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"Flourish and Nurturing Sustainable Innovation for a Prosperous Nation"

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Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor International Innovation Invention Competition and Symposium 2024 (JIIICaS2024), where JIIICaS2024 is a virtual platform for all creative minds to share and present their invention and innovation. Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students and get some ideas to develop future innovation products.

Foreword Rector

Assalamualaikum warahmatullahi Wabarakatuh, Salam Sejahtera, Salam Malaysia MADANI and Salam UiTM Dihatiku.

In the name of Allah, the Most Gracious, the Most Merciful.

It is a great honor to welcome you to the Johor International Innovation, Invention, Competition, and Symposium 2024 (JIIICaS 2024). This event connects various disciplines, focusing on education and engaging educators, students, researchers, and innovators from all walks of life.

Innovation is not just about ideas; it demands perseverance, creativity, and determination to turn those ideas into reality. The remarkable projects showcased today highlight the dedication and spirit of all participants. Initiatives like this not only explore new technologies but also cultivate skills and leadership among our youth. At Universiti Teknologi MARA (UiTM) Johor Branch, we are fully committed to fostering a dynamic culture of innovation, promoting the commercialization of new products, and encouraging meaningful collaborations with industry and society.

As we celebrate this event, I would like to extend my heartfelt gratitude to all sponsors, judges, the College of Computing, Informatics and Mathematics, UiTM Pasir Gudang Campus as the event organizer, as well as to the researchers and participants for their hard work in making this event a success. Let us continue striving for innovation and excellence. May the ideas presented today inspire us and lay the groundwork for future achievements.

Thank you.

Associate Professor Dr. Saunah Zainon
Rector
Universiti Teknologi MARA (UiTM)
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(A-ST011) POTENTIAL OF GOJI BERRIES (*LYCIUM BARBARUM*) FRUITS AS NATURAL ANTIOXIDANT MEDICINE

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ABSTRACT

Lycium barbarum, a species of the Solanaceae family known as goji berries is attributed to various health benefits such as immune system, eye health and reduced cholesterol due to bioactive compounds. The research focused on *L. barbarum* fruits for their phytochemical and antioxidant property. Phytochemicals were extracted using hexane, ethyl acetate and methanol through the cold maceration method. The result shows that the highest percentage yield was methanol extract with 2.5%. Phytochemical screening affirmed the presence of alkaloids, saponins, terpenoids, phenols, flavonoids, and glycosides. Antioxidant activity was evaluated through DPPH assay. Methanol extract demonstrated strong radical scavenging activity with an IC_{50} value of 76.61 µg/mL. In conclusion, this study shows that the extracts of *L. barbarum* contain medicinally bioactive compounds and have the potential as an antioxidant agent(s) that may benefit human health.

Keywords: *Lycium barbarum*, Solanaceae, Extraction, Phytochemical, Antioxidant

1.0 INTRODUCTION

Natural product is substances that originate from animals, plants and microorganisms. New therapeutic compounds have been comes from nature due to the tremendous chemical diversity found in various species of plants. Since the beginning of the 20th century, extraction or powder of medicinal plant has been used as the main active ingredient in medicinal products because they are considered a powerful source of drugs that have no side effects when applied to patients (Brown *et al.*, 2010). *Lycium barbarum* which belongs to Solanaceae family is a species primarily valued for its edible fruits, commonly referred to as goji berries, a deciduous shrub thrives in regions such as China, Tibet, and various other parts of Asia (Shahrajabian *et al.*, 2020). Numerous studies have emphasized the positive effects of goji berries on antioxidant, anti-tumor, antimicrobial, hypoglycemic, anti-mutagenic and anti-aging. Additionally, goji berries are known for their high content of phenolic compounds, including flavonoids and phenolic acids, which contribute to their antioxidant properties and potential health benefits (Nazirah *et al.*, 2014). In this study, the phytochemical screening was done on *L. barbarum* extracts in order to detect the presence of secondary metabolites and demonstrate the antioxidant activity of goji berries.

2.0 OBJECTIVE

This study aims to extract phytochemicals from the dried *L. barbarum* using different polarity of solvents such as ethyl acetate, hexane and methanol. Phytochemical screening has been done to identify the presence of phytochemicals from the extracts of *L. barbarum*. Besides, the antioxidant activities of *L. barbarum* extracts were also demonstrated by using DPPH (2,2-diphenyl-1-picrylhydrazyl) methods.

3.0 METHODOLOGY

Plant Extraction

The fruits of *L. barbarum* were dried and ground into fine powder. It has been weighed and extracted sequentially with *n*-hexane, ethyl acetate and methanol. The extracts were filtered through a filter paper and concentrated using rotary evaporator to obtain the crude extract.

Phytochemical Screening

Chemical tests for the screening and identification of bioactive chemical constituents such as alkaloids, flavonoids, phenols, saponins, terpenoids, glycosides, steroids and tannins on *L. barbarum* extracts were carried out by using a standard procedure (Lei *et al*., 2021).

Antioxidant Assay

DPPH radical scavenging assay was utilized to determine the antioxidant activity of *L. barbarum* with some modifications (Donno *et al*., 2015). Each sample (1.0 mg) was dissolved in methanol (1 mL) to obtain a stock solution with a concentration of 1000 µg/mL. A series of diluted solutions were prepared from the stock solution with methanol starting from 1000, 500, 250, 125, 62.5, 31.3,15.63 and 7.81 µg/mL. The sample solutions with various concentrations (0.2 mL) were mixed with 3.8 mL of methanolic DPPH solution (50 µM). The mixture was incubated for 30 minutes at room temperature in the dark. After 30 minutes, the absorbance of the reaction mixture was recorded at 517 nm.

4.0 RESULTS

Extraction of sample

The crude extracts of *L.barbarum* from the extraction process were weighed using an analytical balance. The percentage and yield of each extract were calculated. Table 1 below shows the result of sample extraction of different solvents. Methanol demonstrated the highest percentage yield at 2.5%, indicating effective extraction of a diverse range of polar compounds. Ethyl acetate exhibited moderate efficiency with a percentage yield of 1.32%, while hexane showed a relatively lower yield of 1.12%, suggesting lower solubility of non-polar compounds in this solvent.

Table 1: Result of sample extraction.

Extract	Weight of ground sample (g)	Weight of crude extract (g)	Percentage yield (%)
Hexane	196	2.20	1.12
Ethyl Acetate	192	2.54	1.32
Methanol	186	4.66	2.50

Phytochemical screening of *L.barbarum*

L. barbarum has been reported to contain many active compounds. In this study, phytochemical screening was carried out to detect the presence of secondary metabolites in n-hexane, ethyl acetate and methanol. Moreover, phytochemical screening confirmed the presence of various bioactive compounds in goji berries, including alkaloids, saponins, terpenoids, phenols, flavonoids, and glycosides. These compounds contribute to the potential health benefits associated with goji berries. Table 2 shows the result of the phytochemical analysis of those extracts.

Table 2: Phytochemical screening of *L. barbarum*

Test	Crude extract			Observation
	n-Hexane	Ethyl Acetate	Methanol	
Alkaloid	+	+	+	Reddish brown
Flavonoid	-	+	+	Light yellow
Phenol	-	+	+	Dark green
Terpenoid	-	+	+	Brown
Saponin	-	+	+	Frothing
Glycoside	-	+	+	Greenish yellow

Key: presence (+), absence (-)

Antioxidant Activity

The DPPH radical scavenging assay was employed to evaluate the antioxidant properties of *L.barbarum.* The data on the DPPH radical scavenging activity of hexane, ethyl acetate, and methanol extracts from *L. barbarum* fruits, along with the standard antioxidant, ascorbic acid, is presented in Table 3. Methanol extract demonstrated strong radical scavenging activity with an IC_{50} value of 76.61 µg/mL. Ethyl acetate extract presented significant DPPH radical scavenging activity with an inhibition rate of 89.80% at 1000 µg/mL with a corresponding IC50 value of 135.03 µg/mL. Hexane extract was not determined for the IC50 in this experiment as the sample inhibition at 1000µg/mL is less than 50%.

Table 3: DPPH radical scavenging of the extract of *L. barbarum*

Extract	**% Inhibition at 1000µg/mL**	**IC_{50} (µg/mL)**
n-Hexane	45.30 ± 0.97	ND
Ethyl acetate	89.80 ± 0.83	135.03 ± 0.96
Methanol	94.56 ± 0.55	76.61 ± 0.35
Ascorbic acid	98.04 ± 0.85	10.40 ± 0.21

Data present mean ± standard deviation of three replicate experiments; ND- not determined

5.0 CONCLUSION

The phytochemical screening has revealed there are many secondary metabolites in *L.barbarum* fruit extract such as alkaloid, flavonoid, saponin, phenol, terpenoid and glycoside. Meanwhile, the antioxidant study revealed that the ethyl acetate and methanol extracts demonstrated notable DPPH radical scavenging activity, with methanol exhibiting higher potency (IC_{50} 76.61 µg/mL). The results showed that the extract of *L.barbarum* has the potential as an antioxidant agent for medicinal purposes.

6.0 REFERENCES

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