

Exploring the Potential of *Pluchea Indica* L. Leaves from Muara Gembong, Bekasi, as a Functional Snacks

Andini Putri Riandani¹, Supriyanto², Mimah Mutmainah³, Ricki Chandra Suyahya⁴

^{1, 2, 4} Department of Agricultural Product Technology, Universitas Pelita Bangsa, Indonesia

³ Department of Food Technology, Universitas Koperasi Indonesia, Indonesia

✉ Corresponding Author : Andini Putri Riandani (e-mail: andiniriandani@pelitabangsa.ac.id)

Article Information	ABSTRACT
Article History Received : June 21, 2025 Revised : July 16, 2025 Published : July 26, 2025	Muara Gembong, Indonesia, hosts a rich yet degraded mangrove ecosystem that plays a vital ecological and economic role. One plant species found abundantly in this ecosystem is <i>Pluchea indica</i> L., a mangrove-associated shrub with proven pharmacological properties. This study aimed to explore the nutritional potential and initial consumer acceptance of <i>Pluchea indica</i> L. leaves as a functional food product. Fresh leaves were collected from Pantai Bahagia Village and subjected to proximate and total phenolic content analysis. The results showed that the leaves contain 83.77% moisture, 5.25% protein, 0.52% fat, 6.10% carbohydrate, 2.97% ash, 1.12% crude fiber, and 1,324 mg/kg total phenolic compounds. Compared to other leafy plants such as <i>Moringa oleifera</i> and <i>Sauropus androgynus</i>, <i>Pluchea indica</i> L. leaves offer competitive nutritional and antioxidant value. To assess consumer acceptance, a simple snack product in the form of “peyek” was prepared and evaluated through a 5-point hedonic sensory test. The overall liking scores ranged from 3.25 to 4.5, indicating moderate to high acceptance. These findings suggest that <i>Pluchea indica</i> L. has promising potential as a sustainable, locally sourced functional food, aligning with environmental conservation and community empowerment efforts, particularly in supporting SDG 1 (No Poverty) and SDG 14 (Life Below Water).
Keywords: <i>Pluchea Indica</i> L.; Mangrove; Muara Gembong; Coastal Plants.	

INTRODUCTION

Muara Gembong, a coastal area in Bekasi Regency, West Java, has a fairly extensive and strategic mangrove ecosystem, but has experienced significant degradation in recent decades. Data shows that in the Pantai Bahagia and Pantai Mekar areas, there has been a change in mangrove land cover due to abrasion and land conversion into ponds and settlements. According to Maulani et al., (2021) noted that in the period 2009–2019, there was an addition of 1,017.246 ha and a loss of 275.37 ha of mangrove, indicating significant land change dynamics. It was noted that the mangrove vegetation diversity index in Mekar Beach increased from 0.22 in 2016 to 1.24 in 2019 as a result of rehabilitation and conservation efforts (Rahmasari et al., 2019). The mangrove ecosystem in this area has important ecological functions, such as protecting the coast from abrasion, storing carbon, buffering seawater intrusion, and as a habitat for biodiversity (Martuti et al., 2019). In addition to its ecological function, mangroves also provide high economic value for coastal communities. The estimated economic value of mangroves in Pantai Bahagia Village reaches IDR 15.5 billion per year, including direct benefits such as wood, fishery products, and indirect benefits such as coastal protection.

One type of plant that grows naturally in the mangrove ecosystem and has great potential to be empowered is *Pluchea indica* L., or better known as beluntas. This plant is a shrub from the Asteraceae family that is widely found in coastal areas and ponds (Chan et al., 2022). Various studies, such as Chan et al., (2022) dan Widyawati et al., (2023), showed that *Pluchea indica* L. leaves contain active compounds such as dicaffeoylquinic acid, β -sitosterol, and thiophenes which act as antioxidants, antimicrobials, antidiabetics, anticancer, and anti-inflammatories. This pharmacological potential makes *Pluchea indica* L. a potential alternative raw material for the development of healthy food products, such as functional snacks that are not only delicious but also provide health benefits. Utilization of these leaves in the form of healthy snacks can be one form of innovation based on local resources that have economic value.

Furthermore, the use of *Pluchea indica* L as a healthy snack ingredient also has strong relevance to the sustainable development approach. The development of *Pluchea Indica* L. leaf food products as Non-Timber Forest Products (NTFPs) supports environmental conservation by increasing the economic value of the ecosystem, while encouraging communities to be involved in sustainable natural resource management (Lukman et al., 2025). This approach is in line with the Community-Based Management (CBM) concept which emphasizes community participation in strengthening social and environmental resilience (Wahyudin, 2004). From a socio-economic perspective, this activity is able to create new jobs, increase the entrepreneurial capacity of coastal communities, and expand market access for local food products. Therefore, this research also directly supports the achievement of the Sustainable Development Goals (SDGs), especially SDG 1 (No Poverty) through community economic empowerment and SDG 14 (Marine Ecosystems) through the protection and sustainable use of coastal ecosystems. From the explanation above, it can be concluded that the purpose of this study is to explore the potential of *Pluchea Indica* L. leaves by determining the nutritional content of fresh *Pluchea Indica* L. leaves and to analyze the panelist's acceptance of snack products based on *Pluchea Indica* L. leaves as an initial study for further product development.

RESEARCH METHODS

Samples Collection and Preparation

About 120 g of fresh *Pluchea Indica* L. leaves were collected from Desa Pantai Bahagia, Muara Gembong, West Java Indonesia. The leaves were thoroughly cleaned with distilled water prior to extraction. The cleaning process is important to get rid of unwanted substances and separated their petioles.

Extraction

Fresh leaves were first prepared and ground into a fine powder using a blender. Approximately 0.2 grams of the powdered sample were placed into a conical flask, followed by the addition of 10 mL of methanol. The mixture was then incubated in a water bath at 40°C for 3 hours. After extraction, the solution was filtered using filter paper, and the resulting extract was stored in a sealed bottle at 4°C for further analysis.

Proximate analysis

The proximate analysis (Moisture, protein, fat, ash, crude fiber, and carbohydrate) was performed using a modified version of the SNI 01-2891-1992 method and was conducted in duplicate. Key nutritional components were analyzed in fresh *Pluchea indica* L. leaf samples and all measurements were carried out in duplicate. Moisture content (on a wet basis) was measured by oven-drying (Faithful LO 30, China) finely ground fresh leaves at 105 °C for 3 hours or until a constant weight (in mg) was reached. Protein content analysed through Kjeldahl method. Fat content was assessed through continuous Soxhlet extraction using hexane as the organic solvent. Ash content was determined by incinerating the leaf samples in a furnace at 550 °C, while crude fiber was measured using a sequential heating process involving acid and alkaline digestion.

Carbohydrate content was calculated theoretically using by different method, based on Equation (1):

$$\text{Carbohydrate content (\%)} = 100 - (\text{protein} + \text{fat} + \text{moisture} + \text{ash} + \text{crude fiber})$$

Total Phenolic Content Analysis

The total phenolic content of the extracts was determined using the Folin–Ciocalteu method (Anggraeni Saputri et al., 2024; Riandani et al., 2022). A volume of 0.5 mL of each sample was transferred into a 10 mL volumetric flask containing 0.5 mL of Folin–Ciocalteu reagent. Subsequently, 5 mL of distilled water and 1.5 mL of a 20% (w/v) sodium bicarbonate solution were added, and the final volume was adjusted with distilled water. During the reaction, phenolic compounds reduce the phosphomolybdic and phosphotungstic acids in the reagent to form blue-colored molybdenum and tungsten oxides. After an incubation period of two hours, the absorbance of the blue complex was recorded at 765 nm against a reagent blank using a UV-VIS spectrophotometer (Thermo scientific, genesys, USA). Phenolic content was quantified using a standard calibration curve prepared from gallic acid (100–500 ppm), and results were expressed as milligrams of gallic acid equivalents (mg GAE) per 100 grams of sample $\pm$ standard deviation. All measurements were carried out in duplicate.

Pluchea Indica Snack preparation

Snacks made from *pluchea indica* L. leaves are made simply to find out the natural taste of the leaves. Snacks are made traditionally, namely made into rempeyek. Fresh *Pluchea Indica* L. leaves are coated with a thin flour mixture and then fried for 2-3 minutes. The flour mixture consists of rice flour, tapioca flour, coconut milk, eggs, flavoring, coriander, shallots, garlic, lime leaves, and salt.

Sensory Analysis

sensory analysis was conducted to measure the panelists' acceptance of the taste of *Pluchea indica* L. leaves. The analysis method used was the hedonic test. The 20 semi-trained panelists will taste the product and respond to the characteristics of the *Pluchea Indica* L. peyek. The attributes used include appearance, taste, smell, texture, and preference based then scored by Likert scale of 1-5. This sensory analysis is an initial analysis to determine whether *Pluchea indica* L. leaves can be processed into snacks or other products.

Statistical analysis

XLSTAT software version 2025.1.1 (Addinsoft, Paris, France) was employed for statistical analysis.

RESULTS AND DISCUSSION

Proximate and Total Phenolic Content

Most plants, both leaves and flowers or other parts, have the potential to be processed into food products that have health benefits. The content of certain nutrients synthesized during primary metabolism such as carbohydrates and fats plays an important role in the production of quality phytochemical bioactive materials and functions at the secondary metabolic level. Therefore, in order to determine the main nutrient content of plants, proximate content analysis needs to be carried out (Zubairi & Jaies, 2014). The results of the proximate analysis of *Pluchea Indica* L. segara leaves can be seen in table 1.

Table 1. Proximate Analysis Result of fresh *Pluchea indica* Leaves and comparasion with other leaves

No.	Content Level (% w.w)	Pluchea Indica L.
1	Lipid	0.52
2	Protein	5.25
3	Carbohydrate	6.10
4	Ash	2.97
5	Crude Fiber	1.12
6	Moisture	83.77
8	Total Phenolic (mg/kg)	1324

The moisture content of *Pluchea indica* L. leaves is 83.77% s in line with previous studies which stated that the water content of fresh beluntas leaves is 84.69% (Donowarti & Dayang Diah, 2020). This content is relatively high and comparable to the water content of fresh *Moringa* leaves of 74.2%. (Elvira et al., 2024) and katuk leaves are 72.2% (Suhendra et al., 2024). High Moisture content is commonly found in fresh leaves, but can accelerate damage if not dried or processed immediately. So, the handling of fresh *Pluchea Indica* L. leaves must be precise in order to avoid damage to the material during the storage process. Processing to reduce the water content in the leaves can be an option because it will extend the shelf life.

The protein content of *Pluchea indica* leaves of 5.25% is relatively lower than that of *Moringa* leaves of 11.4% (Rai Saputri & Indah Permatasari, 2019) and katuk leaves of 6.4 grams/100 g or equivalent to 6.4%. However, this value still provides a contribution of vegetable protein that is beneficial in the diet, especially as a complement to the main protein source. Processing to reduce the water content in the leaves, such as making tea or powder, not only increases the use of fresh beluntas/*Pluchea indica* L. leaves but also increases the protein content that can be consumed (Rohana et al., 2022).

The ash content in *Pluchea indica* L. leaves of 2.97% indicates a fairly high mineral content. This value is slightly higher than cassava leaves (2.6%) and comparable to moringa leaves (2.9%) (Bilate Daemo et al., 2022), hows potential as a source of minerals such as calcium, iron, and magnesium.

The total phenolic compound content in *Pluchea indica* L. leaves of 1,324 mg/kg indicates the potential for antioxidant activity. In comparison, *Moringa* leaves contain phenolic compounds between 1,000–1,800 mg GAE/kg depending on the extraction method and growing location (Sreelatha & Padma, 2009). This shows that *Pluchea indica* L. is could be included in the group of plants with high antioxidants and has good health benefits. In addition to being a source of antioxidants (Widyawati et al., 2018), there are other functions such as flavonoids and vitamin C which are good for people with type II diabetes (Wulandari, TA, Widyawati, PS, Budianta, 2017), have antidiarrheal (Nurhalimah et al., 2015)and antibacterial effects (Hafsari et al., 2015).

Sensory Analysis

Sensory test was conducted to determine the initial acceptance of processed *Pluchea Indica* L. Leaves products by panelists before developing other products. The simple sensory test conducted was a hedonic test to determine the value of panelist acceptance of processed *Pluchea Indica* L. leaves products in the form of "peyek". The attributes used were preferences for taste, aroma, texture, and appearance with 5-point scales (tabel 2.)

Table 2. 5 point Hedonic Scale

Score	Scale
1	Dislike
2	Dislike Slightly
3	Neither like or dislike
4	Like Slightly
5	Like

The results of consumer preferences are shown in Figure 2. The overall liking scores of *Peyek Pluchea Indica L.* ranged from 3.25 to 4.5 on a 5-point hedonic scale, ranging from 'Neither like nor dislike' to 'somewhat like'. In general, a score higher than 4 indicates that consumers like the product (Su et al., 2022).

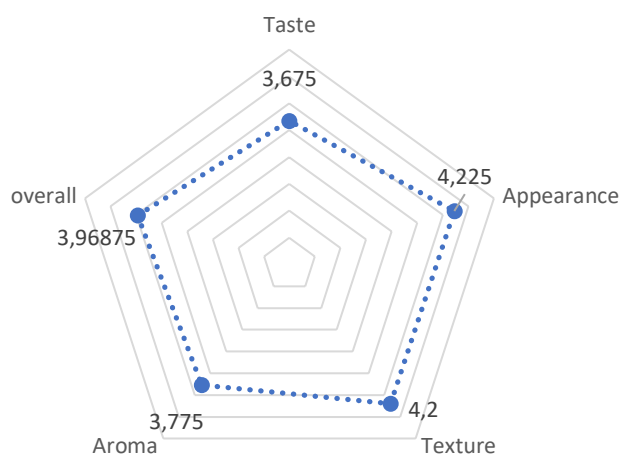


Figure 2. Spider web results of hedonic test analysis of *Pluchea Indica L.* peyek.

According to Figure 2, it can be concluded that overall the panelists can accept fresh *Pluchea Indica L.* leaf crackers, but it is still necessary to improve the formulation to increase the acceptance of the panelists.

Sensory results indicated that *Pluchea indica L.* crackers were generally acceptable, with scores ranging from neutral to slightly pleasant. One of the main factors influencing flavor, particularly bitter or astringent flavors, was the high total phenolic compound content (1,324 mg/kg). Phenolic compounds, including flavonoids, often have a bitter or astringent flavor (Drewnowski & Gomez-carneros, 2000). High phenolic content, on the one hand, provides health benefits as potent antioxidants, associated with antidiabetic, antidiarrheal, and antibacterial potential (Widyawati et al., 2018). However, on the other hand, these compounds may contribute to a flavor profile that is less desirable for some panelists, especially those unfamiliar with the bitter taste of the leaves. A lower flavor score may indicate that the bitter or herbal flavor of *Pluchea indica L.* leaves needs to be balanced with other seasonings, such as salt, garlic, or stronger spices to mask or complement the flavor. The frying process may also slightly modify the phenolic compounds, potentially reducing or altering the intensity of the bitter flavor (Nieto et al., 2010).

CONCLUSION

The proximate and total phenolic content analysis of fresh *Pluchea indica L.* leaves demonstrates that this plant has considerable potential as a functional food ingredient. With a high moisture content of 83.77%, appropriate handling and drying methods are essential to preserve

quality and extend shelf life. The protein content of 5.25%—though lower than that of *Moringa* and *Katuk* leaves—still contributes beneficial plant-based protein to the diet. Its ash content (2.97%) indicates the presence of essential minerals, while the lowfat content (0.52%) makes it suitable for low-fat dietary formulations.

Notably, the total phenolic content of 1,324 mg/kg suggests a significant antioxidant capacity, placing *Pluchea indica* L. among plants with high bioactive potential. This supports its use in the development of health-oriented food products.

To fully leverage the identified nutritional and bioactive potential of *Pluchea indica* L. in food applications, particularly in the "peyek" format, subsequent research should prioritize systematic optimization of product formulation. This involves a data-driven approach to precisely manipulate ingredient ratios and processing parameters, aiming to mitigate any undesirable sensory attributes (e.g., bitterness from phenolics) while preserving or enhancing desirable characteristics. Concurrently, diversification of product applications beyond peyek, exploring other matrices suitable for incorporating *Pluchea indica* L. (e.g., fortified snacks, functional beverages), is warranted. Upon achieving optimized prototypes, expanded consumer sensory evaluation and market trials across broader demographic segments are crucial to ascertain product acceptance and market viability. Furthermore, targeted consumer education initiatives highlighting the documented health benefits, particularly its antioxidant capacity and contribution to macronutrient intake, will be instrumental in fostering market penetration and consumer adoption of *Pluchea indica* L.-derived food products.

REFERENCES

- Anggraeni Saputri, S., Sinurat, E., Prasetyo, H., Setyo Sasongko, A., Fateha, F., Dwi Cahyadi, F., Beni Rouf, A., Yulda, Y., Sihono, S., Choerun Nissa, R., & Hidayat, H. (2024). Karakterisasi nori-like product berbasis rumput laut lokal Indonesia dengan variasi penyalut. *Jurnal Pengolahan Hasil Perikanan Indonesia*, 27(5), 407–416. <https://doi.org/10.17844/jphpi.v27i5.53534>
- Bilate Daemo, B., Belew Yohannes, D., Muluaem Beyene, T., & Gebreselassie Abteu, W. (2022). Biochemical Analysis of Cassava (*Manihot esculenta* Crantz) Accessions in Southwest of Ethiopia. *Journal of Food Quality*, 2022. <https://doi.org/10.1155/2022/9904103>
- Chan, E. W. C., Ng, Y. K., Wong, S. K., & Chan, H. T. (2022). *Pluchea indica*: An updated review of its botany, uses, bioactive compounds and pharmacological properties. *Pharmaceutical Sciences Asia*, 49(1), 77–85. <https://doi.org/10.29090/PSA.2022.01.21.113>
- Donowarti, I., & Dayang Diah, F. (2020). Pengamatan hasil olahan daun beluntas (*Pluchea indica* L.) terhadap sifat fisika dan kimianya. *Teknologi Pangan : Media Informasi Dan Komunikasi Ilmiah Teknologi Pertanian*, 11(2), 118–134. <https://doi.org/10.35891/tp.v11i2.2166>
- Drewnowski, A., & Gomez-carneros, C. (2000). Bitter Taste and Phytonutrients and Consumers. *The American Journal of Clinical Nutrition*, February, 1424–1435.
- Elvira, I., Baihaqi, B., Fitri Faradilla, R. H., Rejeki, S., & Suci, I. A. (2024). Pengaruh Metode Pengolahan Terhadap Kadar Air, Kadar Abu, dan Kandungan Vitamin C Daun Kelor (*Moringa Oleifera*). *Jurnal Agrosains*, 17(1), 9–13.
- Hafsari, A. R., Cahyanto, T., Sujarwo, T., & Lestari, R. I. (2015). Uji Aktivitas Antibakteri Daun Beluntas (*Pluchea indica* (L.) LESS.) Terhadap *Propionibacterium acnes* Penyebab Jerawat. *Istek*, 9(1), 142–161.
- Lukman, K. M., Quevedo, J. M. D., Rifai, H., Uluuddin, Y. I., Sofue, Y., Uchiyama, Y., &

- Kohsaka, R. (2025). Mangrove Forest Food Products as Alternative Livelihood Measures: Community Conservation in Muara Gembong, Bekasi Regency, Indonesia. *Discover Sustainability*, 6. <https://doi.org/10.1007/s43621-025-01049-4>
- Martuti, N. K. T., Setyowati, D. L., Nugraha, S. B., & Universitas Negeri Semarang. Lembaga Penelitian dan Pengabdian Kepada Masyarakat. (2019). *Ekosistem mangrove : perannya di pesisir*. Lembaga Penelitian dan Pengabdian kepada Masyarakat, Universitas Negeri Semarang.
- Maulani, A., Taufiq-SPJ, N., & Pratikto, I. (2021). Perubahan Lahan Mangrove di Pesisir Muara Gembong, Bekasi, Jawa Barat. *Journal of Marine Research*, 10(1), 55–63. <https://doi.org/10.14710/jmr.v10i1.28396>
- Nieto, L. M., Hodaifa, G., & Peña, J. L. L. (2010). Changes in phenolic compounds and Rancimat stability of olive oils from varieties of olives at different stages of ripeness. *Journal of the Science of Food and Agriculture*, 90(14), 2393–2398. <https://doi.org/10.1002/jsfa.4097>
- Nurhalimah, H., Wijayanti, N., & Widyaningsih, T. D. (2015). Efek Antidiare Ekstrak Daun Beluntas (*Pluchea indica* L.) Terhadap Mencit Jantan Yang Diinduksi Bakteri *Salmonella* *Thyphimurium*. *Jurnal Pangan Dan ...*, 3(3), 1083–1094. <http://jpa.ub.ac.id/index.php/jpa/article/view/231>
- Rahmasari, S. N., Agus, F., Muningsih, D., & Gantini, W. T. (2019). Studi Keanekaragaman Mangrove Pantai Mekar Kecamatan Muara Gembong Kabupaten Bekasi. *Jurnal CARE*, 4(1), 35–41.
- Rai Saputri, G., & Indah Permatasari, A. (2019). Determination Of Protein Levels In Young And Old Leaves (*Moringaoleifera* L.) Leaves Using The Kjeldahl Method Penetapan Kadar Protein Pada Daun Kelor Muda Dan Daun Kelor Tua (*Moringaoleifera* L.) Dengan Menggunakan Metode Kjeldahl. *Jurnal Analis Farmasi*, 4(2), 108–116.
- Riandani, A. P., Prangdimurti, E., & Herawati, D. (2022). Profiling the chemical and sensory properties of cascara beverages from different locations in Indonesia. *Food Research*, 6(4), 388–398. [https://doi.org/10.26656/fr.2017.6\(4\).520](https://doi.org/10.26656/fr.2017.6(4).520)
- Rohana, R., Yulinda, R., & Putri, R. F. (2022). Pengaruh Penambahan Berbagai Konsentrasi Tepung Daun Beluntas (*Pluchea indica* L.) Dan Mawar (*Rosa damascena* Mill) Terhadap Hasil Karakteristik Kimia Beserta Uji Organoleptik Larutannya. *JUSTER: Jurnal Sains Dan Terapan*, 1(3), 197–207. <https://doi.org/10.57218/juster.v1i3.341>
- Su, Y., Wang, H., Wu, Z., Zhao, L., Huang, W., Shi, B., He, J., Wang, S., & Zhong, K. (2022). Sensory Description and Consumer Hedonic Perception of Ultra-High Temperature (UHT) Milk. *Foods*, 11(9). <https://doi.org/10.3390/foods11091350>
- Suhendra, S., Nopriandy, F., Perdana, D., & Maryam, A. (2024). Analisis Kadar Air dan Laju Pengeringan Bahan Baku Pembuatan Bubur Pedas Instan. *Jurnal Engine*, 8(1), 1–6.
- Wahyudin, Y. (2004). “Community Based Management (Cbm)” (Issue September). <https://doi.org/10.13140/RG.2.1.2850.3766>
- Widyawati, P. S., Budianta, T. D. W., Werdani, Y. D. W., & Halim, M. O. (2018). Aktivitas Antioksidan Minuman Daun Beluntas Teh Hitam (*Pluchea indica* Less-Camelia sinensis). *Agritech*, 38(2), 200. <https://doi.org/10.22146/agritech.25699>
- Widyawati, P. S., Darmoatmodjo, L. M. Y. D., Wibisono, D. A. S., Putra, E. W., & Dharma, A. W. (2023). Potency of pluchea (*Pluchea indica* Less) leaves to increase functional value of wet noodles: a review. *Food Research*, 7, 103–110. [https://doi.org/10.26656/fr.2017.7\(S1\).21](https://doi.org/10.26656/fr.2017.7(S1).21)

- Wulandari, TA, Widyawati, PS, Budianta, T. (2017). Pengaruh Penambahan Air Perasan Lemon Terhadap Aktivitas Antidiabetik Minuman Beluntas (*Pluchea Indica Less*) Lemon. *Jurnal Teknologi Pangan Dan Gizi*, 16(1), 1–9. <http://repository.wima.ac.id/11816/39/ABSTRAK.pdf>
- Zubairi, S. I., & Jaies, N. S. (2014). Daun Hibiscus rosa sinensis: Analisis proksimat, aktiviti antioksidan dan kandungan bahan inorganik. *Malaysian Journal of Analytical Sciences*, 18(2), 260–270.