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Article

Butterfly pea flower extract as a natural colorant for yogurt: impacts on sensory characteristics and functional value

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Abstract

Yogurt is a widely consumed fermented milk product valued for its nutritional content and health benefits, particularly its probiotic properties that support digestive health. In recent years, consumer demand for natural food colorants has increased significantly due to concerns regarding the potential toxicity of synthetic dyes. Clitoria ternatea L. flower extract contains stable and safe polyacylated anthocyanins that function as natural blue pigments and have been recognized by BPOM as colorants that do not require certification. In addition to providing an appealing color that is sensitive to pH, butterfly pea flowers contain bioactive compounds such as flavonoids, tannins, and polyphenols, which exhibit antioxidant, antimicrobial, and anti-inflammatory activities. Incorporating butterfly pea flower extract into yogurt prior to fermentation allows for uniform color distribution and results in relatively stable coloration during storage at 4°C. The extract also enhances the organoleptic qualities of yogurt by imparting a subtle floral aroma and contributing to a thicker texture preferred by consumers. Beyond its aesthetic contribution, the bioactive components of the extract offer additional functional benefits, including antioxidant activity and prebiotic potential that support digestive health and immune function. The use of butterfly pea flower extract as a natural colorant in yogurt represents an innovative approach that meets market demand for functional, natural, and safe food products with added health benefits.

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1. Introduction

Food colorants are commonly used additives in processed food products to enhance visual appeal. These colorants may be synthetic or natural. Although synthetic blue dyes such as Patent Blue (E131), Indigo Carmine (E132), and Brilliant Blue FCF (E133) are considered safe when consumed within the acceptable daily intake (ADI), some synthetic dyes may contain aromatic non-sulfonic amines that pose potential genotoxic and carcinogenic risks (1). As public awareness of the possible health hazards associated with synthetic colorants increases, the demand for natural food colorants has continued to rise. Consumers increasingly prefer natural and safer alternatives due to concerns regarding the toxicity and long-term health effects of synthetic chemicals (2).

As food additives, natural colorants also provide various health benefits that make them a favorite choice in the food industry. For example, anthocyanins that extensively studied, not only produce attractive red to purple colors, but also have various biological activities. Research indicates that anthocyanins possess antidiabetic effects by lowering blood glucose levels, anti-obesity properties through the regulation of lipid metabolism, and antihypertensive activities that support cardiovascular health (3). In addition, anthocyanins

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demonstrate antiproliferative properties that help inhibit cancer cell growth, as well as antimicrobial and anti-inflammatory effects that contribute to immune system support (4).

The butterfly pea flower (*Clitoria ternatea* L.) is a rich source of polyacylated anthocyanins. The extract of its petals has been recognized by the Food and Drug Administration of Indonesia (BPOM) as a natural blue colorant exempt from certification (5,6), confirming its safety for use in food. The primary anthocyanins present in butterfly pea flowers are known as ternatins, exhibit greater stability than their non-acylated counterparts. This enhanced stability is attributed to acyl moieties that protect the anthocyanin structure from degradation. For instance, these compounds are stable at high temperatures (60–100°C) and during storage at low pH (pH 3–4) (7). Owing to their stability, anthocyanins from butterfly pea flowers are suitable for use as natural colorants for acidic food. A pertinent application is in yogurt, which typically has a pH of approximately 4.5 ± 0.1 (8).

Yogurt is a fermented dairy product valued for its nutritional content, health benefits, and appealing sensory characteristics. It is produced through fermentation of milk by bacterial cultures such as *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilus* (9). These bacteria, often referred to as starter cultures, ferment lactose into lactic acid. These bacteria play a crucial role in regulating acidity, contributing to texture development, and generating characteristic flavors through the fermentation of glucose (10). Beyond its distinctive tangy taste, yogurt is a functional food, with its health benefits largely attributed to its probiotic content. These probiotics help maintain gut microbiota balance and alleviate digestive symptoms such as bloating, particularly for individuals with gastroenteritis (11).

Research and reviews on butterfly pea flowers have been conducted extensively. However, a comprehensive review focusing specifically on its application as a colorant in yogurt is currently lacking. Existing reviews have primarily discussed the general use of butterfly pea flowers in food and medicine (12) or emphasized its bioactive properties, such as antibacterial and antioxidant activities (13–15). This review therefore aims to fill this gap by critically evaluating the use of butterfly pea flower extracts as a natural coloring agent in yogurt products.

2. Materials and Methods

The literature search was conducted using the electronic databases Google Scholar, Scopus, and PubMed. The search strategy employed a combination of keywords, including "butterfly pea flower anthocyanin," "natural butterfly pea flower dye," "natural blue dye," and "butterfly pea flower in yogurt." The inclusion criteria for the selected literature were as follows: (1) published in peer-reviewed journals as primary research articles or reviews; (2) available in full text; (3) written in English or Indonesian; and (4) directly relevant to the topic of butterfly pea flower as a colorant in yogurt.

3. Results and Discussion

3.1. Natural Colorants in the Food Industry

Natural colorants are pigments derived from natural sources such as plants, animals, or minerals and are used to impart color to food products. According to the Regulation the Indonesian Food and Drug Authority (BPOM) Number 37 of 2013 concerning the Maximum Limits for the Use of Food Additives Colorants, natural colorants must meet stringent safety and certification standards to

ensure they pose no risks to consumer health. Natural colorants offer several advantages, including enhanced safety due to the absence of harmful or toxic chemical residues and also considered more environmentally friendly, as their production typically avoids complex synthetic processes. Furthermore, increasing consumer preference for "clean label" products and natural ingredients is increasingly driving the food industry to adopt natural colorants, which can enhance a product's market image and strengthen consumer trust (2).

Table 1. Blue Colorant for Food

Blue Colorant	Category	Disadvantages	Ref.
Patent Blue (E 131), *Indigo Carmine* (E 132), *Brilliant Blue* FCF (E 133)	Synthetic	Anaphylaxis and allergic skin reactions from high aromatic nonsulfonated amines	(2)
Fikosianin (*phycocyanin*) from spirulina	Natural colorant	Light and oxygen sensitivity	(16)
Red cabbage	Natural colorant	Decreased stability and color change at high pH	(17)

3.2. Butterfly Pea (Clitoria ternatea L.)

Butterfly pea (*Clitoria ternatea* L.) is a climbing plant of the Fabaceae family originating from tropical Asia, native to tropical Asia, particularly Southeast Asia and the Maluku Islands of Indonesia. Its flowers are characterized by the vivid purple-blue coloration and butterfly-shaped petals (Figure 1). Botanical and agronomic studies indicate that butterfly pea flowers play diverse roles across various fields (18,19). Beyond its ornamental value and traditional use as a natural colorant in Southeast Asian cuisine, butterfly pea possesses significant medicinal potential due to its rich profile of bioactive compounds, including flavonoids, anthocyanins, and tannins. These compounds are exhibit potential pharmacological properties such as antioxidant, anti-inflammatory, and antimicrobial activities (20). The antioxidant activity, in particular, plays a crucial role in protecting cells from free radical damage and can contribute to digestive and immune health upon regular consumption. Consequently, the incorporation of butterfly pea flower extracts into food products like yogurt not only provides a natural color but also enhances nutritional and functional value (21,22).

Figure 1. Butterfly Pea (*Clitoria ternatea* L.) (23)

Butterfly pea flower is widely recognized as a natural dye and is commonly used as an alternative to synthetic colorants in food products, including yogurt (8,24). The coloring properties are derived from anthocyanins, which are water-soluble pigments. Anthocyanins are highly sensitive to pH changes, resulting in color variations from dark blue under

neutral-alkaline conditions to purple or pink in acidic environments (25). This color flexibility is particularly advantageous in fermented products like yogurt, as the final hue can be tailored through product formulation to meet consumer preferences. The application of butterfly pea flowers as a food ingredient is further supported by studies demonstrating the stability and safety of its extracts (26). Studies indicate that its anthocyanins remain relatively stable under various storage conditions and processing parameters, such as temperature and pH fluctuations (26–28). Consequently, butterfly pea flowers not only aligns with current consumer trends toward natural and healthy foods but also serves to enhance the sensory appeal and overall quality of final products(7,29).

3.3. Bioactive Compound of Butterfly Pea Flower

3.3.1. Anthocyanins

Anthocyanins, the primary pigments in butterfly pea flowers are responsible for the vivid blue to purple coloration. These pigments are water-soluble and highly sensitive to pH changes, causing significant color shifts depending on the acidity of the medium (28,30). Neutral or alkaline conditions (pH≥ 7) make anthocyanins exhibit a blue hue, whereas in acidic conditions (low pH), the color shifts to pink or red (19). This color transition caused by structural changes in the anthocyanin molecule, specifically shifts in its ionic form, which are influenced by the hydrogen ions concentration (8). Anthocyanins also possess strong antioxidant activity, which helps protect cells from oxidative damage caused by free radicals (31).

Anthocyanins not only function as natural coloring pigments but also serve as significant antioxidant compounds that neutralize free radicals within the body (32). The antioxidant activity of anthocyanins is particularly important because free radicals can induce cellular and tissue damage through oxidative stress. Oxidative stress has been linked to various degenerative diseases, including cancer, cardiovascular disorders, and premature aging (33). Consequently, the anthocyanin content substantially enhances the health-promoting potential of butterfly pea flower extract as a functional ingredient (34).

Research indicates that butterfly pea flower extract exhibits significant antioxidant activity, as quantified by established spectrophotometric assays including DPPH (1,1-diphenyl-2-picrylhydrazyl) and FRAP (Ferric Reducing Antioxidant Power). In the DPPH assay, butterfly pea flower extract inhibit 42.2% of free radicals, indicating considerable antioxidant activity (35). Another study employing the maceration extraction, anthocyanin content was measured between 53.02% and 56.62%, contribute substantially to its free radical scavenging activity (36). Furthermore, the IC_{50} value of butterfly pea flower extract is notably low, ranging from 40 and 50 µg/mL, indicating very strong antioxidant potential (37).

3.3.2. Flavonoids, Tannins, and Other Bioactive Compounds

Flavonoids and tannins are important groups of bioactive compounds that contribute to the health benefits of yogurt enriched with butterfly pea flower extract. Flavonoids are polyphenolic compounds known for antioxidant, antimicrobial, and anti-inflammatory activities (38). Specifically, flavonoids from butterfly pea flowers have been shown to inhibit cyclooxygenase (COX) and lipoxygenase (LOX) enzymes, key mediators of the inflammatory process, which may help reduce swelling and inflammation (27). Various studies further

indicate that flavonoids can modulate immune function and play a role in preventing chronic diseases such as cancer and diabetes (39).

Table 2. Bioactive Compounds in *Clitoria ternatea* L. Flower

Chemical Compound	Ref.
Flavonoid	(15,19,40,41)
Antosianin	(19,25,40,42,43)
Flavonol glikosida	(19,40,42)
Kaempferol glikosida	(40)
Quersetin glikosida	(40)
Mirisetin glikosida	(40)
Tannin	(41)
Flobatanin	(27)
Karbohidrat	(27)
Saponin	(15,27,41)
Glikosida	(27)
Triterpenoid	(27)
Fenolmfavanoid	(27)
Protein	(27)
Alkaloid	(41)
Steroid	(27)
Antrakuinon	(41)
Asam palmitat	(27)
Stearat	(27)
Oleat lonoleat	(27)
Linolenat	(27)

Tannins are another class of polyphenolic compounds, function as antimicrobial agents by binding to microbial proteins and disrupting cell membranes. These compounds can damage bacterial cell membranes and inhibit peptidoglycan synthesis leading to bacterial cell death (18). The antimicrobial activity of tannins has been shown to be effective against several pathogenic bacteria, including *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Bacillus cereus*. In addition, tannins also exert protective antioxidant effects by preventing lipid peroxidation in tissues (44).

Several other bioactive components in butterfly pea flowers, including saponins, steroids, and alkaloids (Table 2). Saponins disrupt microbial cell membranes by reducing surface tension and increasing permeability, thereby inducing the leakage of essential cellular components (45). Alkaloids, on the other hand, are capable of damaging cell walls and disrupting critical metabolic processes in bacteria (27). The synergistic interaction among flavonoids, tannins, anthocyanins, and these additional compounds in butterfly pea flower extract provides stronger and more stable protection while also enhancing the sensory profile of yogurt. These bioactive compounds support the use of butterfly pea flower as a multifunctional additive that not only imparts color but also contributes health benefits and extends the shelf life of yogurt (37).

3.4. Butterfly Pea as Yogurt Colorant

The drying process of butterfly pea flowers is a crucial step that determines the quality of raw materials for downstream applications, including natural colorants and functional ingredients. Due to the daily blooming cycle and short harvest window, effective and rapid drying is essential to preserve their chemical and bioactive properties (46). During the rainy season, flower production increases substantially, making optimal post-harvest handling is necessary to prevent the reduces of flower yield. However, sun drying poses the risk of degrading anthocyanins and other bioactive compounds due to excessive heat and UV radiation exposure. Meanwhile, air-drying at ambient temperature is often ineffective, as incomplete drying can promote fungal growth and lead to spoilage and quality loss (47).

Drying with a temperature-controlled oven represents an important innovation for preserving the quality of the butterfly pea flowers. This oven employ a hybrid energy system, combining electricity and solar power makes the process both environmentally sustainable and cost-effective (48). The drying temperature maintained below 50°C to preserve the natural color and preventing the degradation bioactive compounds. Research indicates that the interaction between drying temperature and duration significantly affects moisture content, total soluble solids, total phenols, flavonoids, anthocyanins, and antioxidant activity. Controlled-temperature drying oven enables optimal and rapid drying, thereby preparing the flowers efficiently for subsequent processing or stable storage (47).

Butterfly pea flower extract can be incorporated into yogurt either by adding it to the milk base prior to fermentation or by blending it directly into the finished product. This procedure is relatively simple and practical, ensuring uniform color distribution when the extract is thoroughly mixed (49). Several studies recommend adding the extract prior to fermentation to achieve more stable and homogeneous color integration, while also optimizing interactions with the bacterial starter cultures. The anthocyanins impart an aesthetically pleasing and vibrant blue hue, which enhances visual appeal of yogurt (50).

Anthocyanins are highly sensitive to pH and temperature fluctuations during the storage of food products such as yogurt. These pigments exhibit a blue color at neutral or alkaline condition but when the pH decreases to acidic conditions, the color shift to purple or pink. This color transition results from structural changes in the anthocyanin molecules, which are influenced by the hydrogen ion concentration in the medium (48). Therefore, yogurt formulations must be carefully designed to maintain color stability. It is crucial to control the pH within a neutral to slightly acidic range control during fermentation to preserve the desired color. In addition, stabilizers such as polysaccharides (e.g., xanthan gum, guar gum) or milk proteins can reducing pigment degradation caused by physical and chemical factors to maintain the yogurt gel structure and prolong color stability (19). Temperature regulation during storage also plays an important role in minimizing color degradation. Elevated temperatures accelerate oxidation and anthocyanin degradation, leading to undesirable color shifts and a decline in product quality. Therefore, low-temperature storage approximately 4°C is recommended to preserve both the color stability and sensory properties of yogurt enriched with butterfly pea flower extract (51).

Butterfly pea flower extract also affects the overall organoleptic profile of yogurt. It contributes a subtle, natural floral aroma that enhances the product's sensory appeal. However, high concentrations of the extract can cause a bitter taste due to the flavonoids and tannins content (47). Optimal concentration of the extract from 0.1% to 0.5% is recommended to balance color intensity with favorable taste and texture. Furthermore, the

phenolic compounds in the extract interact with milk proteins, slightly increasing the viscosity of yogurt, which is generally accepted as a beneficial change in texture (52).

Functionally, butterfly pea flower extract is rich in anthocyanins and polyphenols which help protect the body from oxidative stress, a condition associated with aging and various chronic diseases (33). Antioxidant activity can also extend product shelf life by inhibiting the oxidation of food components. Moreover, the extract exhibits prebiotic potential, promoting the growth of beneficial gut microbiota, which in turn supports digestive health and enhances immune function. The combination of safe, natural coloration with these nutritional and functional advantages makes yogurt enriched with butterfly pea flower extract a highly appealing product for health-conscious consumers who prioritize natural ingredients (53).

4. Conclusions

Research has demonstrated a range of health benefits of butterfly pea flower (*Clitoria ternatea* L.), attributable to its diverse hydrophilic and lipophilic bioactive compounds. Scientific studies highlight its potential as a functional food and nutraceutical ingredient due to advantages such as ease of cultivation, extract stability, and favorable sensory properties. To facilitate its broader commercial adoption, further research is required, including the precise identification of individual bioactive roles, investigation of synergistic interactions with other ingredients, and validation through well-designed clinical trials. Based on the current research landscape, the development of beverages from butterfly pea flower aimed at blood glucose management represents a promising and immediate opportunity for wider commercialization.

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Author Contributions

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Available data are presented in the manuscript.

Conflicts of Interest

The author declares no conflict of interest.

References

1. Alegbe EO, Uthman TO. A review of history, properties, classification, applications and challenges of natural and synthetic dyes. Heliyon [Internet]. 2024 Jul 15;10(13). Available from: https://doi.org/10.1016/j.heliyon.2024.e33646
2. Amchova P, Siska F, Ruda-Kucerova J. Food Safety and Health Concerns of Synthetic Food Colors: An Update. Toxics [Internet]. 2024;12(7):1–17. Available from: https://doi.org/10.3390/toxics12070466
3. Godyla-Jabłoński M, Raczkowska E, Jodkowska A, Kucharska AZ, Sozański T, Bronkowska M. Effects of Anthocyanins on Components of Metabolic Syndrome-A Review. Nutrients [Internet]. 2024;16(8). Available from: https://doi.org/10.3390/nu16081103
4. Mattioli R, Francioso A, Mosca L, Silva P. Anthocyanins: A Comprehensive Review of Their Chemical Properties and Health Effects on Cardiovascular and Neurodegenerative Diseases. Molecules [Internet]. 2020;25(17). Available from: https://doi.org/10.3390/molecules25173809
5. Herlina H, Jannah S, Mulyani E, Sembiring M. Analisa Antosianin pada Minuman Olahan Bunga Telang (Clitoria Ternatea L) Dengan Metode pH Differensial. Parapemikir J Ilm Farm. 2023;12(2):217.
6. Indranita L, Rahmah NA, Juniarti, Abdussalam M. Identification of Anthocyanins Compounds in Butterfly Flower. J homepage. 2024;11(1):36–44.
7. Shirodkar SM, Multisona RR, Gramza-Michalowska A. The Potential for the Implementation of Pea Flower (Clitoria ternatea) Health Properties in Food Matrix. Appl Sci [Internet]. 2023;13(12). Available from: https://doi.org/10.3390/app13127141
8. Nadiyatul Haq Lukman, Fikroh Afifi, Serly Mustika, Alem Fawwaz Akbar, Fadhilla Marwa, Annisatul Syaida, et al. Pemanfaatan Ekstrak Bunga Telang Sebagai Pewarna Alami Yang Kaya Anti Oksidan Pada Berbagai Produk Makanan dan Minuman. Jdistira. 2024;4(1):104–8.
9. Dan T, Hu H, Tian J, He B, Tai J, He Y. Influence of Different Ratios of Lactobacillus delbrueckii subsp. bulgaricus and Streptococcus thermophilus on Fermentation Characteristics of Yogurt. Molecules [Internet]. 2023;28(5). Available from: https://doi.org/10.3390/molecules28052123
10. Ayivi RD, Ibrahim SA. Lactic acid bacteria: an essential probiotic and starter culture for the production of yoghurt. Int J Food Sci Technol [Internet]. 2022;57(11):7008–25. Available from: https://doi.org/10.1111/ijfs.16076
11. Lin Z, Zeng M, Sui Z, Wu Y, Tang X, Liu T. Moderate full-fat and low-fat yoghurt consumption correlates with reduced mortality risk: a large-scale prospective analysis. J Glob Health [Internet]. 2025;15. Available from: https://doi.org/10.7189/jogh.15.04014
12. Yunitasari N, Na'imah J. Sebuah Ulasan: Pemanfaatan Ekstrak Bunga Telang (Clitoria ternatea) di Bidang Obat dan Makanan. Muhammadiyah J Nutr Food Sci [Internet]. 2024;5(2):92–102. Available from: https://doi.org/10.24853/mjnf.5.2.92-102
13. Pisacha IM, Safutri W, Rahayu KW. Review artikel: Aktivitas antibakteri ekstrak bunga telang (Clitoria ternatea L.) terhadap bakteri Staphylococcus aureus. J Pharm Aisyah. 2023;2(2):68–74.
14. Wulandari AMF, Ngai FE, Isabel CF, Dyatmika AKU, Rosari FP, Setyaningsih D, et al.

Potensi daun dan bunga telang (Clitoria ternatea L.) sebagai antioksidan. Medicinus. 2022;35(2):43–50.
15. Abriyani E, Yuniarsih N, Fikayuniar L, Sulastri D, Farmasi F, Buana U, et al. Skrining Fitokimia Ekstrak Daun Clitoria Ternatea L Dan Uji Toksisitas Terhadap Larva Udang Artemia Salina. Skrining Fitokimia Ekstrak … J Pharmacopolium. 2022;5(2):220–2.
16. Sedjati S, Ridlo A, Supriyantini E. Efek Penambahan Gula Terhadap Kestabilan Warna Ekstrak Fikosianin Spirulina sp. J Kelaut Trop. 2016;18(1):1–6.
17. Abedi-Firoozjah R, Yousefi S, Heydari M, Seyedfatehi F, Jafarzadeh S, Mohammadi R, et al. Application of Red Cabbage Anthocyanins as pH-Sensitive Pigments in Smart Food Packaging and Sensors. Polymers (Basel) [Internet]. 2022;14(8). Available from: https://doi.org/10.3390/polym14081629
18. Hawari H, Pujiasmanto B, Triharyanto E. Morfologi dan kandungan flavonoid total bunga telang (Clitoria Ternatea L.) di berbagai ketinggian. Kultivasi. 2022;21(1):88–96.
19. Marpaung AM. Tinjauan manfaat bunga telang (clitoria ternatea l.) bagi kesehatan manusia. J Funct Food Nutraceutical [Internet]. 2020;1(2):63–85. Available from: https://doi.org/10.33555/jffn.v1i2.30
20. Dewi NWRK. Pemanfaatan dan potensi antioksidan pada bunga telang (Clitorea ternatea L.): Literatur Review. J Pharmactive [Internet]. 2022;1(2):44–50. Available from: https://doi.org/10.64036/pharmactive.v1i2.21
21. Purba EC. Kembang telang (Clitoria ternatea L.): pemanfaatan dan bioaktivitas. EduMatSains. 2020;4(2):111–24.
22. Vidana Gamage GC, Goh JK, Choo WS. Application of anthocyanins from blue pea flower in yoghurt and fermented milk: An alternate natural blue colour to spirulina. Int J Gastron Food Sci [Internet]. 2024;37(May):100957. Available from: https://doi.org/10.1016/j.ijgfs.2024.100957
23. Jeyaraj EJ, Lim YY, Choo WS. Extraction methods of butterfly pea (Clitoria ternatea) flower and biological activities of its phytochemicals. J Food Sci Technol [Internet]. 2021;58(6):2054–67. Available from: https://doi.org/10.1007/s13197-020-04745-3
24. Prakosa GG, Budiyanto TA, Aryanti NA. Pemanfaatan Berbagai Jenis Tanaman Sebagai Pewarna Alami di Kawasan Hutan Dengan Tujuan Khusus(KHDTK) Pujon. J For Sci Avicennia. 2022;5(2):110–4.
25. Priska M, Peni N, Carvallo L, Ngapa YD. Ulasan Antosianin dan Pemanfaatannya. Cakra Kim (Indonesian E-Journal Appl Chem. 2018;6(2):79–97.
26. Rifqi M, Pangan T, Gizi D. Ekstraksi antosianin pada bunga telang (Clitoria ternatea L.): Sebuah ulasan. Pas Food Technol J [Internet]. 2021;8(2):45–50. Available from: https://doi.org/10.23969/pftj.v8i2.4049
27. Athallah DR, Rudiyanto W, Wijaya SM, Angraini DI, Kedokteran F, Lampung U, et al. Review Article : Potensi Farmakologi Bunga Telang (Clitoria ternatea) Review Article : Pharmacological Potential of Butterfly Pea (Clitoria ternatea). 2024;14:1613–9.
28. Yurisna VC, Nabila FS, Radhityaningtyas D, Listyaningrum F, Aini N. Potensi Bunga Telang (Clitoria ternatea L.) sebagai Antibakteri pada Produk Pangan. JITIPARI (Jurnal Ilm Teknol dan Ind Pangan UNISRI). 2022;7(1):68–77.
29. Baubara Y, Zahara AS, Wardania S. Organoleptic Tests of The Addition of Telang Flower Extract (Clitoria ternatea) on Cow's Milk Yoghurt (Bos taurus) Production in Air Tawar Village, Langkat. J Biol Trop. 2023;23(3):207–12.
30. Aprianti I, Najini R. Pengembangan Yogurt Bunga Telang (Clitoria ternatea L.)

menggunakan Pemanis dan Penstabil: Studi Sensoris dan Fisikokimia. Sinteza [Internet]. 2025;5(2):102–11. Available from: https://doi.org/10.29408/sinteza.v5i2.30877

31. Sari DP, Harlita H. Optimalisasi Pemanfaatan Pewarna Alami (Natural Dyes) Untuk Preparat Maserasi (Gosok) Tulang. Florea J Biol dan Pembelajarannya. 2020;7(1):31.
32. Rahayu S, Vifta R, Susilo J. Uji Aktivitas Antioksidan Ekstrak Etanol Bunga Telang (Clitoria Ternatea L.) dari Kabupaten Lombok Utara dan Wonosobo menggunakan Metode FRAP. Generics J Res Pharmacy; Vol 1, No 2 Generics J Res Pharmacy, Vol 1, Ed 2, 2021DO - 1014710/genres.v1i29836. 2021 Oct 31;
33. Amaliah S, Yuliawati KM. Studi Literatur Aktivitas Antioksidan Ragam Senyawa Antosianin dalam Ekstrak Bunga Telang (Cltitoria ternatea L.) serta Aktivitas Farmakolginya terhadap Penyakit Diabetes Melitus. J Pharm. 2022;2(2):1–11.
34. Unawahi S, Widyasanti A, Rahimah S. Pemanfaatan ekstrak bunga telang (Clitoria ternatea Linn) sebagai pewarna alami pada minuman bersoda. Agrointek J Teknol Ind Pertan [Internet]. 2022;16(2):263–70. Available from: https://doi.org/10.21107/agrointek.v16i2.13033
35. Jannah S. Uji Aktivitas Antioksidan Variasi Perlakuan Bunga Telang (Clitoria Ternatea L) Dengan Metode DPPH. J Ilm Pharm. 2022;9(1):154–62.
36. Yuanda KE, Audina M, Alawiyah T. Formulasi dan Uji Aktivitas Antioksidan Sediaan Serum Ekstrak Bunga Telang (Clitoria ternatea L.) Sebagai Anti Aging. Innov J Soc Sci Res. 2023 Dec 20;3(6 SE-Articles):8301–13.
37. Nadia S, Sihotang SH, Mukharomah S. Antioxidant Activity Test of Telang Flower (Clitoria ternatea L.) in Serum Preparation With DPPH Method. J Pharm Sci. 2022;5(2):394–403.
38. Andriani D, Murtisiwi L. Penetapan Kadar Fenolik Total Ekstrak Etanol Bunga Telang (Clitoria Ternatea L.) Dengan Spektrofotometri Uv Vis. Cendekia J Pharm [Internet]. 2018;2(1):32–8. Available from: https://doi.org/10.31596/cjp.v2i1.15
39. Purwanto UMS, Aprilia K, Sulistiyani. Antioxidant Activity of Telang (Clitoria ternatea L.) Extract in Inhibiting Lipid Peroxidation. Curr Biochem [Internet]. 2022;9(1):26–37. Available from: https://doi.org/10.29244/cb.9.1.3
40. Kazuma K, Noda N, Suzuki M. Flavonoid composition related to petal color in different lines of Clitoria ternatea. Phytochemistry [Internet]. 2003;64(6):1133–9. Available from: https://doi.org/10.1016/S0031-9422(03)00504-1
41. Cahyaningsih E, Yuda PESK, Santoso P. Skrining Fitokimia Dan Uji Aktivitas Antioksidan Ekstrak Etanol Bunga Telang (Clitoria ternatea L.) dengan Metode Spektrofotometri UV-VIS. J Ilm Medicam. 2019;5(1):51–7.
42. Shen Y, Du L, Zeng H, Zhang X, Prinyawiwatkul W, Alonso-Marenco JR, et al. Butterfly pea (Clitoria ternatea) seed and petal extracts decreased HEp-2 carcinoma cell viability. Int J Food Sci Technol [Internet]. 2016;51(8):1860–8. Available from: https://doi.org/10.1111/ijfs.13158
43. Rifqi M. Ekstraksi Antosianin Pada Buangan telang (Clitoria Ternatea L.). Pas Food Technol J. 2021;8(2):45–50.
44. Maulida Z, Sa'adah A, Saptawati T, Gloria F, Rachma FA. Aktivitas Antioksidan Isolat Flavonoid Ekstrak Etanol Bunga Telang (Clitoria ternatea) Dengan Metode FRAP Antioxidant Activity of Isolate Flavonid of Extracted Ethanol from Asian pigeonwings (Clitoria ternatea) with FRAP Method. BENZENA Pharm Sci J. 2022;01(02):93–102.

45. I Gusti Ayu Sinta Amara Yuda, Ketut Widyani Astuti. Review: Potensi Aktivitas Antibakteri Daun dan Bunga Telang (Clitoria ternatea L.) Terhadap Bakteri Penyebab Jerawat. J Sci Mandalika e-ISSN 2745-5955 | p-ISSN 2809-0543 [Internet]. 2024 Jun 19;5(6 SE-Article):228–35. Available from: https://doi.org/10.36312/10.36312/vol5iss6pp228-235
46. Fauzi RA, Widyasanti A, Perwitasari SDN, Nurhasanah S. Optimasi proses pengeringan terhadap aktivitas antioksidan bunga telang (clitoria ternatea) menggunakan metode respon permukaan. J Teknol Pertan [Internet]. 2022;23(1):9–22. Available from: https://doi.org/10.21776/ub.jtp.2022.023.01.2
47. Rosyidah K, Astuti MD, Kartini D, Mustikasari K. Pengembangan Produk Berbasis Bunga Telang pada KWT Sosial Permai Banjarbaru. Pros Semin Nas Pengabdi Kpd Masy. 2022;4(1):146–52.
48. Astadewi AI, Fauziyah M, Radianto D. Pengendalian Suhu Berbasis PID Pada Pengeringan Bunga Telang. Metrotech (Journal Mech Electr Technol [Internet]. 2024;3(3):142–8. Available from: https://doi.org/10.70609/metrotech.v3i3.5137
49. Chosyatillah AA, Saidi IA. Pengaruh Berbagai Konsentrasi Ekstrak Bunga Telang (Clitoria Ternatea L.) Terhadap Karakteristik Yogurt Susu Sapi. Procedia Eng Life Sci. 2023;4(June):6–10.
50. Putri NI, Chance MJ, Rahardjo, Chandra PA, Ananingsih VK. Proses Pembuatan Serbuk Antosianin Dari Kubis Merah. J Teknol Pangan dan Gizi. 2019;18(1):1–9.
51. Sari DP, Aditiyarini D, Ariestanti CA. Stabilitas Ekstrak Bunga Telang (Clitoria ternatea L.) Terenkapsulasi Maltodekstrin dan Gelatin dan Potensi Prebiotiknya. Biota J Ilm Ilmu-Ilmu Hayati [Internet]. 2024;9(3):226–37. Available from: https://doi.org/10.24002/biota.v9i3.7550
52. Wahyuni F, Okfrianti Y, Wahyu T. Daya Terima Organoleptik Dan Uji Aktivitas Antioksidan Pada Yogurt Dengan Penambahan Ekstrak Bunga Telang. Agritepa. 2025;12(1):67–80.
53. Alfira D, Rasyidah, Nasution RA. Aktivitas Bakteri Asam Laktat (BAL) dan Kadar Antioksidan pada Yoghurt Ampas Tahu dengan Penambahan Sari Bunga Telang (Clitoria ternatea). BIO-CONS J Biol dan Konserv. 2024;6(2):432–40.