

Saponins and Flavone Glycosides in *Tridax procumbens*: Characterization and Biological Activities

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ABSTRACT- *Tridax procumbens*, a common grass indigenous to tropical southern Nigeria, has garnered attention for its pharmacological properties, including antimicrobial effects and wound healing stimulation. The plant's extract contains various compounds such as flavones, glycosides, polysaccharides, and monosaccharides. Saponins, characterized by their molecular structure as triterpene or steroid glycosides, are widely distributed in higher plants and marine animals. In this study, *Tridax procumbens* leaves were collected from central India and subjected to extraction using diethyl ether, 90% alcohol, and water. The resulting crude extracts were examined for the presence of saponins, a class of compounds known for their diverse biological activities. Primary examination of the plant extract revealed the presence of 5,7,4-Trihydroxy-6,3-Dimethoxy flavone molecule, indicating potential therapeutic compounds.

Further experimental investigation focused on the indigenous plant extract's antiasthmatic effect on experimental animals' mast cells. The water and alcoholic extracts were administered at varying doses, showing significant inhibition of histamine release from mast cells, with the 90% alcoholic extract demonstrating maximum inhibition (67%) at a dose of 100 mg/kg body weight. These findings suggest promising mast cell histamine inhibitory activity in the compounds isolated from *Tridax procumbens*. The results correlate with prior studies, supporting the potential medicinal value of this plant. Overall, the study underscores the potential of *Tridax procumbens* as a source of bioactive compounds with antiasthmatic properties, warranting further research into its therapeutic applications.

Keywords- *Tridax procumbens*, Saponin, Antihistaminic, Inhibition.

1. INTRODUCTION

Tridax procumbens, belonging to the Compositae family, is a prevalent grass species found in the tropical regions of southern Nigeria, thriving particularly during the rainy season. Extensive research has highlighted the pharmacological potential of *Tridax procumbens* extract, showcasing its diverse effects, including antimicrobial activity against both gram-positive and gram-negative bacteria and its ability to

promote wound healing. Studies have identified various compounds within the leaves of *Tridax procumbens*, including flavone glycosides, polysaccharides, and monosaccharides, contributing to its therapeutic properties. The term "saponins" derives from the Latin word "sapo," meaning soap, reflecting their historical association with detergent-like properties. Saponins were initially defined based on their surface-active behaviour; however, contemporary

classifications emphasize their molecular structure, specific triterpene or steroid glycosides. Despite their traditional designation, exceptions to their surface activity exist, leading to a more nuanced understanding of their characteristics. Saponins are ubiquitously present in various sources, with higher plants such as *Quillaja Saponaria* (Soap bark), *Saponaria officinalis* (Soapwort), and *Sapindus saponaria* (Soapberry) serving as common origins.

Additionally, lower marine animals belonging to the Echinodermata phylum, including Holothuroidea (Sea cucumbers) and Asteroidea (Starfishes), also contain saponins. This broad distribution underscores the importance of saponins across diverse ecosystems and highlights their potential for medicinal and industrial applications. Understanding the sources and properties of saponins provides valuable insights for harnessing their therapeutic potential, with *Tridex procumbens* emerging as a promising candidate for further investigation and exploitation in pharmaceutical and healthcare industries.

MATERIAL AND METHODS

Plant Material: *Tridex procumbens* is an abundant annual weed in central India. Fresh leaves of this plant were harvested from Agariya Chopda, Raisen (M.P.). Dr. Pramod Patil, a botanist, conducted botanical identification.

Extraction of *Tridex procumbens*: The collected plant material was thoroughly washed with water. Subsequently, the air-dried plant material was ground into a powder extracted using diethyl ether, 90% alcohol, and water employing a Soxhlet apparatus. The weight of the powdered material used for extraction was 600 grams in 600 millilitres of solvent. The extraction process

yielded a greenish-coloured semisolid crude extract comprising approximately 1.8 grams of diethyl ether, 3.84 grams of 90% alcohol, and 16.5 grams of water. The obtained crude extracts were utilized for experimental bioassays.

The yield of Crude Extract by Soxhlation: No specific data regarding the yield of the crude extract by Soxhlation is provided in this section.

Table 1. Extraction Yield of *Tridex procumbens*

PM	S	MW	SV	WoE
TP	DE	600 gm.	600 ml.	1.8 gm.
TP	90% A	600 gm.	600 ml.	3.84 gm.
TP	Water	600 gm.	600 ml.	16.5 gm.

PN=Plant Name, S= Solvent , DE= Diethyl Ether, TP= *Tridex procumbens*, A= Alcohol, SV = Solvent Volume , MW= Material Weight, WoE=Weight of Extract

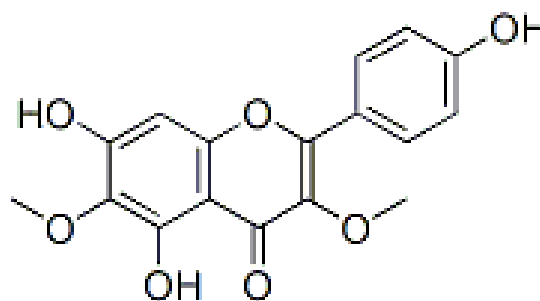


Figure 1. Molecular Structure of 5, 7, 4-Trihydroxy-6,3-Dimethoxy Flavone.

Primary Examination of Saponin in the Plant Extract: Saponins are polar compounds containing glycosides and steroidal compounds. Their detection in plant material involves taking a small amount of the material in a beaker or test tube and vigorously shaking it. The persistence of foam indicates the presence of saponins. While saponins were historically considered toxic, certain glycosides, especially cardiac glycoside saponins, are non-toxic and find use in various medicinal applications. The presence of 5,7,4-Trihydroxy-6,3-Dimethoxy flavone molecules was indicated by the roots of *Tridex procumbens*.

EXPERIMENTAL

The antiasthmatic effect of indigenous plant extracts on mast cells of experimental animals was investigated in this study. Inhibition of mast cell granulation was observed during the study, following treatment with three herbal drugs isolated by the Principal Investigator (PI) and Project Fellow (PF). Specifically, saponins were isolated, with the detailed structure of the compound identified as 5, 7, 4-Trihydroxy-6, 3-Dimethoxy flavone molecule as shown in Figure 1. In order to assess the effectiveness of the extracts, both water and alcoholic extracts of *Tridax procumbens* were administered at varying doses (25, 50, and 100 mg/kg body weight) to experimental animals. The results demonstrated significant inhibition of histamine release from mast cells, particularly with the 90% alcoholic extract of *Tridax procumbens*.

Table 2. Percentage Inhibition of Histamine Release from Mast Cells by *Tridax Procumbens* Extracts

Extract	Dose (mg/kg) body Wt.	% Inhibition	
		Exp1	Exp2
Water Extract	25	0	0
	50	20	20
	100	21	22
90% Alcohol	25	20	25
	50	35	52
	100	65	67

The table presents the percentage inhibition of histamine release from mast cells induced by both water and alcoholic extracts of *Tridax procumbens* at different doses. Notably, the 90% alcoholic extract exhibited maximum inhibition, reaching 67% at a dose of 100 mg/kg body weight. These findings underscore the potential antiasthmatic properties of *Tridax procumbens*

extracts and warrant further investigation into their therapeutic applications.

RESULT AND DISCUSSION

The study revealed significant inhibition of histamine release from mast cells by both water and alcoholic extracts of *Tridax procumbens* at doses of 25, 50, and 100 mg/kg body weight. Notably, the 90% alcoholic extract demonstrated the highest inhibition, reaching 67% at a dose of 100 mg/kg body weight. These findings strongly suggest the mast cell histamine inhibitory activity of compounds isolated from *Tridax procumbens*. Comparable results were reported by Lone (2010), who investigated the antihistaminic activity of two medicinal plants from the Kashmir valley. The observed inhibition of histamine release underscores the therapeutic potential of *Tridax procumbens* extracts in managing allergic conditions such as asthma. Further research is warranted to elucidate this activity's precise mechanisms and explore these findings' clinical implications.

CONCLUSION

The study concludes that both water and alcoholic extracts of *Tridax procumbens* exhibit significant inhibition of histamine release from mast cells, with the 90% alcoholic extract demonstrating the highest inhibition rate of 67% at a dose of 100 mg/kg body weight. These findings highlight the mast cell histamine inhibitory activity of compounds isolated from *Tridax procumbens*, suggesting its potential therapeutic use in managing allergic conditions like asthma. In terms of future scope, further research is warranted to delve deeper into the molecular mechanisms underlying the observed histamine inhibitory effects. Additionally, conducting in vivo studies to assess the safety and efficacy of *Tridax procumbens* extracts in

animal models of asthma could provide valuable insights into its clinical applicability. Furthermore, exploring the potential synergistic effects of *Tridax procumbens* extracts with other conventional asthma medications could lead to the development of novel combination therapies for improved asthma management. Overall, continued investigation into the pharmacological properties of *Tridax procumbens* holds promise for advancing our understanding of its therapeutic potential and expanding its use in clinical settings.

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