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In Vitro Evaluation of the Antiulcer Potential of Polianthes tuberosa L. Leaf Extract

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Abstract: *The present study aimed to evaluate the in vitro antiulcer potential of Polianthes tuberosa L. leaf extract. The leaves were collected, shade-dried, powdered, and extracted by the maceration method using a suitable solvent system. Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, tannins, saponins, glycosides, terpenoids, and phenolic compounds. Antiulcer activity was assessed using the acid neutralizing capacity (ANC) method and compared with a standard antacid preparation containing aluminum hydroxide and magnesium hydroxide. The extract exhibited appreciable acid-neutralizing activity with ANC values of 60.8, 42.8, and 28.8 mEq/g at concentrations of 250, 500, and 1000 mg, respectively. The findings suggest that Polianthes tuberosa leaf extract possesses significant antiulcer and gastroprotective properties and may serve as a promising natural source for ulcer management.*

Keywords: Polianthes tuberosa L., Antiulcer Activity, Acid Neutralizing Capacity, Phytochemical Screening, Gastroprotective Effect.

I. INTRODUCTION

Peptic ulcer disease is one of the most common gastrointestinal disorders affecting millions of people worldwide. It is characterized by the formation of lesions in the gastric or duodenal mucosa due to an imbalance between aggressive factors such as hydrochloric acid, pepsin, Helicobacter pylori infection, stress, alcohol consumption, smoking, and non-steroidal anti-inflammatory drugs (NSAIDs), and protective factors including mucus secretion, bicarbonate production, and mucosal blood flow.[1,2,3,4] Despite the availability of several antiulcer drugs such as proton pump inhibitors, H_2-receptor antagonists, and antacids, long-term use of these medications may result in adverse effects, recurrence, and drug interactions. Therefore, there is increasing interest in the identification of safer and more effective natural alternatives derived from medicinal plants. Medicinal plants have been used since ancient times in traditional systems of medicine for the treatment of various gastrointestinal disorders. Plant-derived compounds are considered valuable sources of therapeutic agents because of their efficacy, safety, affordability, and availability. Numerous medicinal plants possess antiulcer activity due to the presence of bioactive constituents such as flavonoids, tannins, phenolic compounds, alkaloids, saponins, and terpenoids. These phytochemicals exert protective effects through antioxidant activity, acid neutralization, enhancement of mucosal defense, inhibition of gastric acid secretion, and promotion of ulcer healing.[5,6,7,8]

Polianthes tuberosa L., commonly known as tuberose, belongs to the family Asparagaceae and is widely cultivated as an ornamental plant. In addition to its commercial importance in the perfume and floriculture industries, the plant has attracted scientific interest because of its medicinal properties. Previous phytochemical investigations have reported the presence of flavonoids, phenolic compounds, glycosides, tannins, and other secondary metabolites in different parts of the plant.[9,10] These compounds are known to exhibit antioxidant, anti-inflammatory, antimicrobial, and cytoprotective activities that may contribute to gastroprotective effects. Oxidative stress plays an important role in the pathogenesis of gastric ulcers by causing lipid peroxidation, mucosal damage, and inflammation. Natural antioxidants obtained from plants can scavenge free radicals and protect gastric tissues from oxidative injury. Flavonoids and phenolic compounds,

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in particular, have been reported to strengthen mucosal defense mechanisms and reduce ulcer formation. Therefore, plants rich in these constituents may possess significant antiulcer potential.[11,12]

The acid neutralizing capacity (ANC) test is a widely accepted in vitro method for evaluating the antacid and antiulcer properties of natural products. This method determines the ability of a substance to neutralize gastric acid and maintain a favorable gastric pH. A higher acid neutralizing capacity indicates better protection against gastric acidity and ulcer development.[13,14,15]

The present study was undertaken to investigate the antiulcer potential of *Polianthes tuberosa* L. leaf extract using the acid neutralizing capacity method. In addition, preliminary phytochemical screening was performed to identify the major bioactive constituents present in the extract. The study aims to provide scientific evidence supporting the traditional medicinal value of the plant and to explore its potential as a natural gastroprotective agent for the management of peptic ulcer disease.

II. MATERIAL AND METHOD

Preparation of the Plant Extraction

The collected leaves were washed, shade-dried for 7–10 days, and then powdered using a mechanical grinder. The powdered material was stored in an airtight container. Extraction was carried out using solvents such as ethanol/methanol/water by maceration.

Extraction (Maceration)[16,17]

Weigh about 30g of powdered leaf material. Transfer the powder into a clean conical flask or glass container. Add a suitable solvent such as: Hydroalcoholic solvent (ethanol: water) Maintain the ratio of plant material to solvent commonly as: 1:10 (Example: 30 g powder + 100 mL solvent). Seal the container properly and keep it at room temperature for 48–72 hours. Shake the mixture occasionally to improve extraction of phytochemicals. After maceration, filter the extract using muslin cloth followed by Whatman No.1 filter paper. Concentrate the filtrate using a water bath. Dry the concentrated extract and store it in a refrigerator for further phytochemical and antiulcer studies.

Practical Yield of Extract by Maceration Method:

Plant Material: Polianthes tuberosa L. leaves

Weight of powdered material used: 40.43 g

Formula for Percentage Yield

$$\text{Percentage Yield} = \frac{\text{Weight of Extract Obtained}}{\text{Weight of Powdered Material}} \times 100$$

Phytochemical screening

A medicinal plant's therapeutic efficacy is determined by its phytoconstituents, either separately or in combination. Among the significant phytochemicals with a variety of biological activity are alkaloids, flavonoids, phenolics, tannins, saponins, steroids, glycosides, terpenes, and more. By identifying the phytochemicals, one can predict a plant's pharmacological action. The traditional qualitative assays are still widely used for the first phytochemical screening of plants, while phytochemicals are now identified using a variety of modern methods.[18]

Method used for the An Acid neutralizing capacity (ANC):[19,20]

Considering every product had a pH of 3.5 or above based on the PAT, the ANC was calculated for each brand. A 25 ml beaker was filled with an exact volume (5 mL) of the antacid suspension, which was then weighed. After that, the suspension was poured into a 250 ml beaker, filled to 70 ml with carbon dioxide-free distilled water, and swirled for a minute. After 15 minutes of stirring, a precise volume of 30 ml of 1.0 N HCl was pipetted into the solution. 0.5 N NaOH (VS) was used to titrate the an excess HCl in order to reach a pH threshold of 3.5. The experiment was

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conducted using a magnetic stirrer at a temperature of 37 °C ±3 °C for the various brands and batches. The amount of acid ingested in milliequivalents (mEq) per gram of antacid was calculated.

Fig No 1 (ANC testing results)

III. RESULT

The *Polianthes tuberosa* L. leaf extract showed significant acid neutralizing capacity, indicating notable in vitro antiulcer potential. The extract effectively reduced acidity and maintained buffering action, suggesting the presence of bioactive phytochemicals. This activity may be attributed to compounds such as flavonoids, tannins, and saponins, which contribute to gastric protection through acid neutralization and antioxidant effects. A concentration-dependent response was observed, indicating enhanced activity at higher doses. Overall, the findings sup-port the gastroprotective and antiulcer potential of *Polianthes tuberosa* L. leaves, though further in vivo studies are required for confirmation.

Maceration of extract Practical Yield and Percentage yield:

The maceration of *Polianthes tuberosa L.* leaf powder (40.43 g) practically yielded **5.26 g** of crude extract with a **percentage yield of 13.01%**. The extract obtained was dark green and semi-solid in nature.

Phytochemical analysis

Polianthes Tuberosa L leaf extract has successfully had its starch extracted using a straight forward extraction method. The Phytochemical analysis of extracted starch carried out and result are as follow.

Table No. 1 Phytochemicals Present in *Polianthes Tuberosa L.* Leaves

·ochemical Constituent	Test Used	Observation	sult
Alkaloids	Dragendorff's Test	dish precipitate	ent (+)
Flavonoids	Alkaline Reagent Test	Pink colour	ent (+)
Tannins	c Chloride Test / Byemer's Test	e-black colour	ent (+)
Saponins	Foam Test	Stable froth	ent (+)
Glycosides	Keller–Killiani Test	Brown ring	ent (+)

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Terpenoids	Salkowski Test	lish-brown layer	ent (+)
Phenols	Ferric Chloride Test	ark coloration	ent (+)

Maceration Extraction Procedure

Maceration is a simple and widely used method for extracting active constituents from plant materials. In this method, the powdered plant material is soaked in a suitable solvent for a specific period to dissolve the bioactive compounds. It is commonly used in herbal research because it is easy, cost-effective, and does not require special equipment.

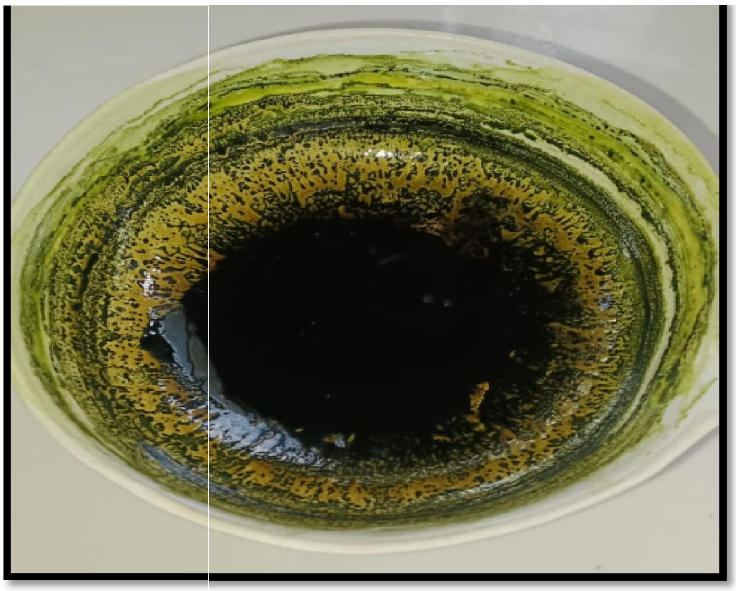

Fig. No. 1. Maceration Extraction

Acid neutralizing capacity

Table No. 2 Effect of sample (Polianthes tuberosa l. leaves extract) on Acid neutralizing capacity

No.	Sample	ce (mg)	H Used (mL)	Consumed (mEq)	(mEq/g)
1	Control	–	35.6	4.4	–
2	$H)_3 + Mg(OH)_2$	250	15.7	24.3	97.2
		500	9.3	30.7	61.4
		000	5.4	34.6	34.6
3	ample Extract	250	24.8	15.2	60.8
		500	18.6	21.4	42.8
		000	11.2	28.8	28.8

The acid neutralizing capacity (ANC) study demonstrated that both the standard antacid and *Polianthes tuberosa* leaf extract were capable of neutralizing gastric acid. The standard antacid [$Al(OH)_3$ + $Mg(OH)_2$] showed higher ANC values compared to the plant extract at all tested concentrations. However, the leaf extract exhibited appreciable acid-neutralizing activity, with ANC values of **60.8, 42.8, and 28.8 mEq/g** at concentrations of **250, 500, and 1000 mg**, respectively. These findings suggest that *Polianthes tuberosa* leaf extract possesses potential antacid and antiulcer properties, which may contribute to its gastroprotective effects.

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IV. CONCLUSION

The present study evaluated the in vitro antiulcer potential of *Polianthes tuberosa* L. leaf extract using the acid neutralizing capacity (ANC) method. Preliminary phytochemical screening confirmed the presence of several important bioactive constituents, including alkaloids, flavonoids, tannins, saponins, glycosides, terpenoids, and phenolic compounds. These phytochemicals are known to possess antioxidant, anti-inflammatory, and gastroprotective properties, which may contribute to the antiulcer activity of the plant. The acid neutralizing capacity study demonstrated that the leaf extract was capable of neutralizing gastric acid and maintaining buffering activity. Although the activity was lower than that of the standard antacid preparation containing aluminum hydroxide and magnesium hydroxide, the extract exhibited appreciable acid-neutralizing effects at all tested concentrations. The observed activity may be attributed to the presence of flavonoids, tannins, and phenolic compounds, which help protect the gastric mucosa from excessive acidity and oxidative damage. The final conclusion indicates that *Polianthes tuberosa* L. leaf extract possesses significant antiulcer potential and may serve as a promising natural source of gastroprotective agents. Further in vivo studies and isolation of active constituents are recommended to confirm its therapeutic efficacy and mechanism of action.

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