African Journal of
Biochemistry and Molecular Biology Research

ISSN : 3434-6120

Index: Harvard, Boston, Sydney University, Dimensions, Lens, ResearchGet Scilit, Semantic, Google Scholar, Base etc

https://doi.org/10.58578/AJBMBR.v2i2.5269

Phytochemistry and Pharmacology of Oxystelma Esculentum

Abdul Wadood Chishti[1], Muhammad Akram[2], Urooj Rehman[3], Fahad Said Khan[4], Momina Iftikhar[5], Isaac John Umaru[6]

[1,5]Superior University Lahore, Pakistan; [2]Government College University Faisalabad, Pakistan; [3]Jinnah University for Women, Karachi, Pakistan; [4]University of Poonch Rawalakot Azad Kashmir Pakistan; [6]Federal University Wukari, Taraba State, Nigeria
makram_0451@yahoo.com

Article Info:

Submitted:	Revised:	Accepted:	Published:
Feb 25, 2025	Mar 10, 2025	Mar 22, 2025	Mar 27, 2025

Abstract

Several phytochemicals, including glycosides, alkaloids, flavonoids, and saponins, are present in the widespread medicinal herb Oxystelmaesculentum. These physiologically active substances contribute to the herb's pharmacological properties, which include anti-inflammatory, antioxidant, antibacterial, and antidiabetic effects. Research studies have shown that O. esculentum can be used medicinally to treat a variety of ailments, such as fever, pain, respiratory issues, and digestive issues. It may also have neuroprotective properties and help in blood sugar regulation. Even though its therapeutic qualities appear promising, more research must be done to verify its efficacy, safety, and potential for drug development.

Keywords: Oxystelma Esculentum, Phytochemistry, Bioactive Compounds, Antidiabetic Activity, Antioxidant Properties

AJBMBR Journal is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License

Introduction

Oxystelma esculentum (L.f.) Sm. is also referred to as the "rosy milkweed vine." The plant is glabrous, thin, and attracts many flower pollinators (Pal et al. 2019). The species is widely distributed from southern Asia to northern Africa. The facility was established in Iraq and Egypt. It is also found in Pakistan, Sri Lanka, India, Bangladesh, Myanmar, Nepal, and southern China. The plant is warm, bitter, tonic, expectorant, pungent, dry, and indigestible; it induces flatulence and has aphrodisiac, laxative, diuretic, and anthelmintic properties. It can additionally treat bronchitis and leucoderma (Chaudhry et al. 2019). The juice is given to children as an astringent and is used to treat cough, gleet, gonorrhea, and muscle soreness. Ulcers can be cured using the milky sap. It is used to reduce itching when combined with turpentine. This plant is widely dispersed, yet it has not received enough attention (Janjić et al. 2021).

Oxys indicates sharp, while Stelma suggests crown, i.e., a sharp crown. This climbing plant has a long, glabrous, cylindrical, weak, and densely branched stem. The leaf is usually 9 cm by 0.6 cm, simple, lanceolate, opposite, and linear, with a long petiole and a pointed tip. The subumbellate, solitary inflorescence is accompanied by pink, purple-veined, widely open flowers that hang downward and measure 2.4 cm to 4.55 cm in diameter. The corolla has five smooth-surfaced, oblong, glandular, hairless sepals in the shape of a cone, and the calyx has five petals that rotate widely and are 3.0 cm wide (Ferguson et al. 2001).

The lanceolate, oval-shaped, smooth-surfaced follicles, which range in length from 5.0 to 8.0 cm, are packed with oval-shaped, blackish seeds. They are often grown by themselves. This plant has been shown to have anthelmintic, diuretic, spermatogenetic, antitussive, laxative, and antileprotic qualities. Furthermore, it induces female fertility. Oxystelmaesculentum decoction is beneficial for ulcers, sore throats, and itches; fruit is a general tonic, antitussive, anthelmintic, and muscle spasm; the whole plant is used as hepatoprotective and useful in lung inflammation and skin diseases (leukoderma) (Chishti et al. 2024).

Subsequently, researchers determined that Oxystelmaesculentum contained water, fibers, proteins, lipids, and carbs (Rai et al. 2024). A collaborative effort of researchers has identified the chemical substances oxystine, esculentine, and oxysine, which are effectively pregnaneglycosides. During repeated column chromatography with methanol and chloroform (96:4) as the eluent, oxystine was obtained from the diethyl ether extract of the

root. The triglycoside of calogenin has been determined to be pregnane glycoside oxysine, which is separated by column chromatography using chloroform methanol (24:1) as the solution. Through utilizing column chromatography of the methanol extract with chloroform and methanol in a particular ratio (24:1) as eluent, esculentin—an additional pregnane glycoside—was also extracted from the root. Esculentin was discovered to be a triglycoside of sarcogenin. Three cardenolides have been identified from the root extract of Oxystelmaesculentum: Oxystelmosid, a diglycoside of uzarigenin; Oxyline, a tetraglycoside of 3-epi-uzarigenin; and Oxystelmine, a diglycoside of periplogenin (Voitenkov et al. 2023).

Pharmacology of *Oxystlma esculentum*

A particular group of Swiss albino rats was chosen, and they were given Ehrlich's ascites carcinoma. Oxystelmaesculentum leaf methanol extract was utilized to treat them. (Xavier et al. 2022). The final result showed that the tumor volume, active cell count, and hematocrit were all significantly reduced. The methanol extract improved the hemoglobin count and red blood cells while reducing the white blood cell count, which became higher during the initial appearance of the sickness. (Ikewuchiet al. 2011). Additionally, this extract raises gonadotropin hormone levels while lowering LPO levels. According to this study, Oxystelmaesculentum leaf methanol extract exhibits significant anticancer properties. The in vitro model was used for the experiments. The results obtained demonstrated that as the content of Oxystelmaesculentum leaf methanol extract increased, it also enhanced its antioxidant activity. It had been shown that the methanolic extract scavenged the superoxide produced by the PMS/NADH/NBT combination. In addition, it has been determined to prevent sodium nitroprusside's production of nitric oxide radicals. This was additionally shown to suppress the hydroxyl radical generated by the Fe^{3+}/ascorbate/EDTA/H_2O_2 system. The methanolic extract of Oxystelmaesculentum eliminates hydrogen peroxide in a manner that depends on the dose (Ashokkumar et al. 2008).

Antimicrobial Activity

The group of scientists studied Oxystelmaesculentum leaves' antibacterial properties in a variety of extraction solvents. The research results suggested that many kinds of gram-

positive and gram-negative infections may be treated. Additionally, the extracts indicated antifungal properties against Candida neoformans and Candida albicans (Stan et al. 2021).

Diuretic Activity

The diuretic properties of a methanol extract of the aerial components of Oxystelmaesculentum (methanoic extract) has been examined in male Wistar albino rats at 5- and 24-hour intervals. The animals were treated with control, urea, furosemide, 200 mg/kg, and 400 mg/kg MEOE.

When the clinical study got started, all of the rats were given a saline pretreatment, and the MEOE was injected intraperitoneally. Urine volume (in milliliters) and electrolyte excretion (Na+, K+, Ca2+, and Cl^-) were recorded at 5 and 24 hours. The output of urine produced significantly ($p<0.001$) in the urea, furosemide, and both MEOE groups. In a dose-dependent way, MEOE increased the quantity of urine and sodium and potassium balance.

The results obtained correspond to the traditional statement that Oxystelmaesculentum is utilized as a diuretic through evidence that methanolic extract is an effective hypernatremic, hyperkalemic, hypercalcemic, and hyperchloremic diuretic (Leli et al. 2022).

Hepatoprotective Effect

Oxystelma esculentum methanol extract's potential to protect rats against paracetamol-induced hepatotoxicity has been studied along with the possible mechanisms at action. At 200 and 400 mg/kg, MEOE (methanol extract of Oxystelmaesculentum) substantially raised glutathione, superoxide dismutase, and catalase levels in a dose-dependent manner while reducing lipid peroxidation, bilirubin, and serum enzyme activity. This contributed to an observed hepatoprotective effect (Pingili et al. 2020).

Laxative activity

Petroleum ether extract demonstrated a similar mechanism of action for alleviating constipation caused by loperamide, exhibiting the same laxative effectiveness as agar-agar. This demonstrates the plant's well-known laxative properties. Cardenolides, flavonoids, phenolics, sterols, and triterpenoids were found in the petroleum ether extract after

phytochemical screening, which may have revealed the underlying source of the laxative effect (Alamgir et al. 2018).

Conclusion

Oxystelma esculentum contains cardenolides and pregnane glycosides. Such components are found in very few plants. It is easily and affordably produced. Many more compounds with significant medicinal qualities can be made from these phytochemicals. Major worldwide concerns include bacterial infections, stress-related diseases, cancer, hepatitis, and urinary problems have been exacerbated by changes in the climate and lifestyle. This herb has strong anti-cancer properties, according to research.

References

Alamgir, A. N. M., &Alamgir, A. N. M. (2018). Secondary metabolites: Secondary metabolic products consisting of C and H; C, H, and O; N, S, and P elements; and O/N heterocycles. *Therapeutic use of medicinal plants and their extracts: volume 2: phytochemistry and bioactive compounds*, 165-309.

Ashokkumar, D., Mazumder, U. K., Gupta, M., Senthilkumar, G. P., &Selvan, V. T. (2008).Evaluation of Antioxidant and Free Radical Scavenging Activities of Oxystelmaesculentum in various in vitro Models. *Journal of Complementary and Integrative Medicine*, *5*(1).

Chishti, A. W., Ahmad, K., &Akram, M. (2024).Exploring the Phytochemistry and Therapeutic Applications of. *Oxystelmaesculentum*.

Chaudhry, B. (2019). *A handbook of common medicinal plants used in Ayurveda*. Kojo Press.

Ferguson, C., Felger, R. S., & Johnson, M. B. (2001).Species Accounts. *The Trees of Sonora, Mexico*, 35.

Janjić, V. (Ed.).(2021). *Plant-Caused Skin Disorders*.Cambridge Scholars Publishing.

Ikewuchi, J. C., Onyeike, E. N., Uwakwe, A. A., &Ikewuchi, C. C. (2011). Effect of aqueous extract of the leaves of Acalyphawilkesiana 'Godseffiana'MuellArg (Euphorbiaceae) on the hematology, plasma biochemistry and ocular indices of oxidative stress in alloxan induced diabetic rats. *Journal of Ethnopharmacology*, *137*(3), 1415-1424.

Leli, K., Warren, G., Horras, S., Bepko, J., & Longstreet, N. (2022).Fluid, Electrolyte, and Acid–Base Disorders. In *Family Medicine: Principles and Practice* (pp. 1359-1377). Cham: Springer International Publishing.

Pal, S., &Mondal, S. (2019). Floral biology, breeding system and pollination of Oxystelmaesculentum (Lf) Sm. *The International Journal of Plant Reproductive Biology*, *11*(2), 176-181.

Pingili, R. B., Challa, S. R., Pawar, A. K., Toleti, V., Kodali, T., &Koppula, S. (2020). A systematic review on hepatoprotective activity of quercetin against various drugs and toxic agents: Evidence from preclinical studies. *Phytotherapy Research*, *34*(1), 5-32.

Rai, E. (2024). *Evaluation Of Nutrient Content, Antioxidant Potential And Antimicrobial Activity Of Selected Wild Edible Fruits* (Doctoral dissertation).

Stan, D., Enciu, A. M., Mateescu, A. L., Ion, A. C., Brezeanu, A. C., Stan, D., &Tanase, C. (2021). Natural compounds with antimicrobial and antiviral effect and nanocarriers used for their transportation. *Frontiers in pharmacology*, *12*, 723233.

Voitenkov, E. E., &Chelladurai, G. Annals of Pharma Research Review Article.

Xavier, T. F., Sabitha, R., &Balavivekananthan, S. (2022). In vitro pharmacological investigations of Oxystelmaesculentum R. Br. and in silico molecular docking analysis of its leaf constituents on diabetic related target. *South African journal of botany*, *149*, 320-338.