Research Article

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Antioxidant Potential at Harvest Age of Butterfly Pea Flower (Clitoria ternatea L.)

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ABSTRACT

The anthocyanin content can be found in the butterfly pea flower, particularly in the petal, which is generally purple. This indicates that the generative phase of the butterfly pea plant, especially during flower formation, affects the flavonoid and anthocyanin content of the butterfly pea flowers. Several factors can influence flowering in butterfly pea cultivation, including environmental and genetic factors. This study aims to determine the highest antioxidant potential at the harvest age of butterfly pea flowers. The research design used a Completely Randomized Design (CRD) with treatment factors including planting media and various types of banana peel organic fertilizer (POC) and green manure. The planting media treatments were: T0 = Soil (control), T1 = Soil and raw rice husks (1:1) / (V), T2 = Soil and burned rice husks (1:1) / (V), T3 = Soil and compost (1:1) / (V). The types of banana peel POC treatments were: K1 = POC from banana peel, K2 = Green manure from Paitan. The results showed that the treatment T2K1 (burned rice husk soil media and banana peel POC) had the highest antioxidant activity at 43.89% with a moisture content of 91.06% at the third harvest of butterfly pea flowers. This can be seen from the soil analysis results for T2, which showed an organic carbon content of 2.50 (high) and available phosphorus of 199.00 (very high), while the banana peel POC had an available phosphorus content of 0.52 (high).

Keywords
Antioxidant; Harvest period; Butterfly pea flower

INTRODUCTION

The butterfly pea flower contains high levels of antioxidants (anthocyanins and flavonoids) that are beneficial for human health, including preventing diseases such as cancer and heart disease. The anthocyanins present can counteract free radicals, which can damage the structure and function of cells in the body. Cellular damage, such as disruptions in reduction and oxidation chains, can lead to oxidative damage, also known as oxidative stress. Free radicals are compounds that can attack bodily structures and result in various diseases, such as atherosclerosis, coronary heart disease, stroke, kidney failure, and the aging process. Antioxidants are compounds or substances that can counteract oxidation reactions caused by free radicals. Flavonoid compounds in some natural materials are known to have activity as natural antioxidants. Anthocyanins can be found in the butterfly pea flower, particularly in the petals, which are generally purple. This indicates that the generative phase of the butterfly pea plant, especially during flower formation, affects the flavonoid and anthocyanin content of the flower.

Several factors can influence flowering in butterfly pea cultivation, including environmental and genetic factors. Environmental factors that affect flowering include temperature, light, pH, and humidity. According to Ramdhan et al. (2015), the enzyme phenylalanine ammonia-lyase (PAL) affects anthocyanin synthesis, so nitrogen and potassium content in the plant's growing medium is necessary. Additionally, optimal flower growth in plants can be supported by the application of organic fertilizers and green manure from Tithonia, which contains high levels of potassium (K) and phosphorus (P). Tithonia diversifolia can be used as green manure because it contains nitrogen (N) and potassium (K), which help meet the main nutrient needs of plants. Tithonia is a weed plant that grows up to 5 meters tall, with an erect, round, woody, and green stem. It has alternate leaves that are 26-32 cm long and 15-25 cm wide, with pointed tips and bases, pinnate leaf veins, and yellow flowers. Tithonia can be utilized, especially its leaves and stems, as a source of plant nutrients in the form of fresh green manure, liquid green manure, or compost (Hakim et al., 2012 in Sri Ayu, 2016). Therefore, efforts to enhance the growth and yield of butterfly pea flowers can be made by improving cultivation practices through the use of a combination of planting media and the application of banana peel organic fertilizer and Tithonia green manure.

Liquid organic fertilizer (POC) is a solution derived from the

decomposition of organic materials such as plant residues and animal manure. The macro and micro nutrients in banana peel waste can support the growth of butterfly pea plants. Banana peel waste contains macro nutrients N, P, K and micro nutrients Ca, Mg, Na, and Zn, which are essential for the growth and development of fruits, stems, and flowering in plants. One advantage of using liquid organic fertilizer is its ability to address nutrient deficiencies, prevent nutrient leaching, and provide nutrients quickly. Additionally, liquid organic fertilizers are environmentally friendly as they do not damage the soil even with frequent use. Thus, soil quality and fertility can be improved with the use of organic fertilizers. Prolonged use of chemical fertilizers has been shown to cause serious issues such as soil pollution and economic and social dependency for farmers (Sedayu et al., 2014).

METHODS

This research was conducted from May to August 2024. The study took place at the Benjonk Organic Farming Community Land, Sendang Hamlet, Penanggungan Village, Trawas District, Mojokerto Regency, East Java Province. Geographically, it is situated at an altitude of 600-700 meters above sea level, with an annual rainfall of 2,000 mm, humidity of 66%, and an average air temperature of 18-20°C. The tools used included 35 x 35 cm polybags, watering cans, hoses, scales, choppers, sieves, containers, shovels, measuring tapes, scissors, plastic bottles, and labels. The materials used in this study were purple butterfly pea seeds, raw rice husks, burned rice husks, compost, soil, and liquid organic fertilizer made from banana peels (banana peels, water, and brown sugar).

This study was designed using a Completely Randomized Design (CRD) with treatments involving planting media and various types of banana peel organic fertilizer (POC) and Tithonia green manure. The planting media treatments were: T0 = Soil (control), T1 = Soil and raw rice husks (1:1) / (V), T2 = Soil and burned rice husks (1:1) / (V), T3 = Soil and compost (1:1) / (V). The types of banana peel POC treatments were: K1 = POC from banana peels, K2 = Tithonia green manure. Based on these two treatment factors, there were 12 treatment combinations, each repeated 3 times, resulting in 24 experimental units. Each experimental unit consisted of 3 plants. The parameters observed included soil analysis, POC analysis using spectrophotometry, and antioxidant content of the butterfly pea flowers (Purwaniati, 2020).

RESULT & DISCUSSION

Moisture content is an important component related to the quality and durability of a simple preparation. According to BPOM (2008), a good moisture content for simplicia is below 10%. Generally, if the moisture content of simplicia exceeds this limit, it can increase the risk of damage from molds and fungi (Mutiatikum et al. 2010). Although the moisture content of butterfly pea flowers exceeds 10%, it is still acceptable as it aligns with the maximum moisture content of 12% for tea-type simplicia products (SNI 1995). The flower parts of butterfly pea have been used as tea in various regions, including Thailand, Vietnam, and Europe. This makes the moisture content still acceptable (Maharani 2018).

In the T2K1 treatment (burned rice husk soil media and banana peel POC), the highest antioxidant level of 43.89% with a moisture content of 91.06% was observed at the third harvest of butterfly pea flowers. This is reflected in the soil analysis results for T2, showing an organic carbon content of 2.50 (high) and available phosphorus of 199.00 (very high), while the banana peel POC had an available phosphorus content of 0.52 (high). This is consistent with the statement that one of the plants containing antioxidants is butterfly pea. Andriani and Murtisiwi (Adriani et al., 2018) stated that the butterfly pea (Clitoria ternatea L.) contains compounds such as flavonoids, anthocyanins, flavonol glycosides, kaempferol glycosides, quercetin glycosides, and myricetin glycosides. Butterfly pea also contains other compounds such as terpenoids, tannins, and steroids. According to Duta and Ray (2018), since phenolic compounds are positively correlated with antioxidant activity, polyphenols may be the compounds responsible for the antioxidant potential in butterfly pea. The variation in antioxidant content could be due to the possibility that antioxidant activity may come from compounds other than flavonoids, as noted by Rohman et al. (2007), who stated that 5.33% of antioxidant activity could originate from compounds other than phenolics and flavonoids. Additionally, it may be due to the types of flavonoids present in the leaves, as not all function as antioxidants, and the presence of antagonistic properties among the phytochemical components (Laswati et al. 2010; Kader et al. 2011).

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Table a. Hasil analisa Pupuk Organik Cair (POC) Kulit Pisang

No	Code	Product	Measure	Methods	Results	Criteria
1	SDL-02	N-total	%	Kjehdhal	0,02	Very Rendah
2	SDL-03	C-Org	%	W_Black-Spectro	0,20	Very Rendah
3	SDL-13	P-Total	%	AAS	0,52	Very High
4	SDL-14	K Total	%	AAS	0,15	Very High

Table b. Hasil analisa pupuk hijau paitan

No	Code	Product	Measure	Methods	Results	Criteria
1	SDL-02	N-total	%	Kjehdhal	4,01	Very Rendah
2	SDL-03	C-Org	%	W_Black-Spectro	32,20	Very High
3	SDL-13	P-Total	%	AAS	0,01	Very High
4	SDL-14	K Total	%	AAS	2,71	Very High

Table c. Soil Analysis Results

Growing Media	Product	Results	Criteria
Soil	pH	6,00	Slighly Acidic
	N-Total	0.30	Half
	C-Organik	3.60	High
	P-Tersedia	158,00	Very High
	K-dd	1.83	Very High
Soil + Raw Rice Husk	pH	5.90	Slightly Acidic
	N-Total	0.23	Half
	C-Organik	3.70	High
	P-Tersedia	106,00	Very High
	K-dd	2.41	Very High
Soil + Raw Rice Burnt	pH	6.30	Slightly Acidic
	N-Total	0.18	Rendah
	C-Organik	2.50	High
	P-Tersedia	199,00	Very High
	K-dd	2.85	Very High
Soil + Compost	pH	5.50	Slightly Acidic
	N-Total	0.49	Half
	C-Organik	6.40	High
	P-Tersedia	379,00	Very High
	K-dd	3.86	Very High

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Table d. Antioxidant Analysis Results

No	Sample Code	Harvest	Parameter Test	Reesult	Measure	Methods
1.	T0K1	Harvest Period 1	Water Resistant Antioxidant Activity	87,35 2,18	% %	Gravimetric DPPH
2.	T0K1	Harvest Period 2	Water Resistant Antioxidant Activity	89.98 24,17	% %	Gravimetric DPPH
3.	T0K1	Harvest Period 3	Water Resistant Antioxidant Activity	87,27 22,52	% %	Gravimetric DPPH
4	T0K2	Harvest Period 1	Water Resistant Antioxidant Activity	88,52 2,18	% %	Gravimetric DPPH
5	T0K2	Harvest Period 2	Water Resistant Antioxidant Activity	90,41 13,99	% %	Gravimetric DPPH
6	T0K2	Harvest Period 3	Water Resistant Antioxidant Activity	87,27 15,27	% %	Gravimetric DPPH
7	T2K1	Harvest Period 1	Water Resistant Antioxidant Activity	88,74 1,31	% %	Gravimetric DPPH
8	T2K1	Harvest Period 2	Water Resistant Antioxidant Activity	89,26 13,35	% %	Gravimetric DPPH
9	T2K1	Harvest Period 3	Water Resistant Antioxidant Activity	91,06 43,89	% %	Gravimetricc DPPH
10	T2K2	Harvest Period 1	Water Resistant Antioxidant Activity	89,59 2,18	% %	Gravimetric DPPH
11	T2K2	Harvest Period 2	Water Resistant Antioxidant Activity	89,26 13,35	% %	Gravimetric DPPH
12	T2K2	Harvest Period 3	Water Resistant Antioxidant Activity	91,33 30,66	% %	Gravimetric DPPH
13	T3K1	Harvest Period 1	Water Resistant Antioxidant Activity	89,85 3,36	% %	Gravimetric DPPH
14	T3K1	Harvest Period 2	Water Resistant Antioxidant Activity	89,22 4,93	% %	Gravimetric DPPH
15	T3K1	Harvest Period 3	Water Resistant Antioxidant Activity	87,65 9	% %	Gravimetric DPPH
16	T3K2	Harvest Period 1	Water Resistant Antioxidant Activity	89,69 2,03	% %	Gravimetric DPPH
17	T3K2	Harvest Period 2	Water Resistant Antioxidant Activity	86,58 1,74	% %	Gravimetric DPPH
18	T3K2	Harvest Period 3	Water Resistant Antioxidant Activity	88,5 7,40	% %	Gravimetric DPPH

CONCLUSION

The treatment with burned rice husk soil media and banana peel POC had the highest antioxidant level of 43.89% with a moisture content of 91.06% at the third harvest of butterfly pea flowers. This can be seen from the soil analysis results for T2, which showed an organic carbon content of 2.50 (high) and available phosphorus of 199.00 (very high), while the banana peel POC had an available phosphorus content of 0.52 (high).

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REFERENCES

1. Andriani dan Lusia Murtisiwi, 2018, Penetapan Kadar Fenolik Total Ekstrak Etanol Bunga Telang (Clitoria Ternatea L.) Dengan Spektrofotometri Uv Vis, Cendekia Journal Of Pharmacy, (2)1: 32-38. Dzoyem, J.P., McGaw, L.J. dan Eloff, J.N.,2014. In vitro antibacterial, antioxidant dan cytotoxic activity of acetone leaf extracts of nine under-investigated Fabaceae tree species leads to potentially useful extracts in animal health dan productivity.

2. Dutta, S., & Ray, S. 2015. Evaluation of Invitro Free Radical Scavenging Activity of Leaf Extract Fractions of Manilkara Hexandra (ROXB) Dubard in Relation to Total Phenolic Contents. International Journal of Pharmacy and Pharmaceutical Sciences, 7:296 301

3. Mutiatikum D, Alegantina S, Astuti Y. 2010. Standarisasi simplisia dari buah miana (Plectranthus Seutellaroides (L)R.Bth yang berasal dari 3 tempat tumbuh Manado, Kupang dan Papua. Buletin Penelitian Kesehatan. 38(1): 1-16

4. Rohman A, Riyanto S, Hidayati NK. 2007. Aktivitas antioksidan, kandungan fenolik total, dan flavonoid total daun Mengkudu (Morinda citrifolia L). Agritech. 27 (4): 147-151

5. Laswati D, Sundari NRI, Anggraini O. 2010. Pemanfaatan kersen (Muntingia calabura L.) sebagai alternatif produk olahan pangan: sifat kimia dan sensoris. Jurnal Teknologi dan Industri Pangan Unisri Surakarta. 4: 127-134.

6. Kader MG, Nikkon F, Rashid MA, Yeasmin T. 2011. Antimicrobial activities of the rhizone extract of Zingiber zerumbet Linn. Asian Pacific Journal of Tropical Biomedicine. 1 (5) 409-412.

7. Kamkaen N, Wilkinson JM. 2009. The antioxidant activity of Clitoria ternatea flower petal extracts and eye gel. Phytotherapy Research. 23: 1624-1625.