

A Comprehensive Review on Botanicals as Anti-ulcer Therapeutics: Prospective Avenues of Biocompatible Drug Discovery

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Abstract

Peptic ulcer is a frequent disease of the Gastro Intestinal tract. It is mostly an inflamed break in the skin or the mucus membrane lining the alimentary tract. When there is a disturbance of the normal equilibrium caused by either enhanced aggression or diminished mucosal resistance ulceration occurs. Divergent to trendy belief, ulcer is not caused by spicy food but instead is most usually due to either an infection or long term use of medications. A combination of drugs like antibiotics and proton pump inhibitors is standard treatment of the peptic ulcer. However these drugs are expensive and are probable to produce more side effects when compared to herbal medicines. Nevertheless, many studies revealed that Botanicals and their phytochemicals can efficiently treat peptic ulcer in humans and a range of animal models. In the present review, attempts have been made to recognize about some of the common Indian medicinal plants which may be used in treatment or prevention of peptic ulcers.

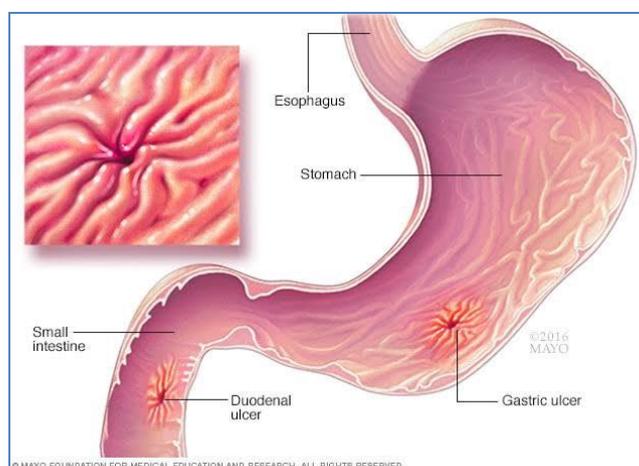
Keywords: Peptic ulcer, Botanicals, Phytochemicals & Herbal medicine.

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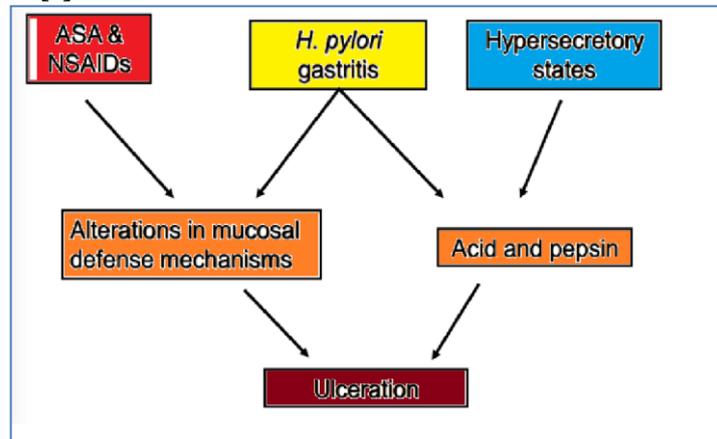
INTRODUCTION

An ulcer is the inflamed crack in the skin or mucus membrane lines the stomach or duodenum. Peptic ulcer is the most frequent disease of the GI Tract. When there is a disturbance of the normal equilibrium caused by either enhanced aggression or diminished mucosal resistance ulceration occurs [1]. Bile acid regurgitation also may injures the gastric mucosa and weakens the barrier of gastric mucosal. The main cause

of peptic ulcer includes *H.pylori* infection Non-steroidal anti-inflammatory drugs, critical illness (stress-related mucosal damage) however some uncommon causes includes Hyper-secretion of gastric acid (e.g., Zollinger-Ellison syndrome), viral infections (e.g., *cytomegalovirus*), vascular insufficiency (crack cocaine-associated) Radiation Chemotherapy and rare genetic subtypes [2].



Peptic ulcer

Pathogenesis of Peptic ulcer [3]

Major part in all traditional systems of medicine constitutes an herbal drug. There are approximately 1300 Indian medicinal plants which are

used in formulating therapeutic preparations according to Ayurvedic and other traditional systems of medicine [4, 5].

Role of Phytochemicals in Peptic Ulcer

Phytochemicals	Proposed Mechanism of Action	Reference
Flavonoids	<ul style="list-style-type: none"> • Anti-secretory mechanism of action of Quercetin. • Flavonol has antihistaminic properties, thus, decreases histamine levels, as well as preventing the release of histamine from gastric mast cells and inhibiting the gastric H⁺/K⁺ proton pump, diminishing acid gastric secretion. • Chalcones, possess cyto-protective effects, which increase the mucosal blood flow, stimulate the synthesis of muco-substances in the gastric mucosa and increase PGs levels. • Antioxidant potential (garcinol, rutin and quercetin). 	6
Tannins	<ul style="list-style-type: none"> • Promotion of tissue repair • Acid secretion inhibition, • Antioxidant • Anti-Helicobacter pylori activity 	7
Alkaloids	<ul style="list-style-type: none"> • Stimulates these neurons and signalizes for protection inhibiting the acid secretion(In the stomach, capsaicin (0.3 nanomol/kg - 10 mg/kg). • Mainly increasing the gastric mucosal blood flow which aid in prevention and healing of ulcers. • Decreases in gastric acid/pepsin secretions and protection of the mucous membrane (Nigakinon & methylnigakinone are also indole alkaloids) 	8
Saponin	<ul style="list-style-type: none"> • Action is mediated by the formation of mucous on the gastric mucosa(generally those of triterpene type like glycyrrhetic acid and carbenoxolone). • Anti-secretory mechanism; they inhibit acid secretion, total acid output, and lower the pH of gastric juice. 	9 10
Triterpenoids	<ul style="list-style-type: none"> • Anti-inflammatory and anti-ulcer activities • Aanti-ulcerogenic effects via cytoprotective action by increase mucus production and PG content. • Improve gastric mucosal blood flow and bicarbonate secretion. • Antioxidant potential, they hasten ulcer healing through reduction of lipid peroxide content and elevation of SOD activity in the stomach. 	11
Polysaccharides	<ul style="list-style-type: none"> • Cytoprotective agents i.e stimulate mucosal regeneration and proliferation and increase PG synthesis, restoring the gastric mucus levels. 	12

Indian Medicinal plant having antiulcer Potential

India is gifted with varieties of large number of medicinal herbs because of variety of climatic conditions and seasons favorable for growth of many

species of plants. India is well famous as the “*Emporium of Medicinal Plants*”. Due to their enormous importance, demand of medicinal plants has increased numerous folds [13].

Antiulcer Activity of Some Indian Medicinal Plants		
Plant	Picture	Reference
<i>Acacia arabica</i> (family Mimosaceae) It is commonly known as “babul tree” and locally called as “karuvelam.”	 Babul Tree	14
<i>Aegle marmelos</i> (Rutaceae). It is commonly known as a “bael tree”		15
<i>Allium sativum</i> (Liliaceae).It is commonly known as “garlic” and locally called as “vellapundu.”		16
<i>Adansonia digitata</i> (Malvaceae). It is commonly known as “boabab or monkey-bread tree of Africa.” It is locally known as “paparapuli.”		17
<i>Momordica charantia</i> (Cucurbitaceae) is commonly known as “bitter gourd.”		18

<p><i>Moringa oleifera</i> (Moringaceae) is commonly known as “drum-stick, horse radish tree.</p>		19
<p><i>Terminalia chebula</i> (Combretaceae) is commonly known as “Myrobalan”.</p>		19
<p><i>Shorea robusta</i> (Dipterocarpaceae) is commonly known as “sal tree.”</p>		19
<p><i>Ficus religiosa</i> (Moraceae) The bark of the plant contains carbohydrates, flavanoids, amino acids, steroids, saponins and tannins etc</p>		20
<p><i>Ocimum sanctum</i>(Laminaeae) The fixed oil has proved to show antiulcer activity because of its lipoxygenase inhibitory activity, histamine antagonistic and anti-secretory effects.</p>		21 22 23
<p><i>Annona squamosa</i> (Annonaceae) is commonly called as custard apple. The gastro protective activity was evaluated by ethanol induced and pylorus ligated rats in experimental animal.</p>		24 25 26
<p><i>Aloe vera</i>.(Lilliaceae) Aloe vera gel possesses gastroprotective properties. The mucilage present in this plant called aloe gel is used for various medicinal purposes. Its healing potential is due to a compound called glucomannan.</p>		27 28
<p>Cardamom <i>Elettaria cardamomum</i> (Zingiberales: Zingiberaceae)</p>		29

Previous work done on Anti-ulcer

Plant	Experiment outcome	Reference
<i>Lagenaria siceraria</i>	The chloroform extract of <i>Lagenaria siceraria</i> at 250 mg/ kg dose has shown mucosal erosion, the partial healing of ulcer with few inflammatory cells and the dose 400 mg/kg has shown healing ulcer, mucosa and no inflammation of cells. <i>L. siceraria</i> is speculated to be recognized for its antioxidant property, which in turn could be linked to existence of flavonoids and polyphenolic compounds, saponins and tannins.	30
<i>Polycarpea aurea</i>	Methanolic extract of <i>Polycarpea aurea</i> was investigated for antiulcer activity. The result showed that the methanolic extract of <i>P. aurea</i> is having an antiulcer activity in the aspirin plus pylorus ligated rat model.	31
<i>Strychnor potatorum</i>	SP-1 an active compound was isolated from the seeds of Nirmali (<i>Strychnor potatorum</i>) and its antiulcer potential was studied against ethanol, hydrochloric acid, indomethacin, stress and pyloric ligation induced gastric Ulceration in albino rats. A significant outcome was observed in all the models.	32
<i>Osyris quadripartita</i>	Anti-ulcer activity of 80% methanol leaf extract of OQ in rats was studied. The effect of OQ extract on gastric ulcer in rats in pylorus ligation-induced and ethanol-induced models was studied using single dosing (100, 200, 400 mg/kg) and repeated dosing (200 mg/kg for 10 and 20 days) approaches. The result of this study proved that OQ has anti-ulcer pharmacologic activity due to one or more of the secondary metabolites present in it.	33
<i>Carum carvi</i> seed	Ethanollic and aqueous extracts of seeds extract <i>Carum carvi</i> at a dose of 100 and 200 mg/kg b.w. respectively was investigated for anti-ulcer activity. The result revealed that both the extracts significantly caused the reduction in gastric content, total acidity, ulcer index, and increase in pH of gastric pylorus ligation ulcer model. In comparison with the standard drug, the results of hydro alcoholic extract at 100 mg dose showed good analgesic and at 200 mg dose showed antiulcer activity.	34
<i>Coccinia grandis</i>	Antiulcer activity of <i>Coccinia grandis</i> leaves against indomethacin induced gastric ulcer model was studied. The ethanolic leaf extract of <i>Coccinia grandis</i> showed significant potential.	35
<i>Mussaenda philippica</i> (Rubiaceae)	Aqueous extract of <i>M. philippica</i> leaves exhibited potential antiulcer activity in experimental rat models.	36

CONCLUSION

The present review focuses on role of various phytochemicals in ulceration along with their possible mechanism of action. The review is lightened list of various Indian medical used to be cure and prevent ulceration. Herbalism provides leads to find therapeutically useful compounds, thus more efforts should be made towards isolation and characterization of active compounds and their structure elucidation. The combination of traditional and modern knowledge can produce better drugs for proper ulceration care with fewer adverse effects.

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