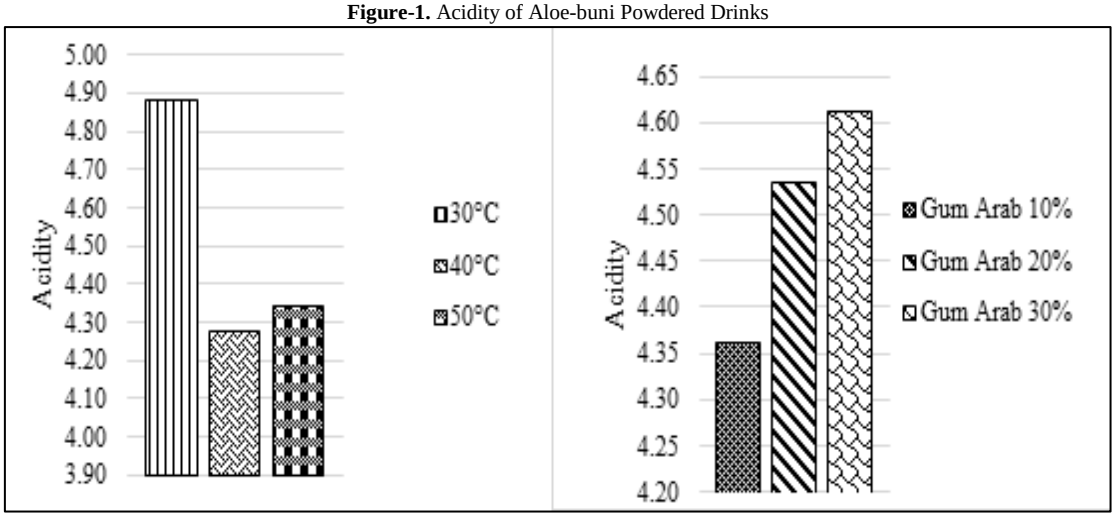
The study used a complete randomized design. The data obtained were analyzed with Anova fingerprints using SPSS version 26. The results of the fingerprints that showed unreal influences were then tested for BNT at a level of 5% and if the results of the fingerprint analysis showed real influences and provided interaction, then continued Duncan's Multi Range Test.

3. Result and Discussion

3.1. Acidity

Fingerprint analysis showed that the arabic gum concentration treatment had a noticeable influence and the drying temperature treatment had a very noticeable effect on the pH of the Aloe-buni powdered drink. The average pH value of the drink Aloe-buni 4.28-4.89, can be seen in Figure 1. In the treatment of the addition of arabic gum filler ingredients, it was seen that there was a tendency, an increase in the pH of the Aloe-buni powdered drink, where the highest acidity was obtained at the addition of arabic gum 30% which is 4.61 and the lowest on the addition of arabic gum 10% i.e., 4.36. In line with the research [17], Arabic gum has a higher pH value than raw materials, so the more arabic gum added, the higher the pH value. The pH value of gum arabic is 4.70 [18]. Increased drying temperature, lowering the pH of Aloe-buni powdered drink. This is due to the formation of acids by the activity of enzymes due to the content of starch or sugar in the ingredients. According to Nayik [19], starch molecules tend to attract negatively charged particles. The withdrawal of OH^- ions to the vicinity of the sugar molecules will result in the concentration of H^+ ions in the solution increasing so that the pH will decrease. Arabic gum has a function as a stabilizer, where gum arabic along with water-soluble organic acids are able to bind water during the drying process. Therefore, the higher the concentration of arabic gum, the more organic acids in the Aloe-buni powder [20]. When the material is dissolved in water, the ratio of hydrogen ions to hydroxyl ions will change. If the number of hydroxyl ions is greater than the number of hydrogen ions, the solution is alkaline so that the pH rises, and vice versa [21]. According to Setiawan [22] arabic is stable in acidic solutions, the natural pH of gum ranges from 3.90-4.90.

Figure-1. Acidity of Aloe-buni Powdered Drinks



3.2. Vitamin C

The concentration of gum arabic has an unreal influence and the drying temperature treatment has a noticeable effect on the vitamin C of the Aloe-buni powdered drink. The average vitamin C value of the powder drink Aloe-buni 44.63 mg/100g to 64.51 mg/100g. The average vitamin C value of Aloe-buni drink can be seen in Table 1. The concentration of arabic gum increased resulting in a decrease in the vitamin C powder of Aloe-buni, the highest level of vitamin C obtained in gum arabic 20% i.e., 57.98 mg/100g and the lowest in the addition of 30% gum was 45.00 mg/100g. This is because gum arabic is a hydrocolloid that has the ability to form gels so that it can protect vitamin C from oxidative damage. This can also be because gum arabic is a water-soluble component capable of binding water [23], an increase of the concentration of gum arabic will increase its binding power to protect vitamin C from damage during the drying process. The increase in drying temperature increases the vitamin C levels of Aloe-buni powdered drink, the highest obtained at 40ºC which is 64.51 mg / 100g and the lowest at 30ºC which is 44.63 mg / 100g. Drying temperature has an impact on increasing the ability of gum arabic to protect important compounds such as vitamin C, because gum arabic has the ability to form a *body* as a coating and has a strong binding power to ignited compounds [24]

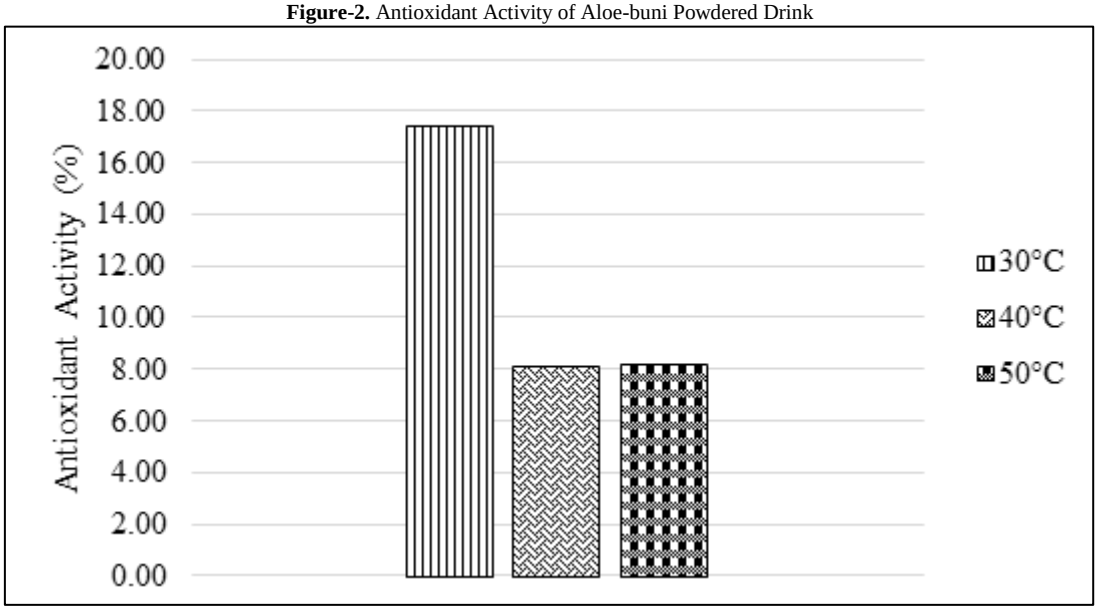
Table-1. Vitamin C Levels (mg/100gr) Aloe-buni Powdered Drinks

Treatment	Drying Temperature (°C)			Average
	30	40	50	
Arabic Gum 10%	42.08	72.61	58.23	57.64
Arabic Gum 20%	54.03	63.52	56.40	57.98
Arabic gum 30%	37.77	57.40	39.83	45.00
Average	44.63	64.51	51.49	

3.3. Antioxidant Activity

Fingerprint analysis showed that the concentration treatment of arabic gum fillers had an unreal influence and the drying temperature treatment had a noticeable influence on the antioxidant activity of Aloe-buni powdered drinks. The average value of antioxidant activity of Aloe-buni drink drying temperature treatment can be seen in Graph 3. The addition of filler material gum arabic resulted in a tendency to increase activity's antioxidant drink powder Aloe-b uni. The highest activity of antioxidant was obtained in arabic gum 30% i.e., 14.20% and lowest at a concentration of 10% i.e. 8.72%. According to [18], Arabic gum is able to protect or bind to an active compound found in a food ingredient. Antioxidant compound binds to gum arabic so that antioxidant compounds can be protected, in arabic gum encapsulate there is antioxidant activity [19]. Higher drying results in a significant decrease in antioxidant activity. The highest antioxidant activity is obtained at a drying temperature of 30 o C, which is 17.44% the lowest at a temperature of 40°C, which is 8.07%, this is because antioxidants are compounds that can inhibit oxidation reactions, easily damaged due to heating. According to Udomkasemsab, *et al.* [25], the longer the drying time, the antioxidant activity of functional powdered drinks decreases. In line with Suriati, *et al.* [26], that antioxidant activity decreases with increased heating time.

Figure-2. Antioxidant Activity of Aloe-buni Powdered Drink

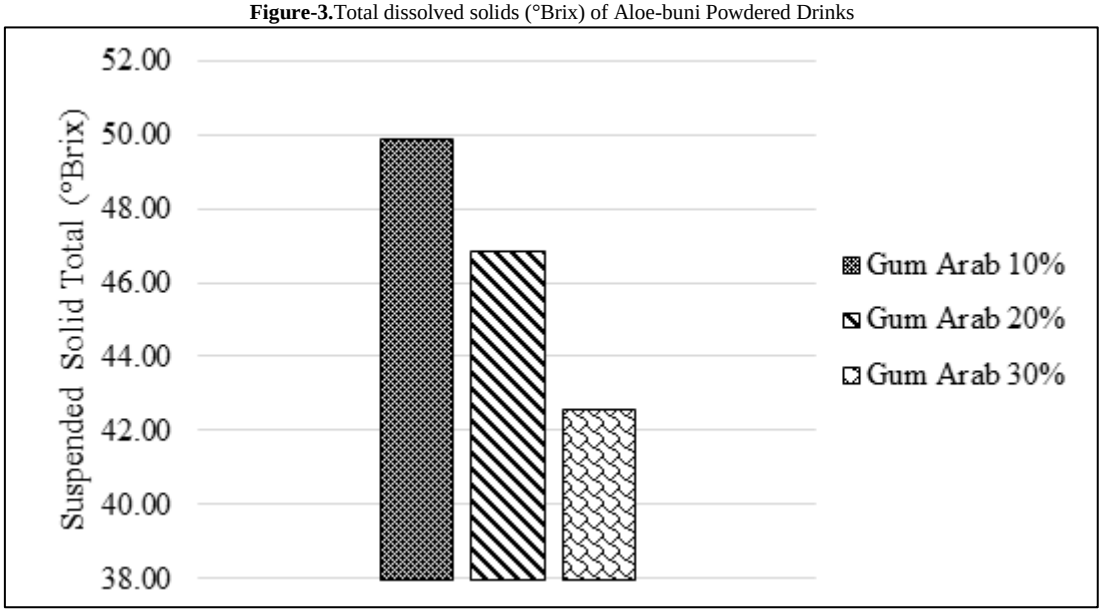


3.4. Total Dissolved Solids

Fingerprint analysis showed that the concentration treatment of Arabic gum fillers had a very noticeable influence and the drying temperature treatment had a real influence on the total dissolved solids of Aloe-buni powdered drinks. The average total dissolved solids value of Aloe-buni drinks can be seen in Chart 4. Arabic gum changes resulted in a significant decrease in the total dissolved solids of the Aloe-buni powdered drink, the highest

value obtained at the addition of arabic gum 10% which was 49.89°Brix and the lowest at a concentration of 30% which was 42.56°Brix. It is because, the higher the concentration of gum arabic the longer the time of solubility required. Qualitatively, an increase in the concentration of gum arabic used will prevent the formation of deposits. The function gum arabic as a stabilizer used in foodstuffs. According to Suriati, *et al.* [11], the factors affecting the solubility of a solid in a liquid are the intensity of stirring, pH, temperature, composition of the solvent, particle size, influence of surfactants, complex formation, and pressure. Particles size can influence decrease solubility. The drying temperature practice indicates that an increase in temperature will increase the total dissolved solids value of Aloe-buni powdered drinks, a high T value is obtained at a temperature of 50ºC which is 48.11°Brix and the lowest at a temperature of 30ºC which is 45.39°Brix. In line with the research of Chaturvedi, *et al.* [27], which states that the length of drying time/ foam mat drying will cause evaporation and can cause an increase in total dissolved solids and viscosity due to the lack of water.

Figure-3. Total dissolved solids (°Brix) of Aloe-buni Powdered Drinks



3.5. Moisture Content

Analysis of the fingerprints showed that the treatment of the concentration of arabic gum filler material and the drying temperature and its interactions had no real effect on the moisture content of the Aloe-buni powdered drink. The average value of the moisture content of Aloe-buni powdered drinks ranges (4.48-7.07) %. The average value of the moisture content of the Aloe-buni powdered drink can be seen in Table 2. The highest of moisture content was obtained at the addition of arabic gum 10% i.e., 6.87% and lowest at a concentration of 30% i.e., 5.18%. Decreased moisture content due to increased concentration of gum arabic. The binding capacity of water by gum arabic is influenced by proteins that have functional groups capable of binding to water. When compared to other types of hydrocolloids, gum arabic has the lowest water binding ability which is only 7.49% [28]. High temperature resulted in the moisture content of Aloe-buni powder drink decreasing, the highest moisture content obtained at 30ºC i.e. 7.0 8% and lowest at 50°C i.e. 4.38%. Moisture content is a very important parameter for dry products because the presence of water in a product can cause a decrease in quality [29].

Table-2. Moisture Content (%) of Aloe-buni Powdered Drinks

Treatment	Storage temperature (°C)			Average
	30	40	50	
Arabic Gum 10%	7.29	6.89	6.45	6.87
Arabic Gum 20%	7.12	6.73	3.62	5.82
Arabic gum 30%	6.82	5.64	3.08	5.18
Average	7.08	6.42	4.38	

3.6. Solubility

Fingerprint analysis showed that the concentration treatment of arabic gum fillers and their drying temperatures and interactions had an unreal influence on the solubility of Aloe-buni powdered drinks. The average value of solubility of Aloe-buni powdered drinks is between 96.66% to 97.48%. The average value of the solubility of the powder drink Aloe-buni can be seen in Table 3. The addition of arabic gum filler material resulted in a decrease in the solubility of Aloe-buni powdered drinks, the highest solubility was obtained at the addition of arabic gum 20% which was 97.45% and the lowest concentration 30% which was 96.66%. Solubility is the maximum amount of substance that can dissolve in a certain amount of solvent or solution at a given temperature. Water serves as a material that can disperse various compounds present in foodstuffs. One of the factors that affect the soluble time is the moisture content of the ingredients, the higher the water content in the drink powder, the longer it takes to dissolve. The increase in water content in foodstuffs will form bonds that cause clots to form and it will take longer

to break the bonds between particles. This is in line with the research of [19] , that the factors that affect the solubility of a solid in a liquid are the intensity of stirring, pH, temperature, composition of the solvent, particle size, influence of surfactants, complex formation, and pressure. In this case the particle size can be an influence of decreasing solubility. The solubility of Aloe-buni powdered drinks is subject to increasing temperature, the lowest solubility is obtained at 30ºC which is 96.69% and the highest at 40°C is 97.48%. This is in line with the research of Galus, *et al.* [30], the solubility of a material in water is influenced by the moisture content of the material in question.

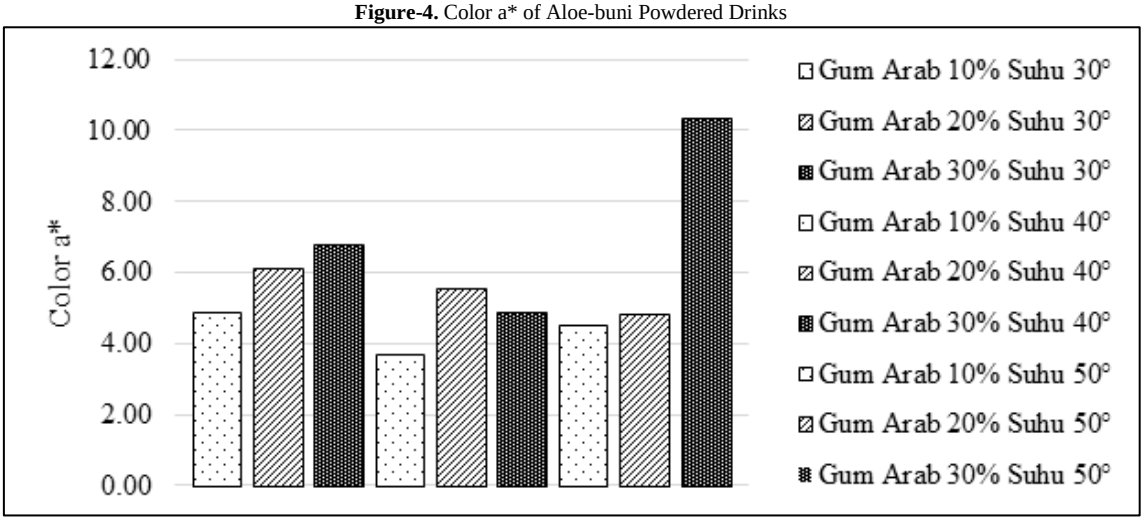
Table-3. Solubility (%) of Aloe-buni Powdered Drink

Treatment	Storage temperature (°C)			Average
	30	40	50	
Arabic Gum 10%	98.00	95.81	98.55	97.45
Arabic Gum 20%	96.88	98.06	97.42	97.45
Arabic gum 30%	95.21	98.56	96.21	96.66
Average	96.69	97.48	97.39	

3.7. Color Test a*

Based on diversity analysis, the color a* treatment of the concentration of the filler material has a very noticeable influence, the drying temperature has an unreal effect and the interaction has a real effect. Arabic gum filler material, increasing the color value of a* drink powder Aloe-buni, color a* highest obtained at the addition of arabic gum 50% i.e. 7.33 and lowest at a concentration of 30% i.e. 4.36. The higher the color value indicates the quality of the buni powder color which is farther from the initial buni fruit color (fades). Widiantoko and Yunianta [31] stated that the addition of stabilizers in food products has no effect on the resulting product because the color of the Arabic gum stabilizer is brownish white in powder form, but when dissolved it will be clear or bright. Arabic gum has low viscosity properties and is tasteless and colorless, it can be added in certain quantities without disturbing the organoleptic properties of food products. The increase in drying temperature resulted in an increase in the color of a* Aloe-buni powdered drinks, the highest value at a drying temperature of 50ºC which was 6.56 and the lowest at a temperature of 40°C which was 4.69. An increase in storage temperature is able to stimulate the hydrolysis process of glycosidic bonds between the aglycon and glycan groups in the anthocyanin structure. The hydrolysis is able to produce aglycon groups that are easily subjected to structural transformation into colorless calcemic compounds.

Figure-4. Color a* of Aloe-buni Powdered Drinks



4. Conclusion

The concentration of arabic gum filler material affects the pH, total dissolved solids, and color a* of Aloe-buni powdered drinks. The drying temperature affects the pH, antioxidant activity, and vitamin C of Aloe-buni powdered drinks. The concentration 30% of gum arabic and a heating temperature of 40ºC resulted in the best Aloe-buni powdered drink, where a pH yield of 4.30 was obtained; antioxidant activity 7.46%; vitamin C 66.06 mg/100g; total dissolved solids 41.33°Brix; moisture content 5.61%; and solubility 98.56% and color a* 4.86.

Acknowledgments

The author would like to thank the Chancellor of the University of Warwadewa for the funding provided, and do not forget to thank the Head of the Research Institute University of Warwadewa and various parties who have helped.

References

[1] Liu, H., Liu, S., Du, B., Dong, K., Wang, Y., and Zhang, Y., 2021. "Aloe vera gel coating aggravates superficial scald incidence in 'Starking' apples during low-temperature storage." *Food Chemistry*, vol. 339, p. 128151. Available: https://doi.org/10.1016/j.foodchem.2020.128151

[2] Ozturk, B., Karakaya, O., Yıldız, K., and Saracoglu, O., 2019. "Effects of Aloe vera gel and MAP on bioactive compounds and quality attributes of cherry laurel fruit during cold storage." *Scientia Horticulturae*, vol. 249, pp. 31–37. Available: https://doi.org/10.1016/J.SCIENTA.2019.01.030

[3] Parven, A., Sarker, M. R., Megharaj, M., and Md. Meftaul, I., 2020. "Prolonging the shelf life of Papaya (*Carica papaya* L.) using Aloe vera gel at ambient temperature." *Scientia Horticulturae*, vol. 265, p. 109228. Available: https://doi.org/10.1016/J.SCIENTA.2020.109228

[4] Sonawane, S. K., Gokhale, J. S., Mulla, M. Z., Kandu, V. R., and Patil, S., 2021. "A comprehensive overview of functional and rheological properties of aloe vera and its application in foods." *Journal of Food Science and Technology*, vol. 58, pp. 1217–1226. Available: https://doi.org/10.1007/S13197-020-04661-6

[5] Barcelo, J. M., Nullar, A. R. M., Caranto, J. K. P., Gatchallan, A. M., and Aquino, I. J. B., 2016. "Antioxidant and Antimutagenic Activities of Ripe Bignay (*Antidesma bunius*) Crude Fruit Extract." *Philippine E-Journal for Applied Research and Development*, vol. 6, pp. 32–43.

[6] Islam, S., Munira, S., Zaman, S., Ferdowsy, K. S., Sukorno, F. I., Ahammed, S., and Hridoy, R. A., 2018. "Estimation of phytochemical, antioxidant screening profile and thrombolytic activities of methanolic extract of Antidesma bunius L. leaf." *Horticulture International Journal*, vol. 2, pp. 32-38. Available: https://doi.org/10.15406/hij.2018.02.00077

[7] Aksornchu, P., Chamnansilpa, N., Adisakwattana, S., Thilavech, T., Choosak, C., Marnpae, M., Mäkynen, K., Dahlan, W., and Ngamukote, S., 2021. "Inhibitory effect of Antidesma bunius fruit extract on carbohydrate digestive enzymes activity and protein glycation in vitro." *Antioxidants*, vol. 10, pp. 1–18. Available: https://doi.org/10.3390/antiox10010032

[8] Hardinasinta, G., Mursalim, M., Muhidong, J., and Salengke, S., 2021. "Determination of some chemical compounds of bignay (*Antidesma bunius*) fruit juice." *Food Science and Technology (Brazil)*, vol. 41, pp. 974–979. Available: https://doi.org/10.1590/fst.27720

[9] Ngamlerst, C., Udomkasemsab, A., Kongkachuichai, R., Kwanbunjan, K., Chupeerach, C., and Prangthip, P., 2019. "The potential of antioxidant-rich Maoberry (*Antidesma bunius*) extract on fat metabolism in liver tissues of rats fed a high-fat diet." *BMC Complementary and Alternative Medicine*, vol. 19, pp. 1–12. Available: https://doi.org/10.1186/s12906-019-2716-0

[10] Devianti, V. A. and Wardhani, R. K., 2018. "Degradasi vitamin c dalam jus buah dengan penambahan sukrosa dan lama waktu." *Journal of Research and Technology*, vol. 4, pp. 41–46.

[11] Suriati, L., Made, S. U. I., Admadi, H. B., and Bagus, W. G. I., 2020. "Incorporating additives for stability of Aloe gel potentially as an edible coating." *AIMS Agriculture and Food*, vol. 5, pp. 327–336. Available: https://doi.org/10.3934/agrfood.2020.3.327

[12] Suriati, L. and Utama, I. M. S., 2019. "Characteristic fillet of aloe vera gel as edible coating." *Journal of Physics: Conference Series*, vol. 1402, Available: https://doi.org/10.1088/1742-6596/1402/6/066021

[13] Aliyah, Q. and Handayani, M. N., 2019. "Penggunaan gum arab sebagai bulking agent pada pembuatan minuman serbuk instan labu kuning dengan menggunakan metode foam mat drying gum arabic as bulking agent in the making of yellow pumpkin instant drink powder using foam mat drying method." *Edufortech*, vol. 4, pp. 1–10.

[14] Yohana, R., 2016. *Karakeristik fisikokimia dan organoleptik minuman serbuk instan dari campuran sari buah pepino (silanum muricatum, aiton.) dan sari buah terung pirus (cyphomandra betacea, sent.)*. Universitas Andalas.

[15] Astuti, T., Widowati, E., and Atmaka, W., 2015. "Kajian karakteristik sensoris, fisik, dan kimia fruit leather isang tanduk (musa corniculata lour.) dengan penambahan berbagai konsentrasi gum arab." *Jurnal Teknologi Hasil Pertanian*, vol. 8, Available: https://doi.org/10.20961/jthp.v0i0.12786

[16] Sutrisno, O. D., Agustina, L., and Al Hakim, H. M., 2019. "Pengaruh jenis dan konsentrasi penstabil pada pembuatan minuman probiotik kacang nagara (*vigna unguiculata ssp. Cylindrica*)." *Pro Food*, vol. 5, pp. 496–506. Available: https://doi.org/10.29303/profood.v5i2.113

[17] Susanti, S., Bintoro, V. P., and Amanullah, D. R., 2021. "Karakteristik Fisik, Total Padatan dan Hedonik Velva Nangka dengan Penambahan Gum Arab Sebagai Penstabil." *Jurnal Ilmiah Sains*, vol. 21, p. 137. Available: https://doi.org/10.35799/jis.v21i2.33861

[18] Ghosh, T., Nakano, K., Mulchandani, N., and Katiyar, V., 2021. "Curcumin loaded iron functionalized biopolymeric nanofibre reinforced edible nanocoatings for improved shelf life of cut pineapples." *Food Packaging and Shelf Life*, vol. 28, p. 100658. Available: https://doi.org/10.1016/j.fpsl.2021.100658

[19] Nayik, G. A., 2020. "Antioxidants in fruits: Properties and health benefits. In antioxidants in fruits: Properties and health benefits." Available: https://doi.org/10.1007/978-981-15-7285-2

[20] Ayu, D. F., Johan, V. S., and Zulfalina, T., 2021. "Kombinasi Bubur Buah Nipah dan Nanas dengan Penambahan Gum Arab pada Mutu dan Karakteristik Sensori Fruit leather." *AgriTECH*, vol. 41, p. 257. Available: https://doi.org/10.22146/agritech.41570

[21] Zuniarto, A. A., Mundzir, O. A., and Maulida, N. A., 2021. "Uji formulasi dan kemasan serbuk instan perasan kulit buah jeruk nipis (*citrus aurantifolia*)." *Jurnal Ilmiah Indonesia*, vol. 6, pp. 484-4857. Available: http://dx.doi.org/10.36418/

[22] Setiawan, A., 2018. *Karakteristik fisik dan tingkat kesukaan beras instan dengan edible coating gum arab yang diperkaya ekstrak daun pandan*. Universitas Mercu Buana Yogyakarta.

[23] Lubis, M. S. P., Nainggolan, R. J., and Yusraini, E., 2017. "Pengaruh perbandingan nenas dengan bit dan konsentrasi gum arab terhadap mutu fruit leather nenas." *Jurnal Rekayasa Pangan Dan Pertanian*, vol. 5, pp. 267–274.

[24] Fauzi, M., Diniyah, N., Rusdianto, A. S., and Kuliahsari, E., 2017. "Penggunaan vitamin c dan suhu pengeringan pada pembuatan chip (*irisan kering*) labu kuning la3 (*cucurbita moschata*)." *Jurnal Penelitian Pascapanen Pertanian*, vol. 14, pp. 108–115.

[25] Udomkasemsab, A., Ngamlerst, C., Adisakwattana, P., and Aroonnual, A., 2018. "Maoberry (*Antidesma bunius*) ameliorates oxidative stress and inflammation in cardiac tissues of rats fed a high-fat diet." pp. 1–11.

[26] Suriati, L., Utama, I. M. S., Harsojuwono, B. A., Gunam, I. B. W., Adnyana, I. M., and Fudholi, A., 2021. "Nano-ecogel to maintain the physicochemical characteristics of fresh-cut mangosteen." *AIMS Agriculture and FoodQ*, vol. 6, pp. 988–999. Available: https://doi.org/10.3934/agrfood.2021059

[27] Chaturvedi, S., Khartad, A., and Chakraborty, S., 2021. "The potential of non-dairy synbiotic instant beverage powder: Review on a new generation of healthy ready-to-reconstitute drinks." *Food Bioscience*, vol. 42, p. 101195. Available: https://doi.org/10.1016/j.fbio.2021.101195

[28] Zaidiyah, Malini, C. P., and Abubakar, Y., 2020. "Jurnal Teknologi dan Industri Pertanian Indonesia." *Jurusan Teknologi Hasil Pertanian*, vol. 12, pp. 10–16.

[29] Suriati, L., 2023. "Evaluation of the quality of fresh-cut mango, mangosteen, and rambutan under cold storage." *Journal of Agriculture and Crops*, vol. 9, pp. 62–69. Available: https://doi.org/10.32861/jac.91.62.69

[30] Galus, S., Mikus, M., Ciurzy´nska, A., Ciurzy´nska, C., Domian, E., Kowalska, J., Marzec, A., and Kowalska, H., 2021. "The effect of whey protein-based edible coatings incorporated with lemon and lemongrass essential oils on the quality attributes of fresh-cut pears during storage." Available: https://doi.org/10.3390/coatings11070745

[31] Widiantoko, R. K. and Yunianta, 2014. "Pembuatan es krim tempe - jahe (kajian proporsi bahan dan penstabil terhadap sifat fisik , kimia dan organoleptik) the making of ice cream from tempe and ginger study of raw materials proportion and stabilizers proportions on the physical , chemical a." *Jurnal Pangan Dan Agroindustri*, vol. 2, pp. 54–66.