



ARTICLE ON ANTIULCER ACTIVITY OF ACACIA ARABICA

¹PRIYANKA SINGH, ²SHALINI SINGH

Department of Pharmacology, Institute of Pharmaceutical Science and Research, Unnao, U.P, India

Abstract: Ulcer is a common GI Trac (gastrointestinal tract) disorder. This disease seen many communities. It is basically an inflamed break in the gastrointestinal tract inner lining of the mucus membrane. Ulcer is caused by when there is a disturbance in the normal equilibrium caused by either enhanced aggression or diminished mucosal resistance. It may be due to the regular usage of drugs, irregular food habits, stress, and so forth. Peptic ulcers are a broad term that includes ulcers of digestive tract in the stomach or the duodenum. The formation of peptic ulcers depends on the presence of acid and peptic activity in gastric juice plus a breakdown in mucosal defenses. A number of synthetic drugs are available to treat ulcers. But these drugs are expensive and are likely to produce more side effects when compared to herbal medicines. The literature revealed that many medicinal plants and polyherbal formulations are used for the treatment of ulcer by various ayurvedic doctors and traditional medicinal practitioners. The ideal aims of treatment of peptic ulcer disease are to relieve pain, heal the ulcer, and delay ulcer recurrence. In this review attempts have been made to know about some medicinal plants which may be used in ayurvedic as well as modern science for the treatment or prevention of peptic ulcer.

Index Terms - Acacia Arabica , Peptic Ulcer, Herbal, Pharmacological Studies

INTRODUCTION

1. Ulcer

Ulcers are the areas of devolution and mortification of gastro-intestinal mucosa uncovered to acid of the alimentary tract that is uncovered to pepsin and hydrochloric acid. The ratio of the duodenum or the stomach is 4:1. (Harsh, Mohan.2009). The ulcers appear in the stomach, where they are known as gastric ulcers. They can occur in the first parts of the intestine, known as duodenal ulcers. (Mahajan, N. 2009). Ulcers cause gnawing / burning ache in the upper abdomen. These symptoms often occur distinct hours following a meal, after the meal leaves the stomach but as long as acid production is still hello. Instead of pain, some patients receive acute hunger or bloating. Other patients have not causing any physical pain but have black defects, showed that the ulcer bleeding. Bleeding is the majority of common complications that causes the ulcers.

2. Peptic ulcer:

Peptic ulcer disease are refer to the painful sores or the layer of stomach or the first part of the small intestine known as the duodenum ulcer which impairs the quality of life and is associated with increased morbidity and mortality. Peptic ulcer disease is a worldwide problem. Statistics from the all sources, they affected 10 percent or more the adult population within their life time. They are the most commonly affected the individuals from 20 to 60 years of age group with males. (Alan, B.1985). Peptic ulcer disease (PUD) is one of the most widespread gastro-intestinal (GI) disorders which causes elevated rate of morbidity mainly for the population of non developed countries. Peptic ulcer occurs in the component of the gastrointestinal tract which is showing the gastric acid and pepsin in the stomach and duodenum. The causes of peptic ulcer is not usually known, it results show the probably due to the imbalance between the offensive (acid, pepsin and Helicobacter pylori) and the protective (gastric mucus and bicarbonate secretion, prostaglandins, nitric oxide, innate resistant of the mucosal cells) factors.

3. Regulation of Gastric Acid Secretion

The terminal addition enzymes H⁺K⁺ ATPase are secreted by H⁺ ions in the apical canaliculi of the parietal cells and activated by histamine, acetylcholine and gastrin acting with their own receptors situated in the basolateral membrane of these cells. Histamine directly act through H₂ receptors followed by generating the formation of cAMP along with Ca²⁺ mobilization, although the acetylcholine and gastrin act either directly through muscarinic & gastrin receptor respectively may act indirectly by releasing histamine from “histaminocytes”. The muscarinic receptors & gastrin receptors (cholicystokinin receptors) function through IP₃-DAG pathway that mobilizes intracellular ca²⁺. (Tripathi, K.D.2009).

APPROACHES FOR TREATMENT OF PEPTIC ULCER

For reduction of volume of gastric acid

A) Anti-histamines

Cimetidine

Ranitidine

Famotidine

B) Proton pump inhibitors

Lansoprazole

Omeprazole

C) Anticholinergics

Pirenzepine

Propantheline

Oxyphenonium

D) Prostaglandin analogue

Misoprostol

1) For netralization of gastric acid

A) Systemic

Sodium bicarbonate

Sodium citrate

B) Non-systemic

Hydroxide/carbonate/trisilicates containing magnesium, Aluminum or calcium

a. For protection of gastric mucosa

Sucralfate

Colloidal bismuth subcitrate

b. Use of antimicrobial agents for treatment of H. pylori infection

Amoxicillin

Clarithromycin

Metronidazole

Tinidazole

Tetracycline

HERBAL INTRODUCTION

Herbs and products are containing the herbs. It has been used to trade and commerce and used for various purposes. The WHO defines as the herb which are used for further processes and formulation of herbal product, whereas they organism the fresh or dried, fragmented or powdered plant material (Bipendra Singh Parihar et al., 2014) Herbs are treated by squeezing, decocting, steaming, roasting or infusion in water, extraction with alcohol or sweetening agents and baking. It can create to herbal products like decoctions, juices, tinctures, infusions, gums, essential oils, fixed oils, and resins. These are used for the medical purposes or the starting of material for additional processing and as food ingredients. It is depended on the sophistication process for the herbal preparation. These products may be also subjected to any number of physical, chemical, or biological processes. It is concluded that pulverization, extraction, distillation, expression, fractionation, purification, concentration, or fermentation. The formulation of the final product may require the mixing of one or more plant preparations for minerals or animal products. The constituents are separated from herbal materials or synthetic mixture.

PLANT PROFILE

1. Fabaceae:

The Fabaceae or Leguminosae family includes trees, shrubs and perennial plants but commonly known as the legume family due to their types of fruits. Plants of this family show compound, stipulated leave on flowering plants. Plants of this family have nodules on their roots which contain nitrogen fixation bacteria. Such Nodule formation is example of symbiosis of rhizobia and plant of leguminosae. Their amazing range and abundance of legumes through worldwide made them economically and culturally important. This family is equally important as source of food in horticulture and agriculture and for the compounds having medicinal uses.

1.2 Botanical Classification

Kingdom : Plantae
Order : Fabales
Family : Fabaceae
Genus : Acacia
Species : Arabica
Vernaculars name : Babul

1.3 Vernacular name

English : Indian Gum Arabic tree
Hindi : Babul, Kikar
Sanskrit : Ajabaksha, Goshringa
Unani : Aqaqia, Babul, Kikar
Urdu : Babul

1.4 Morphological features:

Acacia was first described by Linnaeus in 1773 and there are about 1380 species of Acacia found in Worldwide, about 2/3rd of them native to Australia and rest of extended around the tropical and subtropical regions in the world Maslin et al., (2003). It is size in medium; tree is evergreen with a short stem and having surrounded to spreading crown with feathery foliage. It is originated to the whole drier parts of India. It is normally attains a height of 15 m and having girth of 1.2 m, although trees are reached up to a height of 30 m with a girth of 3 m have also been reported. Bark is a rough dark brownish to nearly black in colour with longitudinally and deeply cracked fissured. Leaves are from 2.5- 5 cm long, bipinnate with spinescent stipules, pinnules narrowly oblong. It is produced the golden yellow flowers with fragrant, crowded in long-stalked globose heads. Pods are flat shaped, 7.5-15.0 cm, contracted between the circular seeds. Flowers bloom from June to September, and also in December to January. The fruits are stalked and compressed moniliform pods with constriction in between seeds. There may be 8-12 seeds per pod. Pods ripen in the months of May to June. (Rashid Mohammad et al., 2014)

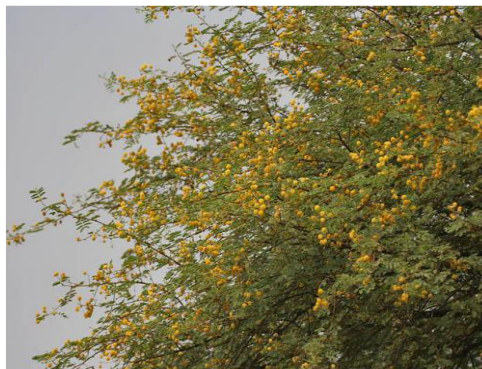


Fig. 1.1 Plant of Acacia Arabica

CHEMICAL CONSTITUENTS:

Bark: The bark is prosperous in phenolics, reduced the tannin and phlobatannin, gallic acid, protocathechuic acid pyrocatechol, (+)- catechin, (-) epigallocatechin-7- gallate, and (-) epigallocatechin-5,7- digallate, (-) epicatechin, (+) dicatechin, quercetin, (+) leucocyanidin gallate, sucrose and (+) catechin-5-gallate. It contains 12- 20% of tannin. Bark contains a large quantity of tannin.

Gum: Gum contains galactose, L-rhamnose, L-arabinose and four aldobiouronic acids, viz. 6-o-(β -glucopyranosyluronic acid)-Dgalactose; 6-o-(4-o-methyl- β -D- gluco pyranosyluronic acid)-Dgalactose; 4-o-(α -D-glucopyranosyluronic acid)-Dgalactose; and 4- o-(4-o-methyl- α -D- glucopyranosyluronic acid)-D-galactose.

Fruit: It contains the high percentage of phenolic constituents consisting of indigallic acid, gallic acid, its methyl and ethyl esters, protocathechuic and ellagic acids, leucocyanidin, m-digallic dimer 3,4,5,7-tetrahydroxy flavan-3-ol, oligomer 3,4,7- trihydroxy flavan 3,4-diol and 3,4,5,7-tetrahydroxy flavan-3-ol and (-) epicatechol. Fruit also contains mucilage and saponins. It contains 32% tannin.

Flowers and pods: It contains stearic acid, kaempferol-3- glucoside, isoquercetin, leucocyanidin. Pods contain tannin 22.44%, expressed in terms of oxalic acid; Wood contains chlorides. Whole pods contain 12-19% of tannin and 18-27% after removal of seeds. Seeds contain amino acids, fatty acids, ascorbic acid and tannin as a major constituent, 18, 19 sugar, moisture 14%, ash 3-4%; pods have got 22-44% tannin.

Leaves: It contains apigenin, 6-8-bis-D-glucoside, rutin and 32% tannin. Mariyam Roqaiya et al., (2015)

PHARMACOLOGICAL STUDIES

Antidiabetic: Wadood et al., confirmed that seeds of *Acacia arabica* possess some chemical compound which has ability to decrease glucose level in normoglycemic rabbits but not in alloxan-diabetic rabbits which means its mechanism of action involved discharge of insulin from beta-cells of pancreas. Decoction (20 mg/kg) of *Acacia arabica* bark produces same effect as talbutamide show the mild alloxonised diabetic rabbits fasted for 18 hr to decrease blood glucose level. The *A. nilotica* sp. lowers blood sugar by 25.05% in common rats, but has not shown any major hypoglycaemic effect in alloxanised diabetic rats. The legumes of *Acacia* sp. Shows hypoglycaemic effect due to its direct or indirect stimulus of β -cells of islets of langerhans for increased insulin secretion.

Antimutagenic: In *Escherichia coli* WP-2 culture extract of *Acacia arabica* bark in methanol causes reversal of formation of pyrimidine dimer and decreases UV-induced mutagenicity

Antiproteolytic: Legumes of *Acacia* sps. were studied for proteolytic, tryptic and chymotryptic actions on human and bovine pancreatic proteases which show more prominent effect on human trypsin and chymotrypsin.

Antifertility: In 11.5% pregnant rats aqueous extract of *Acacia* flowers causes abortion with teratogenic effect where pregnancy was not prohibited. 2% of stem and bark extract shows the semen precipitation action.

General Pharmacology: Various types of extract are reported to produce stimulation effect on ileum of guinea pig, rat's uterus and the heart of pila. Stem bark of acacia sps. were reported to possess a quaternary base picrate, which is pharmacologically alike to choline. CVS effect, antispasmodic activity, CNS depressant activity along with antiprotozoal activity was also reported by 50% extract of Acacia stem bark in ethanol.

Antimicrobial: *A. catechu* and *A. nilotica* exhibit highest activity against *Escherichia coli*, *Staphylococcus aureus* and *Salmonella typhi* and two fungal strains (*Candida albicans* and *Aspergillus niger*). Bark and pods species were found to be included the variety of secondary metabolites like alkaloids, flavonoids, tannins and saponins.

Antibacterial: Agar diffusion method is used to study antimicrobial activity of extracts of *Acacia nilotica* against *Streptococcus viridans*, *Staphylococcus aureus*, *Escherichia coli*, *Bacillus subtilis* and *Shigella sonnei*. Among which *B. subtilis* was found the most susceptible while *Candida albicans* was the most resistant. Methanolic extract of *Acacia nilotica* showed highly considerable antibacterial activity in vitro and compared to the synthetic antibiotics such as Bact-805 and Kcycline for the phytopathogenic bacteria. The Gentamicin and Streptomycin are used for human pathogenic bacteria.

Antifungal: Maximum growth inhibition was shown by the polyphenolic complex of the *Acacia* bark at 50% concentration against *Fusarium oxysporum* where as the flower extract shown the 65 percent of inhibition against the conidial germination of *Alternaria solani* after 10 hr of treatment. Mycelial growth of the plant pathogenic fungi *Sarocladium oryzae* (37%) and *Fusarium oxysporum* (69%) was inhibited by the water extract of leaves while the ethanolic extract that exhibited 51.13% by the inhibition of *Rhizoctonia solani*.

Antidiarrhoeal: *Acacia nilotica* was used for the treatment of diarrhoeal in the Kaduna State, Nigeria. It is used to treat castor oil-induced diarrhoea in mice using aqueous methanol extracts (0.5, 1.0, 2.0 and 3.0 mg/ml). The experiment was performed on isolated rabbit jejunum and *Acacia nilotica* at 3mg/ml was caused the initial relaxation rapidly followed by the contraction.

Antiviral: The leaves extract of *A. arabica* showed in vitro antiviral activity against the Turnip mosaic virus and decreased number of lesions on the hosts *Chenopodium amaranticolor*. The bark extract also showed antiviral activity against the potato virus.

Nematicidal: The aqueous leaf extract of *A. nilotica* showed nematicidal activity against *Meloidogyne incogenita* as it prevented hatching of nematode.

Antioxidant: The methanolic extract of *Acacia nilotica*, contained a fraction, AN-2, which was identified by NMR and mass spectroscopy and found to be a coumarin derivative, i.e. umbelliferone which showed the antioxidative activity. This antioxidative effect of AN-2 was taken at one time up to 100µg/ml and at that time no further increase in activity was found.

LITERATURE REVIEW:

Kumar, et al., (2016) have been reported to be effective in diabetes, skin disease and most concerning with cancer.

Sravani, et al., (2015) has been reported that the extracts of *Acacia* used for the antimicrobial activity. It was assayed against *S. viridans*, *S. aureus*, *E. coli*, *Bacillus subtilis* and *Shigella sonnei* using by the agar diffusion method.

Sharma, et al., (2014) evaluated the bark extracts of *Acacia arabica* was determined the antibacterial activity in different solvents against *S. aureus*, *P. aeruginosa* and *E. coli*. The methanolic extract showed the maximum activity with acetone.

Deshpande, et al., (2013) has been studied the extract of stem and bark of *Acacia nilotica* dissolved in petroleum ether and ethanol showed appears antibacterial activity against *Staphylococcus aureus*, *Escherichia coli*, *Proteus vulgaris*, *Proteus mirabilis*, *Salmonella paratyphi B*, *Klebsiella pneumoniae*.

Asad, et al., (2011) has been studies; the methanolic extract of *Acacia nilotica* leaves was investigated in streptocin, induced diabetic rats.

Badshah and Hussain, et al., (2011). Extract of fresh roots used as narcotic, known as local bear. The gum is used as aphrodisiac with water and branches are used for cleaning teeth.

It concluded **that** the extract of leaf. *A. nilotica* considerable anti-mutagenic and chemo preventive activity of the additional parts. (**Kalaivani and Mathew, 2010**).

CONCLUSION

The pharmacologists are the excited for the development of new drugs from the natural sources, the study of current drugs from *Acacia arabica* can be emphasized for the control of various diseases. The phytoconstituents are the key factors in the medicinal value of this plant. It is quite evident from this review that *Acacia Arabica* is necessary for medicinal herb and extensively all types of medicinal systems. The new formulations carry out to the work on all aspects of herb and throws the attention to set the mind for the analysis and developing which can ultimately useful for the human being. The anti-ulcer activity of leaves of *Acacia arabica* is evaluated by employing pylorus ligation induced and ethanol induced ulcer models. These models correspond to some of the most common causes of gastric ulcer in humans. Many factors and mechanisms are occupied in the ulcerogenesis and gastric mucosal damage induced by different models employed in the present study involving, depletion of gastric wall, mucin mucosal damage induced by non-steroidal anti-inflammatory drugs and free radical production. It is recommended that *Acacia arabica* leaves extract suppress gastric damage induced by offensive factors. It is generally established that gastric ulcers result from an imbalance between offensive factors and the maintenance of the mucosal integrity through endogenous defence mechanisms. The excess gastric acid formation by prostaglandin (PG) includes both enhanced in mucosal resistance as well as a reduce in offensive factors, mainly acid and pepsin. Reduction of PG synthesis by aspirin coincides with the earlier stages of damage to the cell membrane of mucosal, parietal and endothelial cells. On the basis of the present results and available information, it is concluded that the anti-ulcer activity elucidated by *Acacia arabica* is mainly due to the modulation of protection factors through an improvement of gastric cytoprotection and partly due to acid inhibition.

References

1. Abd El-Mawla, A. M. A. and Osman, H. E. H. 2011. Effects of gum acacia aqueous extract on the histology of the intestine and enzymes of both the intestine and the pancreas of albino rats treated with meloxicam, *Pharmacognosy Research*, Vol. 3, Issue 2, pp. 114–121.
2. *Acacia Arabica*. Available from URL: http://en.wikipedia.org/wiki/Acacia_arabica
3. Agrawal, S., Kulkarni, G.T. and Sharma, V.N. 2010. A comparative study on the antioxidant activity of methanol extracts of acacia. *International Journal of Natural and Applied Sciences*, Vol. 4, Issue 1, pp. 78-84.
4. Alan, B., Thomson, R., Mahachai, V., Martin, H. S. and Fenton, K. 1985. Medical management of uncomplicated peptic ulcer disease.
5. Ali, A., Akhter, N., Khan, B.A., Khan, M.S., Rasul, A. and Zaman, S.U. 2012. *Acacia nilotica*: A plant of multipurpose medicinal uses, *Journal of Medical Plants Research*.
6. Ali, A.J., Akanya, H.O., Dauda, B.E.N. 2010. Polygalloyltannin isolated from the roots of *Acacia nilotica* Del. (Leguminosae) is effective against *Plasmodium berghei* in mice. *Journal of Medicinal Plants Research*, Vol. 4, Issue 12, pp.1169-75.
7. Amos S., Akah P.A., Odukwe C.J., Guamanian K.S. and Wambede C. 1999. The pharmacological effects of an aqueous extract from *Acacia nilotica* seeds, *Phytother*, 13, 683-685.
8. Amos, S., Akah, P.A., Odukwe, C.J., Gamaniel, K.S. and Wambede, C. 1999. The pharmacological effects of an aqueous extract from *Acacia nilotica* seeds. *Phytother. Res.*, 13, pp.683-685.
9. Ashfaq U.A., Rehman S., Riaz S., Javed T. and Riazuddin S. 2011. Antiviral activity of *Acacia nilotica* against Hepatitis C Virus in liver infected cells, *Virology J.*, 8, 220.
10. Asres, K., Seyoum, A., Veeresham, C., Buca, F. and Gibbons, S. 2005. Naturally derived anti-HIV agents. *Phytother. Res.*, 19, pp.557-581.

11. Bachaya, H., Iqbal, Z., Khan, M.N. Sindhu, Z.U. and Jabbar, A. 2009. Anthelmintic activity of *Ziziphus nummularia* (bark) and *Acacia nilotica* (fruit) against Trichostrongylid nematodes of sheep. *Journal of Ethno pharmacology*, Vol. 123, Issue 2, pp. 325.

