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Tyrosinase Inhibition *Activity* of *Lycium Barbarum Extract*

Omaima Saddam Zirjawi, Ula M. Noor Almousawi

Department of Pharmacognosy and Medicinal Plants,
Pharmacy College, University of Basra, Iraq

Amjed Haseeb Khamees

Department of Pharmacognosy and Medicinal Plants,
Pharmacy College, University of Baghdad, Iraq

Abstarct: The melanin pigment is an important for protection the skin from UV rays . tyrosinase enzyme is limiting step in the production of melanin, over production of melanin may cause multiple skin conditions, such as sun melanosis, ephelides, melasma, senile lentigosis, and postinflammatory hyperpigmentation. So that tyrosinase inhibitors can be useful in skin depigmentation. Tyrosinase inhibitor from natural sources gain an interest because they are thought to have less negative side effects. *L. barbarum*, belong to Solaneseae family, which is thought to be a botanical species with medicinal qualities. Scientifically termed fructus Lycii and cortex Lycii radicis,. *L. barbarum* fruits provide a range of medicinal qualities, including as antioxidant, immunostimulant, antiaging, energetic, and adaptogenic effects and this due to the presence of many components in these fruits include some polysaccharides, carotenoids, flavonoids, terpenoids, vitamins B and C, and the mineral germanium. The plant fruit and leaves were extracted by maceration method and then the extracts subjected to tyrosinase inhibition assay to investigate the depigmentation of the extracts . the result cleared that the *L. barbarum* have a good tyrosinase inhibition activity.

Key points: Tyrosinase, Melanin, Inhibitors and Lycium barbarum

Introduction

The skin is an important organ of the human body and therefore it is necessary to protect it against the environmental conditions that may cause skin damaging(1). Melanin content determines the color of the skin(2). The pigment melanin is crucial for protecting the skin from UV rays and serves as a vital line of defense for the skin against other damaging elements. Different techniques to the study of skin problems have been established since melanin, despite its benefits, is also involved in aberrant pigmentation and melanoma(3)(4).

In the initial two stages of melanin production, tyrosinase (EC 1.14.18.1) plays a crucial role by accelerating the conversion of L-tyrosine to 3,4-dihydroxyphenylalanine (DOPA) and the subsequent oxidation of DOPA to dopaquinone(5).

Multiple skin conditions, such as sun melanosis, ephelides, melasma, senile lentigosis, and postinflammatory hyperpigmentation, are characterized by the overproduction and buildup of melanin.Tyrosinase inhibitors are becoming more and more useful as depigmenting medicines in hyperpigmentation disorders because tyrosinase is the limiting step enzyme(6).

That being said, there is a continuous search for more effective tyrosinase inhibitors from natural sources because they are thought to have less negative side effects. Presently available inhibitors suffer from toxicity and/or ineffectiveness(7).

L. barbarum, belong to Solaneseae family, which is thought to be a botanical species with medicinal qualities. Scientifically termed fructus Lycii and cortex Lycii radicis,(8). *L. barbarum* fruits provide a range of medicinal qualities, including as antioxidant, immunostimulant, antiaging, energetic, and adaptogenic effects. Naturally occurring substances found in large quantities in these fruits include some polysaccharides, carotenoids, flavonoids, terpenoids, vitamins B and C, and the mineral germanium(9)(10). The fruit is a 1-2 cm long, vivid orange-red, ellipsoid berry that grows in China, Tibet, and other regions of Asia, in Asian nations, ripe fruit has been utilized as a functional food and traditional herbal remedy(11). *L.barbarum* has been reported to have antiaging effect (12) some study demonsterate that oral consuming *L. barbarum* juice to improve the damage caused by the sun to the skin by ultraviolet (UV) radiation(13)(14) .The aim of this study was to investigate the inhibitory activity of two different extracts of *L. barbarum* .

Material and method :

Plant collection: *Lycium barbarum* Leaves and fruits were collected in the period between November 2022 and April 2023 .then it dried at room temperature for 5 days after that it grinding and kept in well closed container.

Plant extraction: 5 g of each plant part were weighed using an electrical balance, macerated in 100 ml (85%) of methanol solution, and then allowed to sit at room temperature for 14 days before being filtered through filter paper(15).

Two samples were used in this assay: sample 1 leaf extract by maceration method and sample 2 fruit extract by maceration method . The assay's solutions were as follows:

1. Tyrosinase at 1.5M
2. Phosphate buffer solution at 0.1M
3. The solution for the extract.

Preparing the phosphate buffer solution:

Solution A: 8.7g of dipotassium hydrogen phosphate (K2 HPO4) was dissolved in 100 milliliters of DW.

Solution B: 6.8 g of potassium di hydrogen phosphate (KH2PO4) was dissolved in 100 milliliters of DW to create the solution.

Next, 39 Ml of (KH2PO4) solution was combined with 61 Ml of (K2 HPO4). DW brought the volume up to 200 and set the PH to 7.0(16) .

Ten micrograms of phosphate puffer, ten micrograms of L-tyrosin, ten micrograms of extract, and ten micrograms of 1.5 M tyrosinase are added to each plate. After that, the mixtures were incubated for 12 minutes at 37 °C, after that the reaction was stopped by putting in the ice for 1 min. then the absorbance of the mixtures measured at 490 nm(17)(18)

Result:

Table (1) Tyrosinase inhibition activity

Samples / Replications	Control	Sample 1	Sample 2
1	0.446	0.279	0.207
2	0.438	0.273	0.203
3	0.436	0.282	0.202
Mean ±SD	0.440 ± 0.09855399	0.278 ± 0.09855399	0.204 ± 0.09855399

Table (2) The tyrosinase inhibition percentage

Sample	% of inhibition
Sample 1	63%
Sample 2	46.36%

Discussion:

Tyrosinase plays a critical role in the melanin pathway, therefore research into compounds that inhibit it has become more important from a pharmaceutical standpoint. These compounds may be utilized to create cosmetics that have the potential to be effective skin whitening treatments for a variety of skin conditions (3)(19)

Tyrosinase inhibitors have applications in the pharmaceutical and cosmetics sectors as depigmenting agents. *L. barbarum* extracts that are currently found as natural components in several cosmetic and dermato-cosmetic products for all these the L. barbarum extract called tyrosinase inhibitor (20).

According to table (1) the results reveal that the *L. barbarum* extract has good tyrosinase inhibitory action. The findings are consistent with (Mocan.A et al, 2019) Sample 1 consistently exhibits a substantially higher tyrosinase inhibition activity (63%) compared to both the control (44%) and Sample 2 (46.36%). This difference is statistically significant, as confirmed by the low standard deviations for all samples since sample 1 has an inhibition activity of around 63% and sample 2 has an inhibition activity of 46.36%.

Conclusion:

In conclusion, our results demonstrated that the methanol extract of *L. barbarum* has agood tyrosinase inhibition activity and this indicate that it has depigmentation effect and it is good candidate to use in cosmetic preparation .

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References:

1. Moon JY, Yim EY, Song G, Lee NH, Hyun CG. Screening of elastase and tyrosinase inhibitory activity from Jeju Island plants. EurAsian J Biosci. 2010;3:41–53.
2. Kim SJMYKHHP. Tyrosinase Inhibitory Activity of 80 Plant Extracts (II). Vol. 11, Biomolecules & Therapeutics. 2003. p. 5–7.
3. Di Petrillo A, González-Paramás AM, Era B, Medda R, Pintus F, Santos-Buelga C, et al. Tyrosinase inhibition and antioxidant properties of Asphodelus microcarpus extracts. BMC Complement Altern Med [Internet]. 2016;16(1):1–9. Available from: http://dx.doi.org/10.1186/s12906-016-1442-0
4. Abdel-Daim M, Funasaka Y, Komoto M, Nakagawa Y, Yanagita E, Nishigori C. Pharmacogenomics of metabotropic glutamate receptor subtype 1 and in vivo malignant melanoma formation. J Dermatol. 2010;37(7):635–46.
5. Chung KW, Park YJ, Choi YJ, Park MH, Ha YM, Uehara Y, et al. Evaluation of in vitro and in vivo anti-melanogenic activity of a newly synthesized strong tyrosinase inhibitor (E)-3-(2,4 dihydroxybenzylidene) pyrrolidine-2,5-dione (3-DBP). Biochim Biophys Acta - Gen Subj. 2012;1820(7):962–9.
6. Chan YY, Kim KH, Cheah SH. Inhibitory effects of Sargassum polycystum on tyrosinase activity and melanin formation in B16F10 murine melanoma cells. J Ethnopharmacol. 2011;137(3):1183–8.
7. Momtaz S, Mapunya BM, Houghton PJ, Edgerly C, Hussein A, Naidoo S, et al. Tyrosinase inhibition by extracts and constituents of Sideroxylon inerme L. stem bark, used in South Africa for skin lightening. J Ethnopharmacol. 2008;119(3):507–12.
8. Chang RCC, So KF. Use of anti-aging herbal medicine, Lycium barbarum, against aging-associated diseases. What do we know so far? Cell Mol Neurobiol. 2008;28(5):643–52.

9. Ni J, Au M, Kong H, Wang X, Wen C. Lycium barbarum polysaccharides in ageing and its potential use for prevention and treatment of osteoarthritis: a systematic review. BMC Complement Med Ther. 2021;21(1):1–16.

10. Wu SJ, Ng LT, Lin CC. Antioxidant activities of some common ingredients of traditional chinese medicine, Angelica sinensis, Lycium barbarum and Poria cocos. Phyther Res. 2004;18(12):1008–12.

11. Amagase H, Farnsworth NR. A review of botanical characteristics, phytochemistry, clinical relevance in efficacy and safety of Lycium barbarum fruit (Goji). Food Res Int. 2011;44(7):1702–17.

12. Gao Y, Wei Y, Wang Y, Gao F, Chen Z. Lycium Barbarum: A Traditional Chinese Herb and A Promising Anti-Aging Agent. Aging Dis [Internet]. 2017;8(6):778. Available from: http://www.aginganddisease.org/EN/10.14336/AD.2017.0725

13. Zhao H, Alexeev A, Chang E, Greenburg G, Bojanowski K. Lycium barbarum glycoconjugates: Effect on human skin and cultured dermal fibroblasts. Phytomedicine. 2005;12(1–2):131–7.

14. Leite F de G, Júnior JAO, Chiavacci LA, Chiari-Andréo BG. Assessment of an anti-ageing structured cosmetic formulation containing goji berry. Brazilian J Pharm Sci. 2019;55:1–12.

15. Vidovic BB, Milincic DD, Kostic AŽ, Pešic MB, Marcetic MD, Djuriš JD, et al. Health Benefits and Applications of Goji Berries in Functional Food Products Development : A Review. Antioxidants. 2022;11(248):1–29.

16. Mohan C. A guide for the preparation and use of overhead and slide visuals. Calbiochem. 2006;(1):1–30.

17. Jiratchayamaethasakul C, Ding Y, Hwang O, Im ST, Jang Y, Myung SW, et al. In vitro screening of elastase, collagenase, hyaluronidase, and tyrosinase inhibitory and antioxidant activities of 22 halophyte plant extracts for novel cosmeceuticals. Fish Aquat Sci. 2020;23(1):1–9.

18. ASoo Jin Kim, Moon young Heo KB. Tyrosinase Inhibitory Activity. Vol. 11, Journal of applied pharmacology. 2013. p. 245–8.

19. Abd Razak DL, Jamaluddin A, Abd Rashid NY, Sani NA, Abdul Manan M. Assessment of Cosmeceutical Potentials of Selected Mushroom Fruitbody Extracts Through Evaluation of Antioxidant, Anti-Hyaluronidase and Anti-Tyrosinase Activity. J—Multidisciplinary Sci J. 2020;3(3):329–42.

20. Mocan A, Moldovan C, Zengin G, Bender O, Locatelli M, Simirgiotis M, et al. UHPLC-QTOF-MS analysis of bioactive constituents from two Romanian Goji (Lycium barbarum L.) berries cultivars and their antioxidant, enzyme inhibitory, and real-time cytotoxicological evaluation. Food Chem Toxicol. 2018;115:414–24.