

Phytochemistry and Pharmacology of Oxystelma Esculentum

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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

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 *Oxystelma 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 *Oxystelma esculentum* (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^+ , Ca^{2+} , 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 *Oxystelma esculentum* 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 *Oxystelma esculentum*) 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.

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