AN OVERVIEW ON THE PHARMACOLOGICAL ACTIVITIES OF URENA LOBATA

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Abstract

Urena Lobata, , a medicinal plant is widely used to cure variety of diseases. Considerable research has been carried out so far to elucidate the phytochemicals present in it along with its bioactivity. In this review we have consolidated the phytochemical constituents and pharmacological activities of *Urena Lobata*. Numerous biological activities of *Urena Lobata* include anti-inflammatory, anti-diabetic, anti-diarrheal, anti-microbial, anti-cancer, and anti-ulcer properties.

Keywords : *Urena Lobata*, antimicrobial, anti-inflammatory, antidiabetic

INTRODUCTION

Medicinal plants are the potential sources of modern medicines; many drug lead molecules are directly derived from bioactive natural products. They form the source of critically potent medicines for life saving applications. The main advantage of traditional plant-based medicine over chemotherapy is its easy availability and safety, they are cost effective, accessible, impart natural healing and have low side effects. The traditional medicinal practices and medicines derived from natural products were found to have minimal side effects, which are generally used readily after preparation or making into suitable forms such as pills, syrups, formulations or decoction. The processing technology does not involve hazardous chemicals or multistep syntheses, which in turn increases their acceptance for medicinal practices. A large number of herbs, shrubs, trees and even their parts are used as lifesaving medicines. [1-2] Several plants are known to be used in the biosynthesis of metal nanoparticles.[3] Numerous medicinal plants and their therapeutic action has been discussed in Ayurveda as well.

Urena lobata belonging to the family Malvaceae, is found in Bangladesh, India and China.[4]. It is commonly known by the name Caesar weed or Congo, a shrub usually seen in the tropical and sub-tropical regions, which grows up from 0.5 m to 2.5 m tall and has pink flowers.[5]

Figure 1: *Urena Lobata* habitat

The extract of leaves and roots are used in the treatment of various diseases. The root of *Urena Lobata* is a popular diuretic. The flowers are used as expectorant. The root finds application as an abortifacient. Traditionally the plant is used in the treatment of gonorrhoea, febrifuge, rheumatism, wounds etc [6]. It was also reported that, they exhibit antioxidant activity [7,8,9], antimicrobial [10,11], analgesic, anti-inflammatory [12,13,14], immunomodulatory, hypoglycaemic effect [15], anti-diarrheal [16,17], hypolipidemic [18] and anti-fertility/spermatogenesis effect [19]. This review consolidates the pharmacological activities of *Urena Lobata.*

Chemical constituents of Urena lobata

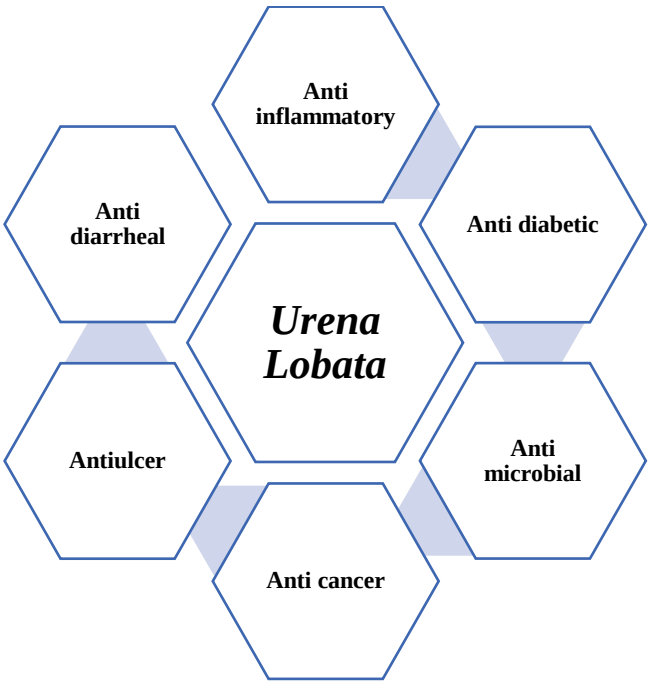
Urena Lobata contains both macro and micro nutrients in sufficient quantity which is found to vary in different parts of the plant. A.O. Egbebi et.al. reported the total chemical composition of *Urena lobata* (Table 1).[20]. It was found that the methanolic extracts of leaves of *Urena Lobata* contains tannins, alkaloids, flavonoids and saponins.

Sl No.	Composition	Percentage
1.	Moisture	7.21
2.	Crude Fibre	6.31
3.	Carbohydrate	47.53
4.	Crude protein	19.79
5.	Fat	10.21
6.	Ash	8.95
7.	Calcium	42.09
8.	Copper	0.31

9.	Iron	9.35
10.	Magnesium	35.38
11.	Manganese	0.81
12.	Potassium	35.38
13.	Sodium	29.48
14.	Zinc	51.55
15.	Phosphorus	24.9

Table 1: Chemical compositions [20]

Various biological activities of *Urena Lobata* is consolidated in Scheme 1.



Scheme 1: Therapeutic activities of Urena Lobata

Anti inflammatory

Urena Lobata is used in the treatment of anti-inflammatory diseases.[18] Studies by P.L. Rajagopal et.al. on the aqueous extract of *Urena Lobata* exhibits concentration dependent anti-inflammatory activity , even at 500 microgram/ml, which was comparable with that of diclofenac sodium.[22] An in-silico study on the leaf extract of *Urena Lobata* done by Doti Wahyuningsih et.al., shows that the ethanolic extract of the plant shows promising anti-inflammatory activities. Ultra- High -Performance Liquid Chromatography was used to analyze the active ingredients in the extract. Pharmacokinetic properties were evaluated using pkCSM online tool.[13] Stigmasterol, β-sitosterol mangiferin, gossypetin and chrysoeriol were

the active compounds found in *Urena Lobata* (Figure1). Molecular docking study indicated that stigmasterol and β-sitosterol of *Urena Lobata* have strong anti-inflammatory activity as is evident from inhibition constant (Ki) value against PLA-2 and COX-2. The prediction of ADME (Absorption, distribution, metabolism and excretion) also indicated good properties.[13] Yudi Purnoma et.al. demonstrated that the leaf extracts from *Urena lobata* have significant anti-inflammatory properties. An in-vivo study was done by orally administrating the extract to Wistar rats and ADME prediction was carried out. [14]

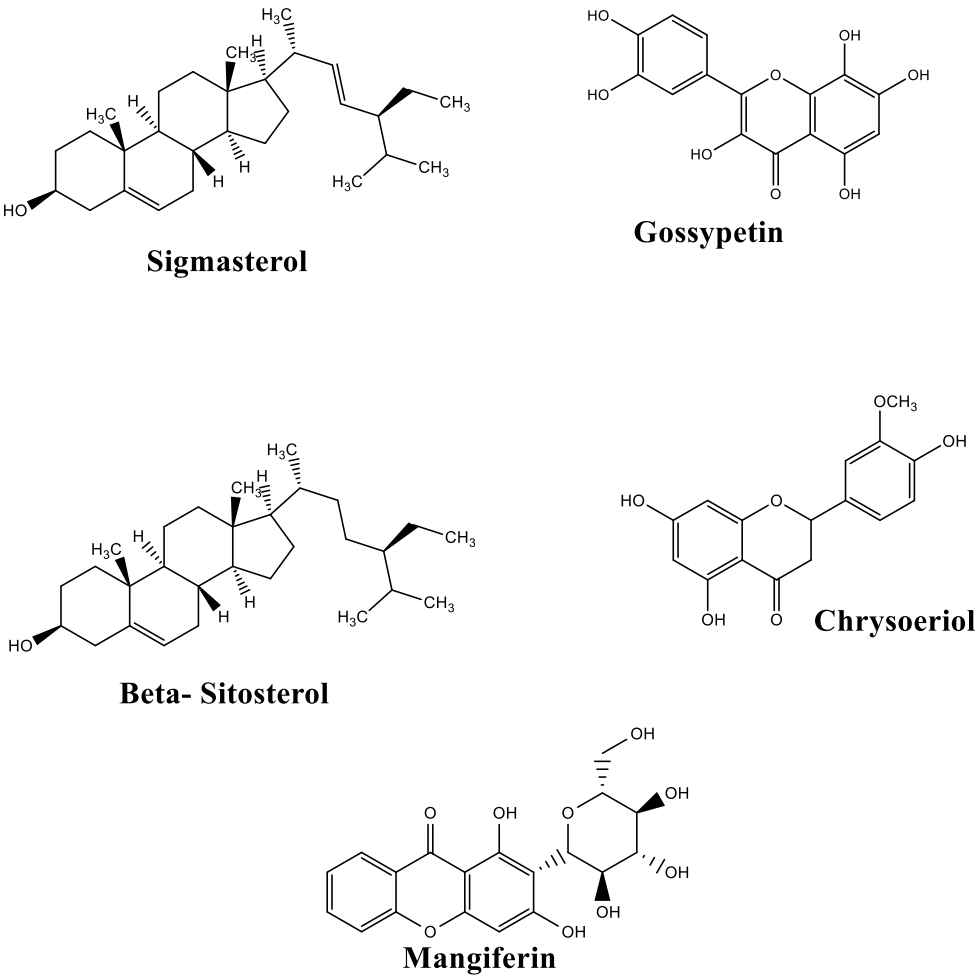


Figure 2: Structures of active compounds found in *Urena Lobata.*

Anti diabetic activity

Streptozotocin, an active component present in *Urena Lobata* can induce anti- hyperglycemic effect. Purnomo et al. studied anti-hyperglycemic effect of *the aqueous* extract and ethanolic extract by inhibition of Dipeptidyl Peptidase IV (DPP-IV) on diabetic rats. The extracts from

Urena Lobata decreases DPP-IV level and blood glucose AUC and increases insulin level and GLP-1. Aqueous extract shows decrease in DPP-IV and blood glucose and increase in insulin level and GLP-1 than the ethanolic extract. [23].

Anxiolytic

Islam et.al., studied anxiolytic effect in the methanolic extract of *Urena Lobata* by an in-vivo study in Swiss albino mice. The mice were treated with the extract and compared with the standard diazepam. The methanolic extract have a significant anxiolytic effect in different experimental animals. In open field behavioral test the methanolic extract showed dose dependent changes in behavioral pattern. The highest effect were observed for 500mg/kg of methanolic extract. Flavonoids, alkaloids, terpenoids are the major secondary metabolites responsible for the anxiolytic effect of *Urena Lobata*.[26] K. Ashok et.al. demonstrated anxiolytic activity of ethanolic extract of Urena Lobata with a variable dosage from 250–500mg/kg. They conducted four separate behavioral tests, the results were verified with animal model. A maximum load of 500mg/kg of *Urena Lobata* leaf extract in ethanol shows efficient anxiolytic effect compared to standard drugs.[27]

Anticancer

Cancer is the most dreaded disease condition of overgrowth of cells or tissues. *Urena lobata* has been used as constituent for different formulations for cancer treatment in traditional medicinal practices. R. Mathappan et.al. studied the anticancer activity of *Urena Lobata* against Ehrlich ascites carcinoma (EAC) cell lines in Swiss albino mice. The study was done on both methanolic extract and aqueous extract. The two extracts show significant reduction in tumour volume.[28] Constant Anatole Pieme and coworkers studied both anti-cancer and antioxidant activity of methanol extracts against breast cancer cell lines. With an IC_{50} of 181 for *Urena Lobata*, the antiproliferative activity data showed a considerable decrease in cell viability. After 24, 48, and 72 hours, the extract showed a substantial reduction in cell viability and a linear correlation at a concentration of 100 mg/ L. A substantial difference in the activities of catalase, glutathione-S-transferase, and superoxide dismutase was discovered. MB-MDA435 cell lines significantly benefited from the proliferative and antioxidant effects of *Urena Lobata* and its extract. [29]

Antiulcer

Peptic ulcer disease (PUD) is a serious gastrointestinal disorder. A number of synthetic drugs eventhough available to treat ulcers, many of them are found to be expensive with side effects when compared to herbal medicines. Singare et al. studied the antiulcer properties of leaf extracts of *Urena lobata*. Isolated compounds from leaves of *Urena lobata* were studied on ethanol- induced gastric ulceration and Pylorus ligation induced gastric ulcers. In rats, different doses of the leaf extract was tested (10, 15 and 20mg/kg body weight) and the protection range was observed from 26.33 % to 71.14 % and compared with standard drug omeprazole (54.18 observed on 20mg/kg dose). Histopathological findings shows decrease in alcohol-induced ulcer in the stomach with increase in concentration of the extract.[30]

Anti diarrheal

The antidiarrheal efficacies of leaf extract of *Urena Lobata* was revealed by Yadav and Tangpu, by using murine models. The 800 mg/kg dose of methanol extracts of the leaf exhibited significant ($p < 0.001$) inhibitor activity against castor oil–induced diarrhea and PGE2-induced intrafluid accumulation. [16] In the studies by Cimanga et al., aqueous and 80% methanol extracts were provided with a dose of 200 mg/kg body weight to diarrheic Wistar rats. It significantly delayed or extended the onset time to 149.6±0.4 and 162.3±0.1 minutes compared to negative control with 85.2±0.3 minutes. The soluble fractions in chloroform, ethylacetate, n-butanol displayed the same effects as aqueous extract at different extents in both antidiarrheal tests. 80% methanol extract exhibited the maximum antidiarrheal activity [17]

Antimicrobial activity

Antimicrobial activity of ethanolic and aqueous extract of leaves of *Urena lobata* was studied against Staphylococcus aureus, Pseudomonas aeruginosa, Salmonella typhi and E coli. The extract of the leaves was taken in different solvents – chloroform, ethanol and water. Phytochemical screening was also done. Antimicrobial activity was studied using agar well diffusion method. The results showed that, the activity was more in aqueous extract and maximum zone of inhibition was obtained against Staphylococcus aureus at the concentration 300 µM/ml. [10] Majority of the clinically used antifungal agents are not much effective when recurrence of the disease is considered. Hence natural anti-fungal agents are gaining importance. Microorganisms that asymptomatically colonise inside the tissue of a host plant and maintain mutualistic association for part or whole of lifecycle are called endophytes. A study done by Fokou et.al. on the activity of bacterial endophytes isolated from *Urena lobata* on different candida species revealed that, the MIC range from 100 µg/ml and 200 µg/ml. and

time kill kinetics study revealed that action started between 3-9 hrs after contact with the extract. [11]

Toxicity

Toxicity study of ethanolic extract of the leaf of *Urena lobata* was done by Islam et.al. on *Allium sativum* [31]. The ethanolic extract of the leaf at different concentrations were exposed to *Allium sativum*, and the root number and the length of the root was measured and compared with its growth on exposure to $CuSO_4$ (reference standard). The results suggested that, both ethanolic extract and $CuSO_4$ reduces the root growth in a dose dependent manner. A decrease in the number of roots was also observed at higher concentration of the ethanolic extract of the leaf

Wound healing

Considerable amount of work has been done during the past several years to develop wound healing agents.Hydroalcohol extract of *Urena Lobata* was subjected to chick embryo wound model studies by R.Thirumalaikumaran et.al.This study shows that the dosage of the plant extract is directly dependant on the percentage of wound closure. The hydro alcohol extract showed good dose-dependent healing potency. The hydro alcoholic extracts at 500 µg/ml concentration showed 51% wound contraction compared to the positive control which showed 79.21 % and the negative control which showed no significant wound closure. The extract exhibited better angiogenic properties from neovascularization studies. Angiogenesis was morphometrically analysed and tabulated. The hydro alcoholic extract was more angiogenic than the aqueous extract in terms of increase in number and thickness of blood vessels than the aqueous extract.[32] Wound healing activity of methanolic extract in albino rats was performed by Mathappan et.al using two doses -200mg/kg and 400mg/kg. Mortality was not observed up to 4g/kg. A significant wound contraction and reduction in the period of epithelialization was observed. The wet and dry tissue weight as well as the hydroxyproline content was found to be more in case of 400mg/kg .[33]

Antioxidant activity

In Ayurveda, *Urena lobata* is frequently utilized to alleviate the signs of aging and other related problems. The diverse phytochemicals found in *Urena Lobata* can induce the regulation of homeostatic mechanism. Thus, this plant can be used effectively against oxidants; there are recent reports to substantiate the antioxidant activity of *Urena Lobata.* M.S Latha et. al reported

in-vitro lipid peroxidation inhibition by the methanolic extract of *Urena Lobata* roots, which scavenged hydroxyl and superoxide radicals. The root extract of *Urena Lobata* has exhibited IC_{50} values of 470.60 ug/ml, 1627.35 ug/ml, and 1109.24 ug/ml for scavenging superoxide radicals, hydroxyl radicals, and lipid peroxidation, respectively.[34] C.A. Pieme et. al. evaluated the in vitro antioxidant properties of methanolic extract against breast cancer cell lines (MB-MDA 435 cells). The proliferation of cell proliferation was found to be in concentration dependent manner. [29]In vitro tests using the compound 1,1 diphenyl-2-picryl-hydrazyl (DPPH) were performed on the crude extract by Ali et.al. Analysis was done on *Urena Lobata* total phenolic and flavonoid content. The sample was found to efficiently scavenge the free radicals at all the concentrations under investigation thus exhibiting strong antioxidant activity. Cytotoxic activity was evaluated using a brine shrimp fatality bioassay using vincristine sulphate as the reference substance. The antioxidant outcomes were contrasted with those of common antioxidants like ascorbic acid and quercetin.[35]

CONCLUSION:

This study concluded that *Urena Lobata* contains a variety of significant phytochemicals. Some of them clearly exhibit interesting biological properties, such as anti-inflammatory, anti-cancer, anti-ulcer, anti-diabetic, anti-diarrheal etc. After extensive studies on mechanism of action & pharmacological effects it would be easier to develop novel drugs from *Urena Lobata* extracts. It is expected that it could eventually be used as a novel medicine to treat a variety of ailments.

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