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**Research Article**

# Analyzing Vitamin C Levels in *Leersia hexandra* Extract through Solvent Variations

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**Abstract**
Various food sources and herbal plants are rich in Vitamin C, a crucial antioxidant. One such plant is Banto grass, which belongs to the Poaceae family and is commonly used as an herbal drink in many communities. It contains active compounds known for their healing and disease-prevention properties. This study aimed to evaluate the levels of vitamin C in Banto grass extract using different solvents. The research followed a descriptive approach and used UV-Vis Spectrophotometry as the analytical method. The findings showed that the vitamin C content varied significantly in Banto grass extracts prepared with distilled water, ethanol, and methanol solvents. The extract prepared with methanol had the highest vitamin C content of 4,030 ppm, which was more than the eco-enzyme water extract that contained 4,030 ppm of vitamin C. However, the extracts prepared with distilled water and ethanol solvents had lower vitamin C levels of 2,507 ppm and 3,687 ppm, respectively. This research highlights the potential of Banto grass as a rich source of vitamin C, which is essential for collagen formation, wound healing, and antioxidant activity, leading to faster wound healing and optimal tissue repair.
**Keywords:** *Sorus Form; Sorus Location; Pterydophyta; Sporangium.*

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## Introduction

Antioxidants, such as vitamin C, are compounds capable of mitigating the adverse effects of oxidation on living cells. They achieve this by donating electrons to oxidative compounds, thereby inhibiting their activity and capturing free radicals. These actions effectively curtail oxidative stress reactions, a known precursor to various diseases in both plants and animals [1]. The potency of antioxidants lies in their ability to neutralize free radicals through the provision of electron pairs, taming their wild reactivity [2]. Vitamin C, an essential organic compound found in small amounts in food but required in significant quantities for normal metabolic functions [3], stands out as a well-known antioxidant. Its distinctive trait is the capacity to combat extracellular free radicals, especially those susceptible to oxidation from heat, light, and metals. Notably, banto grass serves as one natural source of these invaluable antioxidants [4].

Banto grass is a weed plant that can easily grow anywhere. Banto grass has secondary metabolite compounds that function to protect the plant from environmental threats such as insects, bacteria, fungi and other types of pathogens. Secondary metabolites are chemical compounds that generally have bioactivity capabilities and function to defend themselves from unfavorable environments such as temperature, climate, and pest and disease disturbances [5]. Banto grass is traditionally made into a drink called "aia banto". The community believes in the benefits of "aia

banto" to eliminate toxins in the body, asthma, and shortness of breath [6]. To obtain the content of secondary metabolite compounds found in bato grass can use the extraction method[7].

Extraction is a process of separating one or several ingredients from a solid or liquid using a solvent [8]. The selection of the solvent used in the extraction must pay attention to the nature of the content to be isolated, for example polarity, because basically a compound will dissolve easily in a solvent of the same polarity. In principle, polar compounds will dissolve in polar compounds and non-polar compounds can dissolve in non-polar solvents [9]. Numerous studies have explored the antioxidant properties of banto grass extract, but there is a notable absence of research investigating the variation in vitamin C levels within banto grass extract when employing different solvents. Hence, this study aims to fill this research gap by examining the vitamin C content of banto grass extract under various solvent conditions.

## Materials and methods

*Materials*

The tools to be used in this study were 100 mL volumetric flasks, spectrophotometer (*Thermo Scientific*), Rotary Vacuum Evaporator (*Thermo Scientific Genesys* 840-208100), cuvettes, funnels, analytical balance, measuring cups, and aluminum foil. While the materials to be used in this study were ascorbic acid, distilled water, banto grass.

*Methods*

1. *Sample Preparation*

   Banto grass is obtained from three different ecological zones in the province of West Sumatra based on the altitude where it grows. The three elevations are the Lintau highlands, the Lubuk Minturun lowlands, and the Pariaman coast. The banto grass samples will be used for the extraction and analysis of its phytochemicals and antioxidants in the biology laboratory. Clean, fresh banto grass is cut into small pieces and then air-dried for 2 days. Then the sample was made into powder using a blender and sieved through a 20 mesh size sieve.

2. *Extraction*

   50g of powder was taken for maceration extraction using 3 solvents that have different polarity levels, namely methanol p.a, ethanol p.a, and distilled water. The 50g extract was soaked in 500mL of each solvent for 3 days. After that it was filtered to separate the filtrate and dregs, then repeated with the same treatment once using the same solvent. The extract obtained was then evaporated using a rotary evaporator to obtain a concentrated extract in each solvent.

3. *Making a 100 ppm ascorbic acid stock solution*

   Ascorbic acid as much as 10 mg was weighed and dissolved with distilled water in a 100 ml volumetric flask and adjusted to the mark, shaken until homogeneous to obtain a solution of 100 ppm ascorbic acid.

4. *Determination of the maximum wavelength*

   Pipette 1 mL of ascorbic acid mother liquor 100 ppm, then put it into a 10 ml volumetric flask (10 ppm concentration). Distilled water was added until the mark and homogeneous. Then the maximum absorption was measured in the wavelength range of 200-300 nm at 10 intervals using a blank of distilled water.

5. *Standard curve preparation*

   Pipette 100 ppm of ascorbic acid stock solution into a 10 mL volumetric flask with a volume of 400 µl, 600 µl, 800 µl, 1 ml and 2 ml (4, 6, 8, 10 and 12 ppm respectively). Then each solution was added with distilled water until the boundary mark was then homogenized and the absorbance was measured at the maximum wavelength obtained.

6. *Determination of sample content using UV-Vis spectrophotometry method*

Each extract was weighed 100 mg and put into a 100 mL volumetric flask. Then the sample was added with distilled water as a solvent up to the mark. Measurement of vitamin C levels in grass extracts using the UV-Vis spectrophotometry method was carried out using distilled water as a blank and ascorbic acid as a standard solution.

## Results and Discussion

### *Results*

The maximum wavelength is the wavelength at which a substance provides the highest absorption and has the maximum sensitivity. Maximum wavelength was determined by measuring the absorbance value of ascorbic acid solution in the wavelength range of 200 - 300 nm. The maximum wavelength measurement results of ascorbic acid are shown in Table 1.

**Table 1. Maximum wavelength of ascorbic acid**

| Wavelength (nm) | Absorbent |
|---|---|
| 200 | 0,247 |
| 210 | 0,185 |
| 220 | 0,164 |
| 230 | 0,217 |
| 240 | 0,326 |
| 250 | 0,403 |
| **260** | **0,436** |
| 270 | 0,369 |
| 280 | 0,216 |
| 290 | 0,080 |
| 300 | 0,022 |

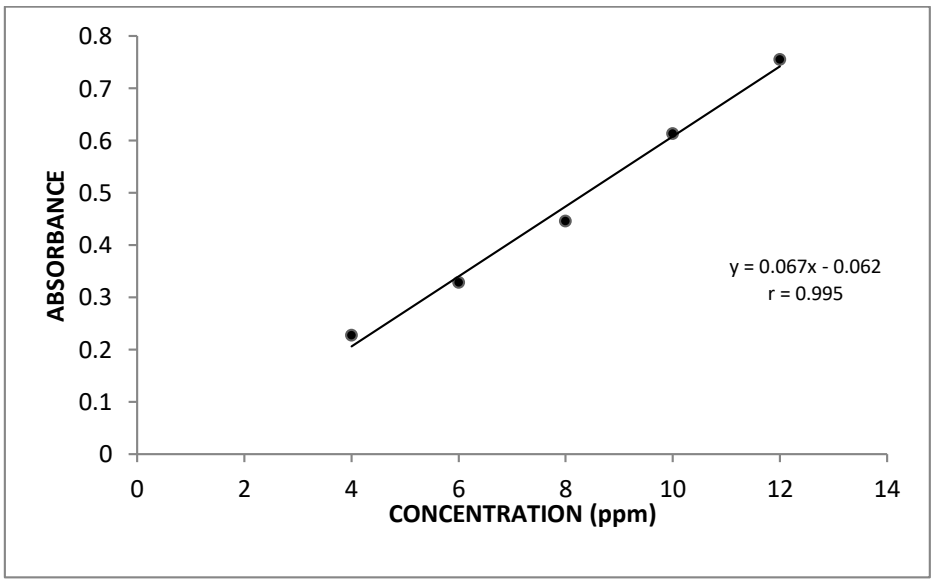


**Figure 1**. Standard curve of ascorbic acid solution.

The highest absorbance value was obtained at a wavelength of 260 nm with an absorbance value of 0.403. Where the wavelength of 260 nm can absorb the maximum absorbance of ascorbic acid. After obtaining the maximum wavelength, the standard curve is determined by measuring the absorbance of a standard solution of ascorbic acid in various concentrations using the maximum

wavelength obtained. The standard curve was determined by measuring the absorbance of series standard solutions at concentrations of 4, 6, 8, 10, and 12 ppm. The measurement results can be seen in Figure 1

The results of linearity measurements show that there is a linear relationship between concentration and absorbance. From the calculation results, the regression equation is y = 0.067x + 0.062 with a correlation coefficient of r = 0.995. In a good analysis method, it is expected that the correlation coefficient value is close to 1.

Banto grass extract sample solution was dissolved in distilled water because ascorbic acid is polar so it dissolves in water. Then the resulting filtrate was measured using a UV-Vis spectrophotometer. The results of measuring the levels of vitamin C in banto grass extract using different solvents, UV-Vis spectrophotometry can be seen in Figure 2.

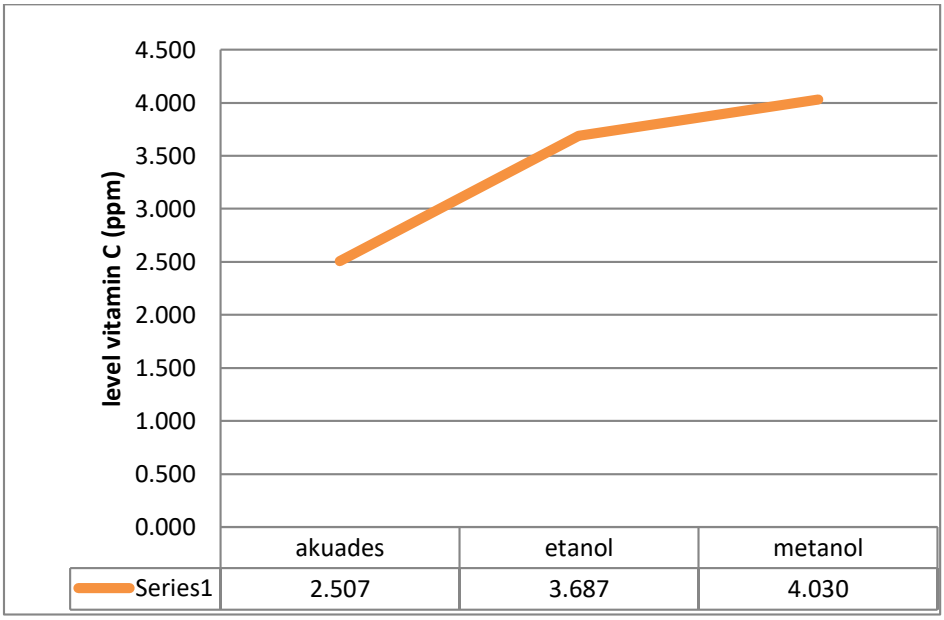


**Figure 2**. Comparison of vitamin C levels of banto grass extract using different solvents.

There are differences in levels of vitamin C in each banto grass extract. In banto grass extract using different solvents, the highest vitamin C content was found in banto grass extract using methanol solvent of 4.030 ppm. While the lowest levels of vitamin C were found in banto grass extract using aquadest solvent of 2.507 ppm.

***Discussion***

In this study, it was seen that there were differences in the levels of vitamin C in each banto grass extract, both in the grass extract using distilled water, ethanol and methanol as solvents. This is because the evaporation process can affect the levels of Vitamin C in ecoenzymes. This evaporation process will produce a concentrated liquid solution with a higher concentration. The supernatant of the ecoenzyme is concentrated for solvent evaporation to obtain a concentrated extract. The solvent evaporation process was carried out using a rotary vacuum evaporator. According to Herbig [10], in a dry state, vitamin C is quite stable, but in a soluble state, vitamin C is easily damaged when in contact with air, especially when exposed to heat. In addition, also stated that vitamin C is also easily degraded by temperature and ambient light so that vitamin C levels are reduced. The process of damage or decrease in vitamin C is called oxidation [11].

Another factor that causes differences in vitamin C levels in banto grass extract is the type of solvent used. The type of solvent will affect the antioxidant compounds present in the sample. The selection of the solvent used in the extraction must pay attention to the nature of the content to be isolated, for example polarity, because basically a compound will dissolve easily in a solvent of

the same polarity. In principle, polar compounds will dissolve in polar compounds and non-polar compounds can dissolve in non-polar solvents [6].

Another factor that can affect plant content is the environment. This was proven in the research of Adem [11], regarding the influence of the height of the plant location on the level of flavonoids and the antioxidant power of kirinyuh leaves. In his research it is known that the altitude of the region can affect the total flavonoids in the plant. Total flavonoids and antioxidant power will increase as the altitude increases. Climate factors around plants can affect the content found in plants including air temperature, sunlight, air humidity and wind as well as soil conditions are very influential on the plant growth process to the variation of secondary metabolites contained [12].

High antioxidant activity can accelerate wound healing because it can stimulate the production of endogenous antioxidants at the wound site and provide a conducive environment for wound healing. According to Hasanah [13], vitamin C is a water-soluble vitamin, which has an important role in repairing body tissues and the body's metabolic processes through oxidation and reduction reactions. Vitamin C also acts as an antioxidant, accelerates wound healing, and forms collagen. Pramono [14], stated that collagen is a key component in the wound healing phase. Collagen fibers are formed by fibroblasts, which originate from the bonds of hydroxyproline and hydroxylysine. The two bonds formed from the hydroxylation process that play a role in this process are the enzymes proline and lysyl hydroxylase, and as cofactors for these enzymes are vitamin C, also stated that vitamin C plays a role in the formation and maintenance of collagen during wound healing and may prevent bleeding from the vascular components of the connective tissue. Vitamin C can also be used to improve delayed wound healing due to radiation [15].

## Conclusions

Analysis of vitamin C content in banto grass extract using different solvents with UV-Vis spectrophotometric method, it is known that banto grass extract with methanol solvent has higher vitamin C content compared to ecoenzyme water extract. The ecoenzyme water extract has a vitamin C content of 4,030 ppm. Meanwhile, banto grass extracts using distilled water and ethanol solvents have vitamin C levels of 2,507 ppm and 3,687 ppm.

## References

[1] Neldawati, Gusnedi, and Ratnawulan, “Analisis Nilai Absorbansi dalam Penentuan Kadar Flavonoid untuk Berbagai Jenis Daun Tanaman Obat,” vol. 72, no. 2, 2013, doi: http://dx.doi.org/10.24036/756171074.

[2] B. Lawal, O. K. Shittu, F. I. Oibiokpa, E. B. Berinyuy, and H. Mohammed, “African natural products with potential antioxidants and hepatoprotectives properties: a review,” *Clin. Phytoscience*, vol. 2, no. 1, p. 23, Jan. 2017, doi: 10.1186/s40816-016-0037-0.

[3] M. Sulaiman, “An Overview of Natural Plant Antioxidants: Analysis and Evaluation,” *Adv. Biochem.*, vol. 1, no. 4, p. 64, 2013, doi: 10.11648/j.ab.20130104.12.

[4] R. U. Hamzah, A. A. Jigam, H. A. Makun, and E. C. Egwim, “Antioxidant Properties of Selected African Vegetables, Fruits and Mushrooms: A Review,” in *Mycotoxin and Food Safety in Developing Countries*, H. Makun, Ed., InTech, 2013. doi: 10.5772/52771.

[5] R. Sari and S. Suhartati, “Tumbuhan Porang: Prospek Budidaya sebagai Salah Satu Sistem Agroforestry,” *Bul. Eboni*, vol. 12, no. 2, pp. 97–110, 2015, doi: https://dx.doi.org/10.20886/buleboni.5061.

[6] P. Mahendra and S. Bisht, “Ferula asafoetida : Traditional uses and pharmacological activity,” *Pharmacogn. Rev.*, vol. 6, no. 12, p. 141, 2012, doi: 10.4103/0973-7847.99948.

[7] M. Kujawska, “Yerba Mate (Ilex paraguariensis) Beverage: Nutraceutical Ingredient or Conveyor for the Intake of Medicinal Plants? Evidence from Paraguayan Folk Medicine,” *Evid. Based Complement. Alternat. Med.*, vol. 2018, pp. 1–17, 2018, doi: 10.1155/2018/6849317.

[8] C. F. Poole, "Solvent Selection for Liquid-Phase Extraction," in *Liquid-Phase Extraction*, Elsevier, 2020, pp. 45–89. doi: 10.1016/B978-0-12-816911-7.00002-5.

[9] T. Lefebvre, E. Destandau, and E. Lesellier, "Selective extraction of bioactive compounds from plants using recent extraction techniques: A review," *J. Chromatogr. A*, vol. 1635, p. 461770, Jan. 2021, doi: 10.1016/j.chroma.2020.461770.

[10] A.-L. Herbig, J.-F. Maingonnat, and C. M. G. C. Renard, "Oxygen availability in model solutions and purées during heat treatment and the impact on vitamin C degradation," *LWT - Food Sci. Technol.*, vol. 85, pp. 493–499, Nov. 2017, doi: 10.1016/j.lwt.2016.09.033.

[11] S. M. Adem, S. H. Leung, L. M. Sharpe Elles, and L. A. Shaver, "A Laboratory Experiment for Rapid Determination of the Stability of Vitamin C," *J. Chem. Educ.*, vol. 93, no. 10, pp. 1766–1769, Oct. 2016, doi: 10.1021/acs.jchemed.6b00344.

[12] S. Yang *et al.*, "Characterization and Bioavailability of Vitamin C Nanoliposomes Prepared by Film Evaporation-Dynamic High Pressure Microfluidization," *J. Dispers. Sci. Technol.*, vol. 33, no. 11, pp. 1608–1614, Oct. 2012, doi: 10.1080/01932691.2011.629511.

[13] U. Hasanah, "Penentuan Kadar Vitamin C Pada Mangga Kweni Dengan Menggunakan Metode Iodometri," *J. Kel. SEHAT Sejah.*, vol. 16, no. 31, pp. 90–95, Jun. 2018, doi: 10.24114/jkss.v16i31.10176.

[14] W. B. Pramono, E. Leksana, and H. H. Satoto, "Pengaruh Pemberian Ropivakain Infiltrasi Terhadap Tampilan Kolagen Di Sekitar Luka Insisi Pada Tikus Wistar," *JAI J. Anestesiol. Indones.*, vol. 8, no. 1, p. 1, Mar. 2016, doi: 10.14710/jai.v8i1.11859.

[15] H. Arief and M. A. Widodo, "Peranan Stres Oksidatif pada Proses Penyembuhan Luka," *J. Ilm. Kedokt. Wijaya Kusuma*, vol. 5, no. 2, p. 22, Mar. 2018, doi: 10.30742/jikw.v5i2.338.