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## Characteristics of Sambung Nyawa (*Gynura procumbens*) mix with Cinnamon (*Cinnamomum burmannii*) as Functional Drink Instant Powder

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### ABSTRACT

Instant powder drinks are practical, water-soluble beverage products with a long shelf life. This study developed a functional instant powder drink from *sambung nyawa* (*Gynura procumbens*) leaf extract, enriched with cinnamon bark extract to enhance flavor and antioxidant properties. The objective was to evaluate the effect of adding various concentrations of cinnamon bark powder (0%, 15%, 20%, 25%, and 30%) on the physicochemical, microbiological, and sensory characteristics of the final product, and to determine the optimal formulation. A completely randomized design with three replications was used. Data were analyzed using ANOVA and followed by DNMR at a 5% significance level. Results showed that cinnamon addition significantly affected total polyphenols, antioxidant activity (IC<sub>50</sub>), titratable acidity, dissolving time, taste, and aroma, but had no significant effect on moisture content, ash content, water insoluble fraction, total plate count, or color. The best formulation was 30% cinnamon addition, yielding 2.11% moisture; 0.33% ash; 0.99% total acidity; 201.45 mg GAE/g total polyphenols; 78.75 mg/L IC<sub>50</sub>; 33.44 s dissolving time; 0.93% insoluble part; 2.37×10<sup>3</sup> CFU/g total plate count; and favorable sensory scores for color (3.7, liked), taste (3.33, neutral), and aroma (3.67, liked).

#### Contribution to Sustainable Development Goals (SDGs):

**SDG 2:** Zero Hunger

**SDG 8:** Decent Work and Economic Growth

**SDG 12:** Responsible Consumption and Production

## 1. INTRODUCTION

### 1.1. Research Background

Sambung nyawa plants (*Gynura procumbens*) has been known as an herbal plant, but its development into functional food products has not been widely carried out. Based on the results of phytochemical screening of various sambung hidup plant extracts, the water extract of sambung nyawa leaves contains several secondary metabolites such as phenols, tannins, flavonoids, alkaloids, saponins, and steroids [1]. Sambung nyawa plants have many benefits such as keeping blood pressure from rising, controlling blood sugar, lowering cholesterol, preventing

and repairing kidney damage, and reducing inflammation [2]. The leaves are usually consumed raw, boiled and can be used as ingredients in salads, soups and appetizers [3].

Processing innovations are needed in sambung hidup plants to facilitate consumption, extend shelf life, and utilize its content. One of them is by processing it into instant powder functional drinks. Functional drinks are one part of functional food that can be consumed in the form of drinks to meet nutritional needs and provide optimal health effects from the nutrients it contains [4].

Formulation or mixture in functional drinks is the most important part of functional drinks so that the taste produced can be accepted by the public and its benefits for health [5]. Formulations that can be developed from instant powder functional drinks of sambung nyawa leaves can be done by



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adding spices. One of the spices that is quite widely produced in Indonesia because it has a distinctive flavor is cinnamon bark. The addition of cinnamon bark in functional beverage formulations with a combination of other ingredients is known to increase phytochemical compounds, such as alkaloids, saponins, flavonoids, steroids, triterpenoids, and phenolics [6].

### 1.2. Literature Review

Sambung nyawa plants is often found in various regions, especially in Padang City, West Sumatra, because this plant can grow freely in nature. However, many people do not know that this plant has medicinal properties in various diseases. Therefore, this plant is referred to as a life-sustaining plant [7]. The plant contains several secondary metabolites such as phenols, tannins, flavonoids, alkaloids, saponins, and so on [1].

Utilization of sambung nyawa leaves can be done by making instant powder functional drinks. Formulation in functional drinks is the most important part of functional drinks so that the resulting taste can be accepted by the public and its benefits for health [5]. Formulations that can be developed from instant powder functional drinks of sambung hidup leaves can be done by adding spices. One of the spices that is quite widely produced in Indonesia because it has a distinctive flavor is cinnamon bark. The utilization of cinnamon bark in beverage products is still relatively small and not as a raw material, but is used as an additional ingredient in beverage products. The addition of cinnamon bark in functional beverage formulations with a combination of other ingredients is known to increase phytochemical compounds, As in previous studies that combined binahong leaf tea with cinnamon bark with a concentration of 40% reportedly increased phytochemical compounds of alkaloids, saponins, flavonoids, steroids, triterpenoids, and phenolics and the resulting taste is not bitter but there is still a spicy taste from cinnamon, a slightly fragrant aroma typical of cinnamon bark, and the resulting color is slightly brown [6].

### 1.3. Research Objective

The purpose of this study was to determine the effect of the addition of cinnamon bark instant powder on the physicochemical, microbiological, and organoleptic properties of functional beverages of sambung hidup leaf instant powder and to determine the best amount of cinnamon bark instant powder addition that can produce functional beverages of sambung hidup leaf instant powder based on physicochemical, microbiological, and organoleptic properties.

## 2. MATERIALS AND METHODS

This research was conducted in the Laboratory of the Faculty of Agricultural Technology, University of Andalas, Padang City, West Sumatra. Some of the laboratories used by researchers are Techno Park Laboratory; Laboratory of Chemistry, Biochemistry of Agricultural Products and Food Nutrition; Instrumentation Laboratory; Total Quality Control (TQC) Laboratory; and Microbiology and Biotechnology Laboratory of Food and Agricultural Products. This research was conducted from June to August 2024.

The design used in this study was a completely randomized design (CRD) with 5 treatments and 3 repetitions. Data were analyzed using the F test and if significant effect was continued

with Duncan's New Multiple Range Test (DNMRT) at the 5% level. The treatments used in this study are as follows:

- A = No addition of cinnamon bark instant powder
- B = Addition of 15% cinnamon bark instant powder
- C = Addition of 20% cinnamon bark instant powder
- D = Addition of 25% cinnamon bark instant powder
- E = Addition of 30% cinnamon bark instant powder

The implementation of the research was carried out by determining the formulation of product manufacturing, making water extract of sambung nyawa leaf and cinnamon bark water extract, making instant powder of sambung nyawa leaf and cinnamon bark instant powder, and making instant powder functional drinks by combining the two instant powders that have been made.

Observations were made on the raw materials of instant powder of sambung hidup leaf and instant powder of cinnamon bark and the finished product of instant powder functional drink. Observations made on raw materials of instant powder of sambung hidup leaf and instant powder of cinnamon bark are water content, ash content, yield, pH, total polyphenol content, and antioxidant activity (IC<sub>50</sub>). Observations on instant powder functional beverage products are water content, ash content, total acid, total polyphenols, antioxidant activity (IC<sub>50</sub>), dissolving time, insoluble part in water, total plate number, and organoleptic (color, taste, and aroma).

## 3. RESULT AND DISCUSSION

### 3.1. Raw Material Analysis

Observations made on raw materials are water content, ash content, pH value, IC<sub>50</sub>, total polyphenols, and yield. The results of raw material observations can be seen in Table 1.

**Table 1.** Raw Material Analysis Results

| Analysis                     | Raw Materials                    |                             |
|------------------------------|----------------------------------|-----------------------------|
|                              | Instan Powder Leaf Sambung Nyawa | Instan Powder Cinnamon Bark |
| Moisture content (%)         | 2.67                             | 2.45                        |
| Ash content (%)              | 0.56                             | 0.44                        |
| pH                           | 6.01                             | 4.73                        |
| IC <sub>50</sub> (mg/L)      | 139.14                           | 91.97                       |
| Total polyphenols (mg GAE/g) | 104.20                           | 573.19                      |
| Yield (%)                    | 18.47                            | 18.60                       |

Based on Table 3, the water content of instant powder of sambung hidup leaf is higher than that of instant powder of cinnamon bark. The quality requirement for maximum water content of traditional beverage powders is 3% [8]. Instant powder of sambung hidup leaf and instant powder of cinnamon bark have met the standard of water content in the manufacture of traditional beverage powders. Moisture content is the main parameter in determining the quality of dry products such as powdered drinks. Moisture content in powdered beverages is related to the drying temperature during processing, the duration of drying during processing, and the drying method used. In addition, moisture content affects the dissolving speed and shelf life of instant powdered beverages [9]. Comparable to the moisture content, the ash content of the instant powder of sambung hidup leaf is higher

than the instant powder of cinnamon bark. The quality requirement for ash content in traditional beverage powders is 1.5% [8]. This shows that the ash content in the instant powder of sambung hidup leaf and instant powder of cinnamon bark has met the standard of ash content in the manufacture of functional beverage powders. Determination of ash content is done to determine whether or not a processing is good, to determine the type of material used, and as a determinant of the nutritional value parameters of a food [10].

The results of the analysis of the pH value of the instant powder of sambung hidup leaf are higher than the instant powder of cinnamon bark. Cinnamon extract generally has a pH around 4.5 [11]. While the pH of the juice of the sambung hidup leaf is 6.7 [12]. Along with the results of research that has been carried out on testing the pH of instant powder of sambung hidup leaf and instant powder of cinnamon bark obtained is not much different. The pH value of a product depends on the substances contained in it, besides that the concentration of substances can also affect the pH value [13]. Antioxidant activity (IC<sub>50</sub>) in instant powder of sambung hidup leaf is lower than instant powder of cinnamon bark. This states that both instant powders are declared to be able to counteract free radicals with moderate and strong groups. Antioxidant activity has a close relationship, because compounds classified as natural antioxidants from the phenolic compound group such as simple phenolic compounds, flavonoids, and tannins [14]. Total polyphenols in instant powder of sambung hidup leaf are lower than instant powder of cinnamon bark. The difference in chemical components in a plant can be influenced by several factors such as cultivation, place of growth, extraction, and solvent properties [15].

The results of the yield analysis on instant powder of sambung nyawa leaf and instant powder of sweet bark have values that are not much different. The yield value is related to the amount of water evaporated during the drying process through the ratio of the dry weight of the material to the initial weight of the dried material. In addition, the use of maltodextrin and tween 80 causes the total solids to increase so that the yield is greater. This shows that maltodextrin as a filler that can function as a mass enhancer and increase the total solids of the material, so that the yield obtained is large [13].

### 3.2. Chemical Analysis

Chemical analysis carried out on functional drinks of sambung nyawa leaf instant powder with the addition of cinnamon bark instant powder, namely water content, ash content, total acid, total polyphenols, antioxidant activity (IC<sub>50</sub>). The analysis results can be seen in Table 2.

**Table 2.** Chemical Analysis Results of Instant Powder Functional Drinks

| Addition of Cinnamon Bark Instant Powder | Moisture Content (%) | Ash Content (%) | Total Acid (%) | Total polyphenols (mg GAE/g) | IC <sub>50</sub> (mg/L) |
|------------------------------------------|----------------------|-----------------|----------------|------------------------------|-------------------------|
| A (0%)                                   | 2.56                 | 0.67            | 0.68           | 102.17                       | 149.31                  |
| B (15%)                                  | 2.55                 | 0.56            | 0.80           | 122.90                       | 134.04                  |
| C (20%)                                  | 2.45                 | 0.44            | 0.86           | 163.77                       | 117.30                  |
| D (25%)                                  | 2.22                 | 0.44            | 0.93           | 191.45                       | 92.16                   |
| E (30%)                                  | 2.11                 | 0.33            | 0.99           | 201.45                       | 78.75                   |
| CV (%)                                   | 2.99                 | 6.22            | 2.26           | 0.72                         | 0.80                    |

Based on Table 2, it shows that the higher the addition of cinnamon bark instant powder, the lower the water content produced, so that the water content obtained has met the maximum SNI quality requirements of 3% [8]. This happens because the water content of cinnamon bark instant powder is lower than the water content of sambung hidup leaf instant powder, causing the water content to also decrease in the resulting product. Comparable to the value of water content, the higher the addition of cinnamon bark instant powder to the functional drink of instant powder of sambung hidup leaf produces a slightly lower ash content, so that the ash content obtained is in accordance with SNI, with the quality requirements for ash content in traditional beverage powders of 1.5% [8]. Ash content is influenced by the mineral content of food ingredients, where in sambung hidup leaves there are minerals such as Na and K in small amounts [16]. While in cinnamon bark there are minerals such as Ca, Fe, Mg, and Na [17]. Maltodextrin does not contain mineral ingredients, so it will produce a lower total solid mineral content of the product so that the ash content of instant powder functional drinks of sambung hidup leaf with the addition of cinnamon bark instant powder is also low [18].

Based on Table 2, the higher addition of cinnamon bark instant powder resulted in higher total titratable acid. The total acid value is influenced by organic acids contained in plants [19]. Cinnamon bark contains organic acids such as cinnamic acid, caffeic acid, ferulic acid, and ascorbic acid [4] which can cause an increase in total acid. Cinnamic acid is the main antioxidant contributing compound in cinnamon bark as an organic acid [20]. Grapevine also contains organic acids such as chlorogenic acid, caffeic acid, vanillic acid, para coumaric acid, and para hydroxybenzoic acid [21]. In addition, the total acid value has a relationship with the pH value, where the higher the total acid, the lower the pH value, and vice versa [22].

The results of total polyphenol analysis have a close relationship. Based on the total polyphenols obtained, it shows that the higher the addition of cinnamon bark instant powder, the higher the total polyphenols. However, the higher the total polyphenols obtained, the lower the IC<sub>50</sub> value. A compound is declared as a very strong antioxidant if IC<sub>50</sub> < 50 mg/L, strong if IC<sub>50</sub> 50-100 mg/L, moderate if IC<sub>50</sub> 100-150 mg/L, and weak if IC<sub>50</sub> 151-200 mg/L [23]. Then the stronger the antioxidant activity in counteracting free radicals contained in instant powder functional beverages. The increased antioxidant activity (IC<sub>50</sub>) in instant powder functional beverages is due to the content of phenolic group compounds such as flavonoids (quinine), caffeic acid, ferulic acid, tocopherol, catechol, pyrogallol, p-hydroxybenzoic acid, p-coumarin acid, ascorbic acid, and vanillin derived from cinnamon bark [24]. While cinnamic acid is the main antioxidant contributing compound in cinnamon bark [20]. In addition, the content of bioactive compounds found in sambung hidup leaves such as flavonoids, terpenoids, tannins, and saponins [1]. Antioxidant activity has a close relationship with total polyphenol content, where the higher the total polyphenols, the greater the antioxidant activity [15]. Comparable to the results of previous research on Moringa leaf herbal tea and cinnamon bark, the results of total polyphenols ranged from 6.43 mg GAE/g to 7.30 mg GAE/g, where as the concentration of cinnamon bark increases, the total polyphenols produced also increases [25]. In accordance with the results of total polyphenols in functional drinks of instant powder of sambung hidup leaf with the addition of cinnamon bark instant

powder, where the higher the addition of cinnamon bark instant powder, the higher the total polyphenols produced.

### 3.3. Physics Analysis

Physical analysis carried out on functional drinks of sambung nyawa leaf instant powder with the addition of cinnamon bark instant powder, namely dissolving time and insoluble part in water. The analysis results can be seen in Table 3.

**Table 3.** Physics Analysis Results of Instant Powder Functional Drinks

| Addition of Cinnamon Bark Instant Powder | Dissolving Time (seconds) | Part Insoluble in Water (%) |
|------------------------------------------|---------------------------|-----------------------------|
| A (0%)                                   | 54.19                     | 0.83                        |
| B (15%)                                  | 45.14                     | 0.83                        |
| C (20%)                                  | 43.21                     | 0.83                        |
| D (25%)                                  | 37.62                     | 0.93                        |
| E (30%)                                  | 33.44                     | 0.93                        |
| CV(%)                                    | 0.81                      | 3.02                        |

The highest average value of dissolving time is in treatment A with a time of 54.19, while the lowest average value of dissolving time is in treatment E with a time of 33.44 required by instant powder functional drinks. The higher the addition of cinnamon bark instant powder results in a faster dissolving time. Dissolving time aims to make it easier for consumers to serve. One of the factors that affect the dissolving time is the moisture content of the material, the higher the moisture content in the instant powder drink, the longer it takes to dissolve [26]. This is in line with the observation of instant powder water content in this study, that fast dissolving time is followed by low water content. The higher percentage of solubility indicates the better quality of the resulting product because the presentation process will become easier [9]. The faster the dissolving time of instant powder, the lower the water insoluble part obtained in the test results. The results of the analysis of the water insoluble part of the instant powder functional drink have met the SNI quality standards in 1995, where the maximum water insoluble part is 1%. The insoluble part in the functional beverage of sambung hidup leaf instant powder with the addition of cinnamon bark instant powder comes from the solids of sambung nya leaf and cinnamon bark that are carried during the filtering process after boiling. The difference in the number of insoluble parts in water is also caused by the components of the ingredients, particle size, and surface area of the particles [27].

### 3.4. Microbiological Analysis

Microbiological analysis conducted on functional beverages of instant powder of sambung nyawa leaves with the addition of cinnamon bark instant powder is the total plate count. The analysis results can be seen in Table 4.

**Table 4.** Total Plate Count Analysis Results of Instant Powder Functional Drinks

| Addition of Cinnamon Bark Instant Powder | Total Plate Count (CFU/g) |
|------------------------------------------|---------------------------|
| A (0%)                                   | $2.97 \times 10^3$        |
| B (15%)                                  | $2.87 \times 10^3$        |
| C (20%)                                  | $2.73 \times 10^3$        |
| D (25%)                                  | $2.70 \times 10^3$        |
| E (30%)                                  | $2.37 \times 10^3$        |

Based on Table 4, the total plate number of instant powder functional drink of sambung nyawa leaf with the addition of cinnamon bark instant powder is lower in the higher treatment. The standard of total plate number in traditional powder drinks according to SNI is a maximum of  $3.0 \times 10^3$  CFU/g, so the total plate number in instant powder drinks obtained has met the quality standards set [8]. The low value of the total plate number (ALT) of the instant powder functional drink of sambung nyawa leaf with the addition of cinnamon bark instant powder means that the handling and processing of the product has implemented a good sanitation system. In addition, sambung hidup leaf extract and cinnamon bark extract are known to be used as antibacterial activity. Essential oil found in cinnamon bark is reported to have strong antibacterial activity in inhibiting cariogenic bacteria [28] such as *B. cereus*, *S. aureus*, and *E. coli* [20], where the compounds that play a role are sinamaldehyde, terpene ether group compounds, and eugenol, but the greatest antibacterial activity is in the sinamaldehyde compound. Furthermore, some active compounds present in sambung nyawa leaf extract and cinnamon bark extract such as alkaloids, flavonoids, and tannins [29].

### 3.5. Organoleptic Test

The organoleptic test conducted in this study is a favorability test to determine whether the product produced can or cannot be accepted by consumers by choosing one preferred product option from several products. This test is carried out using the human senses as the instrument. Organoleptic tests on functional beverage brewed instant powder of sambung hidup leaf with the addition of cinnamon bark instant powder were carried out on 30 panelists with observations including color, taste, and aroma preference tests. The organoleptic test set as an assessment is a score of 1 to 5. Score 1 = very dislike, score 2 = dislike, score 3 = normal, score 4 = like, and score 5 = very like. Organoleptic test results can be seen in Table 5.

**Table 5.** Organoleptic Test Results of Instant Powder Functional Drinks

| Addition of Cinnamon Bark Instant Powder | Color | Taste | Aroma |
|------------------------------------------|-------|-------|-------|
| A (0%)                                   | 3.40  | 2.43  | 2.90  |
| B (15%)                                  | 3.57  | 3.10  | 3.37  |
| C (20%)                                  | 3.63  | 3.23  | 3.47  |
| D (25%)                                  | 3.67  | 3.27  | 3.63  |
| E (30%)                                  | 3.70  | 3.33  | 3.67  |
| CV (%)                                   | 19.95 | 27.82 | 21.08 |

Based on Table 5, the higher the addition of cinnamon bark instant powder, the higher the level of panelist preference for the color, taste, and aroma of the product. This explains that panelists prefer the color of the drink which leads to dark yellow, due to the higher addition of cinnamon bark instant powder to the instant powder functional drink formula produced. The yellow color comes from flavonoid compounds in sambung hidup leaves. Flavonoids have very distinctive properties, namely a sharp odor, most of which are yellow pigments, soluble in water and organic solvents, and easily decompose at high temperatures [30]. Cinnamon bark has a brownish red color due to the presence of sinamaldehyde compounds. Previous research reported that the use of cinnamon powder in the functional formulation of breadfruit leaf tea has no effect on antioxidant activity and

organoleptic, but can increase the color to brownish yellow due to the presence of sinamaldehyde compounds [31]. Meanwhile, the higher the addition of cinnamon bark instant powder, the more minimized the bitter taste produced from the instant powder of sambung hidup leaf. Taste can be influenced by several factors, namely chemical compounds, concentration, temperature, and interactions with other flavor components [32]. The bitter taste in sambung nyawa leaves comes from alkaloids and tannins. Tannin is a phenolic compound that produces a bitter and astringent taste, while alkaloids give a dominant bitter taste [12]. Cinnamon bark has warm, spicy, fragrant, and slightly sweet properties [33]. The distinctive aroma produced by cinnamon bark causes the aroma of sambung nya leaves to be minimized. The aroma produced by sambung hidup leaves is the typical bitter aroma of sambung nya leaves so that additions are needed in order to minimize the aroma. Flavonoids contain 15 carbon atoms in their basic core, which are by two aromatic rings connected by one three carbons which may or may not form a third ring [34]. Meanwhile, cinnamon bark contains essential oil compounds such as cinnamaldehyde and cinnamic acid which are responsible for its distinctive aroma, flavor, and therapeutic properties [35]. Meanwhile, maltodextrin is also able to bind the aroma molecules in instant powder drinks so that it can help maintain aroma stability [18].

#### 4. CONCLUSION

The conclusion obtained from the results of the research that has been done is that the addition of cinnamon bark instant powder to the functional drink of instant powder of sambung hidup leaf obtained the best treatment is treatment E (addition of 30% cinnamon bark instant powder) and gives a significantly different effect at the level ( $\alpha = 5\%$ ) on total acid analysis of 0,99%, total polyphenol analysis of 201,45 mg GAE/g, antioxidant activity ( $IC_{50}$ ) 78,75 mg/L, dissolving time 33,44 seconds, organoleptic taste 3,33 and aroma 3,67. While the effect was not significant on moisture content of 2,11%, ash content of 0,33%, insoluble part in water 0,93%, total plate number  $2,37 \times 10^3$  CFU/g, and color organoleptic 3,7.

#### REFERENCE

- [1] Amin, Md. Z., Afrin, M., Meghla, N. S., Nur, Md. A., Rahman, Md. M., and Unddin, M. J. Assesment of Antibacterial, Antiinflammatory, and Cytotoxic Effects of Different Extracts of *Gynura procumbens* Leaf. *Current Therapeutic Research*, 95:100636. 2021.
- [2] Simarmata, R., Lekatompeppy, S., dan Harmastini, S. Isolasi Mikroba Endofitik dari Tanaman Obat Sambung Nyawa (*Gynura Procumbens*) dan Analisis Potensinya sebagai Antimikroba. *Jurnal Berkala Penelitian Hayati*, 13: 85–90. 2007.
- [3] Kaewseejan, N., Sutthikhum, V., and Siriamornpun, S. Potential of *Gynura procumbens* Leaves as Source of Flavonoid-Enriched Fractions with Enhanced Antioxidant Capacity. *Journal of Functional Food*, 12:120–128. 2014.
- [4] Ilmi, I. N., Filianty F., dan Yarlina, V. P. Sediaan Kayu Manis (*Cinnamomum Sp.*) sebagai Minuman Fungsional Antidiabetes: Kajian Literatur. *Jurnal Kimia Padjajaran*, 1: 31–59. 2022.
- [5] Widyantari, A. A. A. S. S. Formulasi Minuman Fungsional terhadap Aktivitas Antioksidan. *E-Journal Widya KEsehatan*, 2(1): 22–29. 2020.
- [6] Yasir, M., Mailoa, M., dan Picauly, P. 2019. Karakteristik Organoleptik Teh Daun Binahong dengan Penambahan Kayu Manis. *Jurnal Teknologi Pertanian*, 8(2): 53-57.
- [7] Simamora, A. A. dan Hasibuan, A. S. Pemanfaatan Tanaman Daun Sambung Nyawa Terhadap Hipertensi Di Desa Simirik Kecamatan Padangsidempuan Batunadua Kota Padangsidempuan. *Jurnal Pengabdian Masyarakat Aufa*, 3 (1): 46-52. 2021.
- [8] Badan Standardisasi Nasional. SNI 01-4320-1996 Serbuk Minuman Tradisional. Jakarta: Badan Standardisasi Nasional. 1996.
- [9] Yuliaty, S. T. dan Susanto, W. H. Pengaruh Lama Pengeringan dan Konsentrasi Maltodekstrin terhadap Karakteristik Fisik Kimia dan Organoleptik Minuman Instan Daun Mengkudu (*Morinda citrifolia* L.). *Jurnal Pangan dan Agroindustri*, 3(1): 41-52. 2015.
- [10] Burnadi, C. Kualitas Minuman Serbuk Daun Sirsak (*Annona muricata*) dengan Variasi Konsentrasi Maltodekstrin dan Suhu Pemanasan. *Jurnal Universitas Atma Jaya Yogyakarta*, 1-18. 2016.
- [11] Kinanti, A.S. dan Amelia, J.R. Karakteristik Mutu Minuman Fungsional Okra Hijau dengan Penambahan Sukralosa dan Ekstrak Kayu Manis. *Jurnal Teknologi Pangan Kesehatan*, 5(1):16-25. 2023.
- [12] Novelina, Hasbullah, dan Gusra, Z. Karakteristik Fisikokimia Permen Jelly Daun Sambung Nyawa dengan Penambahan Sari Limau Sundai. *Seminar Teknologi Pertanian Indonesia*, 1(1): 313-323. 2023.
- [13] Setyaningrum, D. Y. Optimasi Formula Minuman Fungsional Serbuk Instan Campuran Sari Buah Terong Belanda (*Cyphomandra betacea*) Dan Markisa Ungu (*Passiflora edulis*) Dengan Metode Pengeringan Busa (Foam Mat Drying). *Skripsi. Institut Pertanian Bogor*. 2017.
- [14] Simamora, A. C. Y., Yusasrini, N. L. A., dan Putra, I. N. K. Pengaruh Jenis Pelarut terhadap Aktivitas Antioksidan Ekstrak Daun Tengkulung (*Protium javanicum* Burm. F) Menggunakan Metode Maserasi. *Jurnal Ilmu dan Teknologi Pangan*, 10(4): 681-689. 2021.
- [15] Sukandar, D., Muawanah, A., Amelia, E. R., dan Anggraeni, F. N. Aktivitas Antioksidan dan Mutu Sensori Formulasi Minuman Fungsional Sawo- Kayu Manis. *Jurnal Kimia Valensi*, 4(2): 80-89. 2014.
- [16] Athiya, Sunardi, dan Anwar. Rasio Kandungan Kalium dan Natrium Daun Sambung Nyawa (*Gynura procumbens* (Lour.) Merr.) Berdasarkan Umur dan Cara Pengolahan. *Jurnal Sains dan Terapan Kimia*, 10(2):91-100. 2016.
- [17] Tasia, W. R. N. dan Widyaningsih, T. D. Jurnal Review: Potensi Cincau Hitam (*Mesona palustris* Bl.), Daun Pandan (*Pandanus amaryllifolius*) dan Kayu Manis (*Cinnamomum burmannii*) sebagai Bahan Baku Minuman Herbal Fungsional. *Jurnal Pangan Dan Agroindustri*, 2(4): 128-136. 2014.
- [18] Corie, Z. C., Koesoemawardani, D., Nurainy, F. dan Nawansih, O. Penambahan Maltodekstrin pada Minuman Serbuk Mangga dengan Metode Foam Mat Drying. *Agrohita: Jurnal Agroteknologi Fakultas Pertanian Universitas Muhammadiyah Tapanuli Selatan*, 8(3): 695–708. 2023.
- [19] Destiana, I. D. dan Rahayu, W. E. Karakteristik Kimia dan Sensori Minuman Tinggi Vitamin C dari Sari Kulit Nanas dan Pepaya. *Jurnal Ilmiah Ilmu dan Teknologi Rekayasa*, 4(2): 18-24. 2021.
- [20] Pagune, J., Laboko, A. I., Anto, dan Pou, M. Karakteristik Fisikokimia dan Hedonik terhadap Pembuatan Minuman Herbal Binahong (*Anredera cordifolia*) dengan Penambahan Kulit Kayu Manis. *Jurnal Ilmiah*, 2(2): 21-32. 2023.

- [21] Fadli, M. Y. Benefits Of Sambung Nyawa (*Gynura procumbens*) Substance As Anticancer. *Jurnal Majority*, 4(5): 50–53. 2015.
- [22] Prastujati, A. U., Hilmi, M., dan Khirzin, M. H. 2018. Pengaruh Konsentrasi Starter terhadap Kadar Alkohol, pH, dan Total Asam Titrasi (TAT) Whey Kefir. *Jurnal Ilmu Peternakan Terapan*, 1(2): 63-69. 2018.
- [23] Fortin, G. A., Asnia, K. K. P., Ramadhani, A. S., dan Maherawarti, M. Review: Minuman Fungsional Serbuk Instan Kaya Antioksidan dari Bahan Nabati. *Jurnal Teknologi Industri Pertanian*, 15(4): 993-1000. 2021.
- [24] Gulcin, I., Kaya, R., Goren, A. C., Akincioglu, H., Topal, M., Bingol, Z., Cakmak, K. C., Sarikaya, S. B. O., Durmaz, L., and Alwasel, S. Anticholinergic, Antidiabetic, and Antioxidant Activities of Cinnamon (*Cinnamomum Verum*) Bark Extracts : Polyphenol Contents Analysis by LC-MS/MS. *International Journal of Food Properties*, 22(1): 1511-1526. 2019.
- [25] Filianty, F., Ilmi, I. N., dan Yarlina, V. P. Kajian Proses Penyeduhan Teh Herbal Daun Kelor (*Moringa oleifera*) dan Kayu Manis (*Cinnamomum cassia*) sebagai Minuman Fungsional. *TEKNOTAN*, 16(3): 155. 2022.
- [26] Iswari, K. Pemanfaatan Tomat dan Sirsak sebagai Bahan Dasar Pembuatan Produk Suplemen Kesehatan. *Jurnal Hortikultura*, 25(3): 367-376. 2015.
- [27] Astuti, D. P. Studi Pembuatan Minuman Serbuk Instan dari Sirih Merah (*Piper crocatum*), Cassia Vera (*Cinnamomum burmannii*) dan Stevia (*Stevia rebaudiana*, Bertoni). Skripsi. *Teknologi Hasil Pertanian*, Universitas Andalas. 2018.
- [28] Choi, O., Cho, S. K., Kim, J., Park, C. G., dan Kim, J. In Vitro Antibacterial Activity and Major Bioactive Components of *Cinnamomum verum* Essential Oils Against Cariogenic Bacteria, *Streptococcus mutans* and *Streptococcus sobrinus*. *Asian Pacific Journal Trop Biomed*, 6(4): 308-314. 2016.
- [29] Sapara, T. U., Waworuntu, O., Juliatri. Efektivitas Antibakteri Ekstrak Daun Pacar Ait (*Impatiens balsamina* L.) terhadap Pertumbuhan *Porphyromonas gingivalis*. *Jurnal Ilmiah Farmasi*, 5(4): 10-17. 2016.
- [30] Lekal J.A. dan Watuguly, T. Analisis Kandungan Flavonoid pada Teh Benalu (*Dendropohtoe pentandra* (L.) Miq.). *Jurnal Biopendix*, 3(2):154-158. 2017.
- [31] Nurminabari, I. S., Widianara, T., dan Irana, W. Pengaruh Perbandingan Serbuk Kayu Manis (*Cinnamomum burmannii*) dengan Cengkeh (*Syzygium aromaticum* L.) dan Konsentrasi Gula Stevia (*Stevia rebaudiana* B.) terhadap Karakteristik The Celup Daun Mengkudu (*Morinda citrifolia* L.). *Pasundan Food Technology Journal*, 6(1): 18-22. 2019.
- [32] Putri, R. M. S. dan Amrizal, S. N. Optimasi Formula Minuman Fungsional Serbuk Instan dari Brunok (*Acaudina molpadioides*) dengan Metode Pengeringan Busa (Foam Mat Drying). *Jurnal Akuakultur, Pesisir dan Pulau-Pulau Kecil*, 4(2):73-78. 2020.
- [33] Arisanti, D. dan Mutsyahidan, A. M. A. Karakteristik Sifat Fisikokimia Teh Herbal “Sekam” (Serai Kombinasi Kayu Manis) sebagai Minuman Fungsional. *Jurnal Technopreneur*, 6(2): 62-66. 2018.
- [34] Sinaga, M. S., Siagian, P. D., dan Ariska, R. Pemanfaatan Ekstrak Daun Sambung Nyawa (*Gynura procumbens* [Lour].Merr) sebagai Antioksidan pada Minyak Kelapa Menggunakan Pelarut Metanol. *Jurnal Teknik Kimia USU*, 6(2): 41–47. 2017.
- [35] Yuwanda, A., Adina, A. B., dan Budiastuti, R. F. Kayu Manis (*Cinnamomum burmannii* (Nees dan T. Nees) Blume): Review tentang Botani, Penggunaan Tradisional, Kandungan Senyawa Kimia, dan Farmakologi. *Journal of Pharmacy and Halal Studies*, 1(1): 17–22. 2023.