

Review Article



Anti-Ulcer Activity of Medicinal Plants: A Review

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ABSTRACT

Peptic ulcer is the most common disorder of gastro-intestinal tract resulting mainly due to an imbalance between the gastric defensive and aggressive factors. The ulcers are most common in industrialized, civilized and developed countries due to stressful life conditions. Factors such as cigarette smoking, alcohol consumption, stress, use of NSAIDs, less nutrient diet may further aggravate the incidence of peptic ulcers. The common symptoms of peptic ulcer are pain and abdominal discomfort. Duodenal ulcer have pain- food relief pattern and gastric ulcer has food- pain pattern. Nowadays acidity and ulcer very common causing huge suffering to humans with ulcers being a matter of concern due to high chances of recurrence and mortality. Peptic ulcers have mortality of 30% and morbidity up to 50%. Although there are number of allopathic drugs to treat peptic ulcer but they all have adverse effects and this has obliged researchers to find alternative treatment options. This led to the identification and usage of herbal plants having anti-ulcer activity. A large number of populations are now relying on these medicinal plants as they are relatively safe, cheap and have no adverse effects.

Keywords: Peptic ulcer, gastric ulcer, aggressive factors, defensive factors, abdominal pain, medicinal plants.

INTRODUCTION

Ulcer is erosion on the skin or on the mucous membrane specified by outward inflamed dead tissue.^{1,2}

The word ulcer is derived from Latin word "ulcus" (genitive: ulceris) which stands for sore, wound or an ulcer.³

The erosions are most commonly seen on gastric or duodenal mucosa and are referred to as peptic ulcer.^{4,5} Peptic ulcers are the areas of degeneration and necrosis of gastro-intestinal mucosa which is exposed to acid and pepsin secretion.

The peptic ulcers are of two types:

1. Gastric ulcer: When the ulcers occur in stomach they are called gastric ulcers.
2. Duodenal ulcer: When the ulcer occurs in the duodenum it is called as duodenal ulcer.

The duodenal ulcer is the commonest of peptic ulcer with the ratio of 4:1 in duodenum and stomach respectively.^{5,6}

Peptic ulcer can lead to several complications such as obstruction, hemorrhage and perforation.⁵

Prevalence

Ulcers affect nearly 10% of world population of which 5% constitute gastric ulcer.^{7,8} Peptic ulcers are more common in males than in females.⁵

The prevalence is approximately 11% to 14% in men and 8% to 11% in women.⁹

TYPE OF ULCERS

There are different types of ulcer differentiated based on their origin or place of occurrence in human body, of which peptic ulcer are the commonest of all.^{2,10}

The different types of ulcers are:

- Pressure ulcers
- Genital ulcers
- Peptic ulcers
- Venous ulcers
- Aphthous ulcer (canker sores)¹

Common types of ulcers are:

Peptic ulcer: It is an open sore or discontinuation in the lining of mucosa exposed to acid and pepsin secretion.^{1,2}

As it is related to pepsin secretion, hence the name peptic ulcer.⁹ The peptic ulcers are of two types i.e., gastric and duodenal ulcer.

Types of peptic ulcer based on site:

1. **Type I:** These type of gastric ulcer, have ulcer along the lesser curvature of stomach and have normal or decreased gastric acid secretion.
2. **Type II:** It includes two types of ulcers, one gastric and one duodenal. This type of ulcer has normal or increased gastric acid secretion.



3. **Type III:** Type- III ulcers are present on pre-pyloric region of stomach and have normal or increased gastric acid secretion and are known as Pre-pylori ulcer.
4. **Type IV:** Proximal gastro esophageal ulcer. These types of ulcers are located near the gastro-esophageal region with gastric acid secretion rate normal or below normal.
5. **Type V:** Anywhere.^{1,3}

Esophageal ulcer: The esophageal ulcers are the ulcers occurring in the lower end of esophagus due to acid reflux or GERD.^{9,10}

Bleeding ulcer: Bleeding ulcer is untreated peptic ulcer which has not been treated for long time.¹⁰

Refractory ulcer: The peptic ulcers that haven't healed after three months of treatment are refractory ulcers.

Stress ulcer: This type of ulcer consist of group of lesions found in esophagus, stomach, or duodenum.⁹

SIGNS AND SYMPTOMS OF PEPTIC ULCER

Abdominal discomfort and nausea,⁹ Bloating and abdominal fullness, Water brash, Hematemesis, Melena, Rarely acute peritonitis,¹ Dark or black stools¹¹, Dry tongue, Weak or feeble pulse, Shortness of breath.¹²

ETIOLOGY AND PATHOGENESIS

Initially the peptic ulcers were believed to be caused by the aggressive action of hydrochloric acid and pepsin on mucosa.¹³

The enzyme gastrin stimulates the production of HCl by parietal cells and in patients with H. pylori infection the increased levels of gastrin are produced that in turn increases production of acid thus leading to erosion of gastric mucosa and subsequently ulceration.¹

Majority of cases of peptic ulcer are due to H.pylori infection, as about 80-90% of patients with duodenal ulcer have H. pylori infection and same goes with 70-90% patients of gastric ulcer.⁹

But the most common cause of ulcer remains due to imbalance between the aggressive (offensive) factors and defensive factors which are listed below.⁶

Table 1: List of Defensive and Aggressive factors

DEFENSIVE FACTORS	AGGRESSIVE FACTORS
Adequate blood flow	Reactive oxygen species ¹⁴
Secretion of PG, Mucin, Bicarbonate ²	Increased secretion of HCl and Pepsin
Mucus bicarbonate layer	Inadequate dietary habits
Cellular regeneration ¹⁰	Free oxygen radicals
Mucosal barrier ⁶	Consumption of NSAID's,
Surface mucus secretion ⁹	Alcohol
Secretion of NO	Stress, Anxiety

Cytokines, VEGF¹⁵

Infection with H. Pylori²

Bile Salts¹⁰

Nutritional deficiency⁶

Corticosteroid use⁹

Tobacco¹¹

Oxidative Stress

Increased lipid peroxidation

Neutrophil infiltration¹⁴

GASTRIC ULCER TREATMENT IN UNANI SYSTEM OF MEDICINE

Gastric ulcer, known as Qarah-e-Medi in unani occurs commonly in people who keep themselves in hurry, becomes worry and consumes curry.

Causes of gastric ulcers in unani:

- ❖ Khilte Had (hot and irritant humour)
- ❖ Consumption of hot and spicy food
- ❖ Intake of hard fibrous diet, rotten food and alcohol
- ❖ Excessive gastric secretions
- ❖ Prolonged stress and strains

Unani principles for treatment of gastric ulcer:

- i. Intake of easily digestible food.
- ii. Avoiding of corrosive drugs such as copper sulphate, white lead etc.
- iii. Usage of astringent drugs for binding effect of ulcers.
- iv. To clear site of ulcer cleansers, detergents and demulcent are given.¹³

Table 2: List of Phytoconstituents responsible for producing anti ulcer activity

Phyto-constituent	Mechanism of action
Flavonoids	Increases mucosal prostaglandin content, decreases histamine secretion from mast cells by inhibiting histidine decarboxylase, inhibits H. pylori growth, scavenges free radicals.
Saponins	Have surfactant property, inhibits gastric acid secretion, and activates mucous membrane protective factors.
Gums and mucilages	Have colloidal property; covers and protects the gastric mucosa.
Tannins	Have astringent property; tan the outermost layer of gastric mucosa and renders it less permeable and more resistant to chemical and mechanical injury or irritation. ¹



Table 3: List of Medicinal plants showing anti- ulcer activity

S.No	Botanical name	Vernacular name	Family	Part used	Phyto-chemicals
1.	<i>Terminalia chebula</i>	Myrobalan ¹⁶	Combretaceae	Fruits	Alkaloids, Flavonoids, Glycosides, Tannins, Terpenoids. ¹⁷
2.	<i>Terminalia pallida</i>	Triphala	Combretaceae ¹⁸	Leaves	Tannins, Terpenoids, Phenols, Alkaloids, Flavonoids, Carbohydrates. ¹⁹
3.	<i>Polyalthia longifolia</i>	Indian mast tree ¹⁶	Annonaceae	Leaves	Alkaloids, Terpenoids. ²⁰
4.	<i>Spondias mombin</i>	Lyeye	Anacardiaceae	Leaves	Tannins, Saponins, Flavonoids, Phenolics, α -tocopherol. ²¹
5.	<i>Ficus exasperata</i>	Sand paper tree	Moraceae	Leaves	Flavonoids Tannins, Saponins, Alkaloids. ²¹
6.	<i>Toona ciliata</i>	Australian red cedar ²²	Meliaceae	Heart wood	Terpenoids, Sterols, Quercetin. ²³
7.	<i>Calligonum cosmosum</i>	Arta	Polygonaceae	Plant	Phenols, Flavonoids. ²⁴
8.	<i>Tephrosia purpurea</i>	Sharpunkha	Fabaceae	Roots	Flavonoids. ²⁵
9.	<i>Carlina acanthifolia</i>	Rechetka ²⁶	Asteraceae	Roots	Inulin, Flavonoids, Essential oils. ²⁷
10.	<i>Momordica charantia</i>	Bitter gourd	Cucurbitaceae	Fruits	Flavonoids, Alkaloids, Steroids, Sterols. ²⁸
11.	<i>Ocimum sanctum</i>	Tulsi	Labiatae	Leaves ²⁹	Eugenol, Euginal, Urosolic acid. ³⁰
12.	<i>Brassica oleracea</i>	Kale	Brassicaceae	Leaves	Flavonoids, Sterols. ³¹
13.	<i>Scutia buxifolia</i>	Coroniha	Rhamnaceae	Bark	Flavonoids, Alkaloids, Polyphenols, Tannins. ³²
14.	<i>Ziziphus jujuba</i>	Annab	Rhamnaceae	Bark	Flavonoids, Alkaloids, Sterols, Polyphenols, Tannins. ³³
15.	<i>Maytenus robusta</i>	Espinheria santa/ Cancerosa ³⁴	Celastraceae	Leaves	Triterpenes, Steroids, Flavonoids. ³⁵
16.	<i>Madhuca indica</i>	Mahua ³⁶	Sapotaceae	Leaves	Triterpenoids, β -sitosterol, Flavonoids. ³⁷
17.	<i>Casearia sylvestris</i>	Bugre tea	Flacourtiaceae	Leaves	Tannins, Triterpenes. ³⁸
18.	<i>Trigonella foenum graceum</i>	Fenugreek	Fabaceae	Seeds	Flavonoids, Polysaccharides. ³⁹
19.	<i>Utlaria salicifolia</i>	Mahali kizhangu	Periplocaceae	Rhizomes	Steroids, Saponins, Tannins. ⁴⁰
20.	<i>Anogeissus latifolia</i>	Dhai ⁴¹	Combretaceae	Bark	Gallic acid and Egallac acid. ⁴²
21.	<i>Asparagus racemosus</i>	Satavari	Liliaceae	Roots	Saponins, Polysaccharides. ⁴³
22.	<i>Azadirachta indica</i>	Neem	Meliaceae	Bark	Terpenoids, Flavones, Phenols, Glycosides. ⁴⁴
23.	<i>Solanum nigrum</i>	Black night shade	Solanaceae	Fruits	Tannins, Alkaloids, Saponins, Volatile oils. ⁴⁵
24.	<i>Eugenia jambolina</i>	Jamun	Myrtaceae	Seeds	Flavonoids, Tannins, Triterpenes. ⁴⁶
25.	<i>Kaempferia parviflora</i>	Krachai dam	Zingiberaceae	Rhizome	Alkaloids, Anthrones, Flavonoids. ⁴⁷
26.	<i>Passiflora foetida</i>	Passion fruit	Passifloraceae	Plant	Proteins, Phenols, Alkaloids, Phenolic Compounds, Flavonoids. ⁴⁸
27.	<i>Alhagi maurorum</i>	Camel thorn	Leguminosae	Arial plant	Flavonoids, Fatty acids, Sterols. ⁴⁹
28.	<i>Bacopa monniera</i>	Brahmi	Scrophulariaceae	Plant	Glycosides-Bacoside A, Bacoside B. ⁵⁰
29.	<i>Bambusa arundinacea</i>	Bamboo ¹⁸	Graminae ¹⁸	Leaves	Glycosides, Alkaloids, Phyto-Sterols. ⁵¹
30.	<i>Jasminum grandiflorum</i>	Jasmine	Oleaceae	Leaves	Phenolics, Flavonoids, Carotenoids. ⁵²
31.	<i>Achyrocline satureoides</i>	Marcela	Asteraceae	Inflorescences	Terpenoids, Flavonoids, Phenolic compounds, Steroids. ⁵³
32.	<i>Bahunia purpurea</i>	Kachnar	Fabaceae	Leaves	Flavonoids, Sterols, Tannins. ⁵⁴
33.	<i>Cressa cretica</i>	Rudravanti	Convolvulaceae	Plant	Alkaloids, Glycosides, Tannins, Proteins. ⁵⁵
34.	<i>Citrullus lanatus</i>	Watermelon	Cucurbitaceae	Seeds	Phenols, Flavonoids, Tannins, Alkaloids, Terpenoids, Steroids, Saponins, Anthraquinones. ⁵⁶



35.	<i>Pseuderanthemum palatiferum</i>	Payawanorn	Acanthaceae	Leaves	Saponin, Triterpenoid, Flavonoids. ⁵⁷
36.	<i>Argimone mexicana</i>	Ghamoya	Papavaraceae	Leaves	Carbohydrates, Flavonoids, Tannins, Terpenoids, Phenols, Saponins. ⁵⁸
37.	<i>Paederia foetida</i>	Chinese flower	Rubiaceae	Plant	Sitosterol, Stigmasterol, Ursolic acid. ⁵⁹
38.	<i>Musa sapientum</i>	Banana	Musaceae	Leaves	Alkaloids, Flavonoids, carbohydrates, Glycosides. ⁶⁰
39.	<i>Artocarpus integrifolia</i>	Jackfruit ⁶¹	Moraceae	Leaves	Tannins, Flavonoids, Sterols, Phenols, Carbohydrates. ⁶²
40.	<i>Nigella sativa</i>	Black cumin ⁶³	Ranunculaceae	Seeds	Saponins, Tannins, Quinines, Sterols, Triterpenes. ⁶⁴
41.	<i>Carum carvi</i>	Caraway	Apiaceae	Seeds	Proteins, Tannins, Phenolic compounds, Flavonoids. ⁶⁵
42.	<i>Mucuna pruriens</i>	Velvet beans	Fabaceae ⁶⁶	Seeds	Alkaloids, Glycosides, Triterpenoids, Tannins, Saponins, β -sitosterol, Amino acids. ⁶⁷
43.	<i>Zingiber officinale</i>	Ginger	Zingiberaceae	Ginger powder	Gingerol, Shogaol. ⁶⁸
44.	<i>Mimosa pudica</i>	Chue mue	Fabaceae	Leaves	Flavonoids, Steroids, Saponins, Tannins, Gums and Mucilages. ⁶⁹
45.	<i>Excoecaria agallocha</i>	Gewa ⁷⁰	Euphorbiaceae	Leaves	Polyphenols, oxygenated diterpenoids. ⁷¹
46.	<i>Cydonia oblonga</i>	Quince	Rosaceae	Fruits	Tannins, Phenols, Polyphenols, Flavonoids. ⁷²
47.	<i>Commiphora wightii</i>	Guggul	Burseraceae	Gum obtained from plant	Sterols, Tannins, Flavonoids. ⁸
48.	<i>Caesalpinia pulcherrima</i>	Peacock flower	Caesalpiniaceae	Bark	Flavonoids, Alkaloids, Steroids, Tannins, Carbohydrates. ⁷³
49.	<i>Convolvulus pluricaulis</i> ⁷⁴	Shankhapushpi	Convolvulaceae	Plant	Carbohydrates, Proteins, Amino acids, Alkaloids, Triterpenoids, Steroids. ⁷⁵
50.	<i>Citrullus colocynthis</i>	Bitter apple	Cucurbitaceae	Fruit	Saponins, Alkaloids, Tannins, Flavonoids. ⁷⁶
51.	<i>Neolamarckia cadamba</i>	Kadamba ⁷⁷	Rubiaceae	Leaves and bark	Terpenoids, Glycosides, Tannins, Saponins, Flavonoids. ⁴
52.	<i>Syzygium alternifolium</i>	Mogi	Myrtaceae	Leaves ⁷⁸	Flavonoids, Tannins. ⁷⁹
53.	<i>Andrographis paniculata</i>	Bhumi neem	Acanthaceae	Leaves	Andrographolide. ⁸⁰
54.	<i>Oyris quadripartita</i>	Wild tea plant	Santalaceae	Leaves	Saponins, Tannins, Flavonoids, Phenols. ⁸¹
55.	<i>Cassia sieberiana</i>	Mororwe ⁸²	Fabaceae	Roots	, Glycosides, Steroids, Flavonoids, Tannins. ⁷
56.	<i>Ceiba pentandra</i>	Kapok ⁸³	Bombacaceae	Roots	Tannins, Flavonoids, Reducing sugars, Triterpenes. ⁸⁴
57.	<i>Rosa damascena</i>	Damask rose ⁸⁵	Rosaceae	Rose oil	Terpenes, Alkaloids, Anthocyanins. ⁸⁶
58.	<i>Moringa olifera</i>	Drumstick tree ⁸⁷	Moringaceae	Leaves ⁸⁸	β -sitosterol
59.	<i>Meila azedarach</i>	White cedar	Meliaceae	Leaves	Quercetin, Rutin. ⁸⁹
60.	<i>Ficus religiosa</i>	Papal tree ⁹⁰	Moraceae	Leaves	Proteins, Sterols, Tannins, Flavonoids, Carbohydrates. ⁹¹

CONCLUSION

Peptic ulcer is the widespread disorder of gastro intestinal tract with recurrent relapses and several complications. Also the allopathic drugs used in its treatment are associated with adverse effects causing further damage to human health. As a result of this researchers are focusing on herbal plants having

therapeutic effects. These herbal plants are rich in several phyto-chemicals such as alkaloids, tannins, flavonoids, phenols, saponins etc; isolation and use of these compounds provides health benefits. Therefore, the medicinal plants having anti-ulcer potential were discussed here which are not only safe but are also relatively cheap.



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