

Original Research Article

Organoleptic Evaluation and Product Development of Butterfly Pea Flower

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Abstract

Health benefits of butterfly pea flower (*Clitoria ternatea*) are well documented in literature. Therefore, the present study was conducted with the objectives i. To develop and incorporate butterfly pea flower extract into the traditional food cuisines. ii. To assess the organoleptic qualities of developed food product and iii. To evaluate the proximate analysis of developed food products from butterfly pea flower. Butterfly pea flower extract was incorporated to various traditional recipes such as Pittha, Pulao, Kheer, Pulut inti and Lemonade. Organoleptic evaluation was done to assess acceptability and nutritive value was calculated. Statistical analysis showed an overall acceptability for the developed products. Nutritive value analysis showed maximum calorie, fat, calcium and magnesium contents of Pulut inti. Protein and potassium content of Kheer were highest. The highest fibre content was found in Pittha (13.25 gm). The present study concludes that using butterfly pea flower in food products definitely enhanced their micronutrients and antioxidants.

Keywords: Pea flower extract, antioxidant, organoleptic evaluation, product development, nutritive value

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Introduction

A perennial blooming plant with a long history in traditional medicine, especially Ayurveda. *Clitoria ternatea* is often referred to as Butterfly Pea or Aparajita or Neelkanta or Shankhpushpi. Originally from Southeast Asia, it can now be found in tropical and subtropical areas all over the world. [1,2]

Throughout the world, its beautiful blue blossoms are employed as natural coloring agents. [3]

The aqueous extract of butterfly pea flower is generally used as a tea, but it has also been used as a natural food coloring agent in various recipes. [4] Butterfly pea flowers include ternatin, kaempferol, quercetin, and myricetin as their primary phenolic components. [5] This plant shows many medicinal properties such as hepatoprotective, antipyretic, antimicrobial, antidiabetic, and antioxidant qualities. [6]

Major production areas in India are shown below [7]

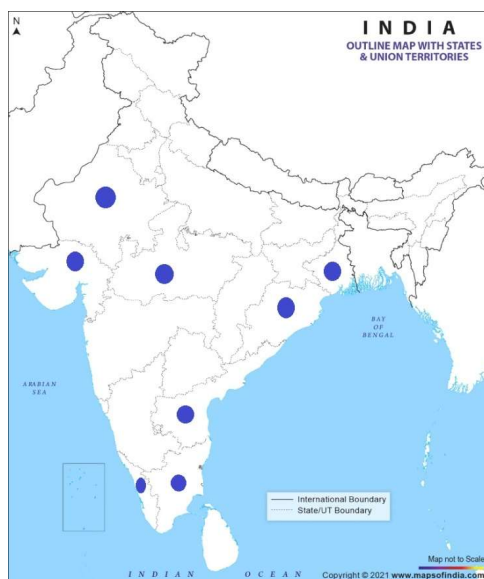


Fig 1: Distribution of Butterfly Pea Plant across India

Nutritional content of Butterfly Pea (*Clitoria ternetea*) flower

Nutrient	Percentage	Concentration (mg/g)
Protein	0.32%	-
Fibre	2.1%	-
Carbohydrate	2.2%	-
Fat	2.5%	-
Moisture	92.4%	-
Calcium	-	3.09 mg/g
Magnesium	-	2.23 mg/g
Potassium	-	1.25 mg/g
Zinc	-	0.59 mg/g
Sodium	-	0.14 mg/g
Iron	-	0.14 mg/g

Source: Sahu *et al.*, 2023 ^[8]

It contains some fatty acids such as palmitic acid, stearic acid, oleic acid, linoleic acid and linolenic acid.^[9] There are some bioactive components also in butterfly pea flower like alkaloids, tannins, saponins, flavonoids, and phenols.

Beneficial effects

Anti-diabetic: Butterfly pea flowers have antioxidant and antihyperglycemic properties. Butterfly pea blossoms help lower blood sugar and insulin levels after a meal and boost antioxidant levels.^[10] Reduced carbohydrate hydrolysis and plasma glucose levels may result from the inhibition of these two enzymes α -amylase and α -glucosidase.^[11] Butterfly pea blossoms contain bioactive substances such as polyphenols and anthocyanins that inhibit the pancreatic enzymes alpha-amylase and alpha-glucosidase. Diabetes can lead to an increase in free radicals, which can harm enzymes and antioxidants. Therefore, naturally occurring *Clitoria ternetea* has larger quantities of polyphenols and flavonoids, which have an anti-diabetic effect.^[12]

Anti-microbial: The anthocyanin component of butterfly pea blossoms showed antibacterial nature against various types of bacteria.^[13] *Clitoria ternetea* is the source of a protein known as "finotin," which has been shown to have antifungal, antibacterial, and insecticidal qualities.^[14]

Anti-oxidant activity: Radiation and other pollution exposure cause the body to create free radicals as byproducts of regular metabolism. They can induce cell damage and infection with variety of diseases since they are so potent. ^[6]

Anti-lipogenic: Butterfly pea flower has lipid lowering effect by stimulation of Adenosine Monophosphate - Activated Protein Kinase (AMPK) and lowering the expression of Peroxisome Proliferator Activator Gamma-Receptor (PPAR- γ).^[15]

Brain-boosting potential: The leaves and seeds of *Clitoria ternatea* are said to improve memory and intellect and are frequently used as a brain tonic. These have efficacy of treating alzheimer's disease.^[16]

Anti-carcinogenic: The butterfly pea is well known for having strong anticancer properties. ^[17, 18]

Anti-depressant: The components found in butterfly pea flower roots including beta-sitosterol, alkaloids, flavonoids, fatty acids, delphinidin 3,3',5' tri-glucoside, phenols, and saponins are shown to have antidepressant properties.^[19]

Anti-arthritic and anti- inflammatory: An aqueous root isolated from *C. ternatea* was shown to have anti-rheumatoid arthritis potential by inhibiting the heat denaturation of the albumin protein, which is said to serve as a measure of anti-arthritic activity.^[20]

Anti-pyretic: Rats' body temperature was successfully lowered by all dosages of *C. ternatea* methanolic root extract in a study done by Devi *et al.*, 2003.^[21]

Application of the butterfly pea flower in daily food consumption

There are several ways to use the butterfly pea bloom in daily life. Research suggests that consuming the flower directly may not provide the same benefits as extracting and incorporating it into cuisine. In Malaysia, the butterfly pea flower is used in several cuisines, including the popular nasi kerabu, Pulut inti and kuhi pualt etc. Adding the flower essence to white rice might have health benefits. Drinking flower-based beverages can provide health advantages.^[22] Butterfly pea flower is added to black tea to make kombucha.^[23] Powdered form is the most effective way to use *C. ternatea* flower as a food additive for an extended duration of storage.^[24] In India, it is traditionally used as coloring agent in many festive dishes. The flowers are often used to prepare blue herbal tea or

sharbat, known for its cooling and calming effects; when lemon juice is added, the drink turns a bright purple, making it popular both in folk practices and modern fusion cuisine.

Possible side effects

Excessive use may lead to nausea or stomach upset in sensitive individuals. Their interactions with various drugs still need more researches.

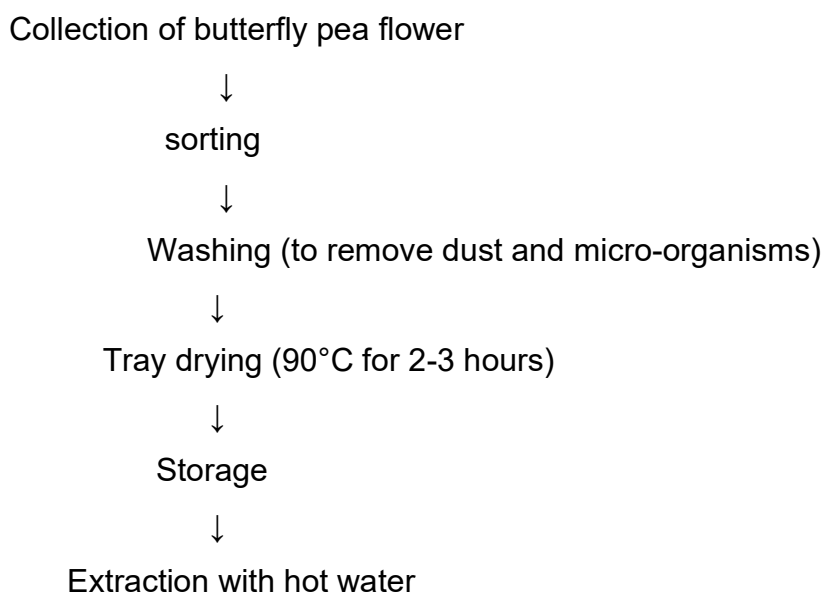
Therefore, on the basis of above health benefits, present study was planned with following objectives

- To develop and incorporate butterfly pea flower extract into the traditional food cuisines
- To assess the organoleptic qualities of food product prepared from butterfly pea flower
- To evaluate the proximate analysis of developed food products from butterfly pea flower

Research Methodology

Procurement of raw Butterfly Pea Flower: Butterfly pea flower was collected from different areas of Hazaribag district in the month of September and October, 2024.

Processing of product:



Development of value-added food products: The development of value added traditional food products namely lemonade, pittha, pulao, kheer and a famous dish of Malaysia i.e. Pulut- inti was done in laboratory of Vinoba Bhawe University.

Organoleptic analysis of cooked products: The freshly prepared food products namely pithi, pulao, kheer, Pulut- inti and lemonade were evaluated organoleptically in five replications by panelists on a 9 points hedonic scale. Mean score of each product was calculated.

Calculation of Nutritive Value: The calorie, carbohydrate, protein, fat, fiber, calcium, magnesium, potassium of the different products were calculated by using the food composition table ICMR and Internet.

Statistical analysis: The data collected was analyzed in form of mean, standard deviations, standard error and ANOVA.

Results & Discussion

1. **Incorporation of butterfly pea flower extract into the traditional food cuisines:** Following recipes were prepared using butterfly pea flower extract –



Pittha



Pulao



Kheer



Lemonade



Pulut Inti

2 Assessment of organoleptic qualities of butterfly pea flower

2.1 Assessment of colour of various products developed by incorporation of butterfly pea flower

Replication Product	Sensory score					Mean $\pm$ S.E
	R1	R2	R3	R4	R5	
Pittha	8.2	8.6	8.2	9	9	8.6 $\pm$ 0.16
Pulao	8.1	8.2	8.4	8.8	9	8.5 $\pm$ 0.15
Kheer	8.1	8.6	8.4	8.8	9	8.5 $\pm$ 0.14
Pulut inti	7.2	8.4	8.2	8.8	9	8.3 $\pm$ 0.16
Lemonade	6.8	9	8.2	8.6	9	8.3 $\pm$ 0.36

Table 1: Effect of colour due to different techniques of cooking on different product prepared from butterfly pea flower

Table 1 shows average score based on the 9-point hedonic scale for colour of different product made from butterfly pea flower. Mean score for colour was maximum for pittha (8.6) followed by pulao and kheer (8.5), followed by pulut inti and lemonade (8.3) although the scores were statistically not significant ($p < 0.05$). So, it can be concluded that the colour of the products was liked very much by the judges.

2.2 Assessment of texture of various products developed by incorporation of butterfly pea flower

Replication Product	Sensory score					Mean $\pm$ S.E
	R1	R2	R3	R4	R5	
Pittha	8	8.8	8.2	8.6	9	8.5 $\pm$ 0.16
Pulao	7.2	7.6	8.1	8.5	9	8.0 $\pm$ 0.18
Pulut inti	7	8.2	8.4	8.4	9	8.2 $\pm$ 0.25
Lemonade	7	8.8	8.4	8.4	9	8.3 $\pm$ 0.31

Table 2: Effect of texture due to different techniques of cooking on different product prepared from butterfly pea flower

Table 2 displays the average texture score for several butterfly pea flower-based products on a 9-point hedonic scale. Pittha had the highest mean texture score (8.5), followed by lemonade (8.3), following Pulut inti and kheer (8.2), and, finally, pulao (8.0). Statistical analysis showed a not significant ($p < 0.05$) difference among acceptability of texture for all products. Therefore, texture of all products was also liked very much by the panelists.

2.3 Assessment of flavor of various products developed by incorporation of butterfly pea flower

Replication Product	Sensory score					Mean $\pm$ S.E
	R1	R2	R3	R4	R5	
Pittha	7.6	8.8	8.2	8.8	9	8.4 $\pm$ 0.23
Pulao	7.8	8	8	8.8	9	8.3 $\pm$ 0.21
Kheer	7.6	8.8	8.6	8.6	9	8.5 $\pm$ 0.21
Pulut inti	7.2	7.8	8.3	8.3	8.8	8.1 $\pm$ 0.25
Lemonade	6.2	9	8.8	8.8	9	8.2 $\pm$ 0.47

Table 3: Effect of flavour due to different techniques of cooking on different product prepared from butterfly pea flower

The table 3 presents the average flavour score for several butterfly pea flower-based products on a 9-point hedonic scale. Kheer earned the highest mean tasting score (8.5), followed by Pittha (8.4), Pulao (8.3), Lemonade (8.2), and finally Pulut inti (8.1). The ANOVA Table revealed that there was no discernible difference ($p < 0.05$) in flavour between the five products manufactured from butterfly pea blossoms. So, it can be inferred that the flavour of the products was extremely well liked by the judges.

2.4 Assessment of taste of various products developed by incorporation of butterfly pea flower

Replication Product	Sensory score					Mean $\pm$ S.E
	R1	R2	R3	R4	R5	

Pittha	7.6	8.8	8.2	9	9	8.5 ± 0.32
Pulao	6.2	7.8	8.4	8.8	9	8.0 ± 0.40
Kheer	7.8	8.6	8.6	8.2	8.8	8.4 ± 0.16
Pulut inti	6.6	8.4	8.6	8.4	8.9	8.1 ± 0.36
Lemonade	6	9	8.2	8.8	9	8.2 ± 0.51

Table 4: Effect of taste due to different techniques of cooking on different product prepared from butterfly pea flower

The table 4 displays the average taste score for several butterfly pea flower-based goods on a 9-point hedonic scale. Pittha had the highest mean tasting score (8.5), followed by kheer (8.4), lemonade (8.2), pulut inti (8.1), and then pulao (8.0). Here also a non-significant difference ($p < 0.05$) was found as per ANOVA for taste of various developed products. Scores for taste also showed that the products were liked very much.

2.5 Assessment of overall acceptability of various products developed by incorporation of butterfly pea flower

Replication Product	Sensory score					Mean ± S.E
	R1	R2	R3	R4	R5	
Pittha	7.8	8.8	8.2	8.8	9	8.5 ± 0.20
Pulao	6	7.8	8.4	8.8	9	8.0 ± 0.48
Kheer	7.6	8.6	8.6	8.6	9	8.4 ± 0.21
Pulut inti	7	8.6	8.6	8.4	8.9	8.3 ± 0.30
Lemonade	6.2	8.2	8.4	8.8	9	8.2 ± 0.47

Table 5: Effect of overall acceptability due to different techniques of cooking on different product prepared from butterfly pea flower

Above table 5 shows the average overall acceptance in which Pittha received the highest average tasting score (8.5), followed by kheer (8.4), pulut inti (8.3), lemonade (8.2) and pulao (8.0). It was non-significant ($p < 0.05$) according to ANOVA analysis. All products were found widespread acceptable by the panelists.

3 Nutrient calculation of various developed products

Nutrients products	Energy (Kcal)	CHO (gm)	Protein (gm)	Fat (gm)	Fiber (gm)	Ca++ (Mg)	Mg++ (Mg)	K+ (Mg)
Pittha	941.86	129.45	11.5	42.44	13.25	57.85	472	318.6
Pulao	357.86	79.25	9.04	0.75	2.25	47.85	118.8	15.6
Kheer	795.36	139.55	19.74	17.3	4.25	527.85	117	575
Pulut inti	1027.86	129.25	13.82	58.62	13	542	585	489.4
Lemonade	60.86	11.35	1.04	1.2	-	108.6	466.85	285.6

Table 6: Nutrients calculation of different products

Table 6 presents that the Calorie in butterfly pea flower Pulut inti (1027.36Kcal) was maximum followed by Pittha (941.86 Kcal), Kheer (795.36 Kcal) Pulao (357.86 Kcal) and Lemonade (60.86 Kcal). The protein content of butterfly pea flower Kheer (19.74 gm) was maximum, followed by Pulut inti(13,82gm), Pittha (11.5 gm), Pulao (9.04 gm) and Lemonade (1.04 gm). The carbohydrate content of butterfly pea flower kheer (139.55 gm) was maximum, followed by Pittha (129.45 gm), Pulut inti (129.25), Pulao (79.25 gm), Lemonade (11.35 gm). The fat content of butterfly prea flower Pulut inti (58.62 gm) was maximum followed by (42.44 gm), Kheer (17.3 gm), Lemonade (1.2 gm), Pulao (0.7gm). The fiber content of butterfly pea flower Pittha (13.25 gm) was maximum followed by Pulut inti (13 gm) , Kheer (4.25 gm), Pulao (2.25 gm) and Lemonade had no fiber. The Calcium content of butterfly pea flower Pulut inti (542 mg), was maximum followed by Kheer (527.85 mg) Lemonade (108.6 mg), Pittha (57.85 mg) and Pulao (47.85). The Magnesium content of butterfly pea flower Pulut inti (585 mg), was maximum followed by Pittha (472 mg), Pulao (118.8 mg), Kheer (117 mg) and Lemonade (46.85). The Potassium content of butterfly pea flower Kheer (575 mg) was maximum followed by Pulut

inti (489.4 mg), Pittha (318.6 mg), Lemonade (285.6 mg) and Pulao (15.6 mg). Using the ANOVA test, no significant difference was found between the five butterfly pea flower-based products tested in terms of nutritive value.

Conclusion

The present study concludes that using butterfly pea blossom to make a product results in a concentration of nutrients, particularly micronutrients and antioxidants. Products such as pittha, pulao, kheer, pulut inti, and lemonade infused with butterfly pea flower extract are easily accepted by people of any age.

References

1. Chauhan N, Rajvaidhya S, Dubey BK. Pharmacognostical, phytochemical and pharmacological review on *Clitoria ternatea* for antiasthmatic activity. *Int J Pharm Sci Res.* 2012; 3(2): 398-404
2. Multisona RR, Myszka K, Kulczyński B, Arnold M, Brzozowska A, Gramza-Michałowska A. Cookies fortified with *Clitoria ternatea* butterfly pea flower petals: Antioxidant capacity, nutritional composition, and sensory profile. *Foods*, 2024; 13(18): 2924. <https://doi.org/10.3390/foods13182924>
3. Nair V, Bang WY, Schreckinger E, Andarwulan N, Cisneros-Zevallos L. Protective Role of Ternatin Anthocyanins and Quercetin Glycosides from Butterfly Pea (*Clitoria ternatea* Leguminosae) Blue Flower Petals against Lipopolysaccharide (LPS)-Induced Inflammation in Macrophage Cells. *J. Agric. Food Chem.* 2015; 63: 6355–6365.
4. Wang Y, Liu T, Xie Y, Li N, Liu Y, Wen J, Zhang M, Feng W, Huang J, Guo Y et al. *Clitoria ternatea* Blue Petal Extract Protects against Obesity, Oxidative Stress, and Inflammation Induced by a High-Fat, High-Fructose Diet in C57BL/6 Mice. *Food Res. Int.* 2022;162: 112008. doi: 10.1016/j.foodres.2022.112008
5. Singh NK, Garabadu D, Sharma P, Shrivastava SK, Mishra P. Anti-allergy and anti-tussive activity of *Clitoria ternatea* L. in experimental animals. *J. Ethnopharmacol.* 2018; 224: 15–26. 10.1016/j.jep.2018.05.026

6. Lakshan SAT, Jayanath NY, Abeysekera WPKM, Abeysekera WKSM. A Commercial Potential Blue Pea (*Clitoria ternatea* L.) Flower Extract Incorporated Beverage Having Functional Properties. Evid. Based Complement. Altern. Med. 2019, 2916914.
7. Bishoyi AK, Pillai VV, Geetha KA, Maiti S. Assessment of genetic diversity in *Clitoria ternatea* populations from different parts of India by RAPD and ISSR markers. Genetic resources and Crop Evolution. 2014; 61(8): 1597 – 1609.
8. Sahu D, Sahu JK, Kumar V, Tamrakar SK. Phytochemicals and medicinal usage of *Clitoria ternatea*. International J Plant and Soil Science. 2023; 35(18): 942- 951.
9. Manjula P, Mohan CH, Sreekanth D, Keerthi B, Devi BP. Phytochemical analysis of *Clitoria ternatea* Linn., a Valuable Medicinal Plant. J. Indian Bot. 2013, 92: 173–178.
10. Chusak C, Thilavech T, Henry CJ, Adisakwattana S. Acute effect of *Clitoria ternatea* flower beverage on glycemic response and antioxidant capacity in healthy subjects: a randomized crossover trial. BMC Complement. Altern. Med. 2018; 18:6. 10.1186/s12906-017-2075-7
11. Wu J, Gong J Chen Q., Wen H He, J, Wang M, Zhou Q. Unveiling kaempferol glycosides as the key antiglycative components in butterfly pea (*Clitoria ternatea*) flower. Current Research in Food Science, 2024; 9: 100896. <https://doi.org/10.1016/j.crfs.2024.100896>
12. Santosa DF. Beneficial health effects of butterfly pea (*Clitoria ternatea*): A literature review. Indonesia Journal of Biomedical Science, 2023; 17(1): 244–247. <https://doi.org/10.15562/ijbs.v17i1.475>
13. Jeyaraj EJ, Lim YY, Choo WS. Extraction methods of butterfly pea (*Clitoria ternatea*) flower and biological activities of its phytochemicals. Journal of Food Science and Technology, 2021; 58(6): 2054–2067. <https://doi.org/10.1007/s13197-020-04745-3>
14. Kelemu S, Cardona C, Segura G. Antimicrobial and insecticidal protein isolated from seeds of *Clitoria ternatea*, a tropical forage legume. Plant Physiol. Biochem. 2004; 42: 867–873. 10.1016/j.plaphy.2004.10.013
15. Utami W, Laksono YD, Setiawibowo SNF, Sunarsih ES, Wulandari F, Rohana E. Antidiabetic an antioxidant activity of *Clitoria Ternatea* Flower extracts and fractions on blood glucose and MDA

- in rats induced by alloxan. *Pharmacy Education*, 2024; 24(6): 21- 27.
<https://doi.org/10.46542/pe.2024.246.2127>
16. Shahnas N, Akhila S. Phytochemical, In vitro and In silico evaluation on *Clitoria Ternatea* on Alzheimer's disease. *Pharmatutor*, 2014; 2(9): 135 - 149
17. Shyam Kumar B, Ishwar Bhat K. In-vitro cytotoxic activity studies of *Clitoria ternatea* Linn flower extracts. *International Journal of Pharmaceutical Sciences Review and Research*, 2011; 6(2): 120-121
18. Shivaprakash P, Balaji KS, Chandrashekara KT; Rangappa KS, Jayarama S. Induction of apoptosis in mcf-7 cells by methanolic extract of *Clitoria ternatea* L. *Int. J. Appl. Biol. Pharm. Technol.* 2015; 6: 80–86.
19. Adelina R. Kajian Tanaman Obat Indonesia yang Berpotensi sebagai Antidepresan, JFIKI, 2013; 3(1): 9–18. Available at: <https://media.neliti.-com/media/publications/104374-IDkajian-tanaman-obat-indonesia-yangberpo.pdf>
20. Ranaweera C, Ranjith P, Chandana A, Ralalage J, Jayakody A, Ratnasooriya, D. In vitro antirheumatoid arthritic activity of aqueous root extract of *Clitoria ternatea*. *Int. Res. J. Pharm.* 2014; 5: 926–928.
21. Devi BP, Boominathan R Mandal SC. Anti-inflammatory, analgesic and antipyretic properties of *Clitoria ternatea* root. *Fitoterapia*, 2003; 74: 345–349. 10.1016/S0367-326X(03)00057-1
22. Mohamad Rizal NA, Mohd Nooh H. Superfood in Malaysia: The butterfly pea flower (*Clitoria ternatea* L.). University repository. UiTM Institutional Repository. 2021, <https://ir.uitm.edu.my/id/eprint/57211>
23. Sinyadewi, Putu R et al. Analysis of Chemical Characteristics and Antioxidant Activity Test of Kombucha Black Tea and Butterfly Pea Flower (*Clitoria Ternatea* L.) Based on Fermentation TIME. *International Journal of Chemical and Material Sciences*, 2021; 4(1): 27-32. doi:[10.21744/ijcms.v4n1.1768](https://doi.org/10.21744/ijcms.v4n1.1768)
24. Aljumayi H, Sami R, Harthi HF, Bedaiwi RI, Algehaini NA, Almehmadi AM, Abushal SA, Kadi RH, Albishi TS, Qumsani AT, Qari SH. Studies of the biochemistry behaviour of herbal butterfly blue

pea flower with some antimicrobial and antioxidant potentials. Pol J Environ. Stud, 2025; 20(10): 1-9.