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RESEARCH ARTICLE

MEDICINAL PLANTS USED IN PEPTIC ULCER – A REVIEW

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ABSTRACT

Peptic ulcer disease (PUD) is considered as one of the common diseases in the world. Modern allopathic drugs are used in the treatment of peptic ulcer but most of these drugs exhibit serious side effects. Medicinal plants containing active chemical constituents are useful in prevention and treatment of various diseases. Herbal medicines are considered as better alternatives for the treatment of peptic ulcer. To review the medicinal plants which are used in the treatment or prevention of Peptic Ulcer Diseases used in Siddha Medicine and the other reported activities like phytochemical compounds and traditional uses of these plants. *Cocculus hirsutus*, *Basella rubra*, *Hemidesmus indicus*, *Cissus quadrangularis*, *Solanum nigrum* are frequently used all over the world as medicinal plants for the treatment of peptic ulcer diseases.

Key words: Peptic Ulcer Diseases, Medicinal plants, Antiulcer activity, Phytochemicals

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INTRODUCTION

Ulcers are deep lesions penetrating through the entire thickness of the gastro intestinal tract (GIT) mucosa and muscularis mucosa (Kaur *et al.*, 2012). Peptic ulcers are a broad term which includes ulcers of digestive tract in the stomach or the duodenum. Recent research has shown that this ulcer developed due to aggressive factors. Infection caused by bacteri a *Helicobacter pylori* or reaction to certain medicines as Non Steroidal Anti-Inflammatory Drugs (NSAIDs) is the causative agent of the disease (Bandyopadhyay *et al.*, 2001). Siddha Medicine is one such heritage of India particularly Tamil Nadu (South India) which is more suited to the culture, tradition and background of the country. In Siddha system of Medicine, Gunmam (Peptic Ulcer Diseases) is classified into eight varieties according to Yugimuni Vaithya Chinthamani - 800 are Vatha gunmam, Pitha gunmam, Kabha gunmam, Mukkutra gunmam, Vayu gunmam, Eri gunmam, Vanthi gunmam and Vali gunmam. Peptic Ulcer, a disease known for its remission and exacerbation due to many reasons is worldwide problem. Siddha system of Medicine too has recorded this clinical condition as Gunmam, 2000 years ago. The disease Gunmam not only affects the physique of a person but also has the characteristic excruciating pain in the abdomen drives one to the extent of committing suicide.

The word Gunmam by itself implies the total deterioration in the physical and mental health of a patient.

Aetiology of Gunmam (PUD): The causes of peptic ulcer disease include *Helicobacter pylori* infection, non-steroidal anti-inflammatory agents (NSAIDs) and malignancy (Jagruti *et al.*, 1997). The gastric mucosa protects itself from gastric acid with a layer of mucus, the secretion of which is stimulated by certain prostaglandins. NSAIDs block the function of cyclooxygenase 1 (cox-1), which is essential for the production of these prostaglandins. Stress as a possible cause, or at least complication, in the development of ulcers. Burns and head injury, however can lead to physiologic stress ulcers, which are reported in many patients who are on mechanical ventilation. Cigarette smoking can increase a person's chance of getting an ulcer. Smoking also slows the healing of existing ulcers and contributes to ulcer recurrence. Ulcers are more common in people who have cirrhosis of the liver, a disease often linked to heavy alcohol consumption (Saumendu Deb Roy *et al.*, 2013). According to Agasthiyar, this disease occurs due to Seivinaippayan (Karmic law). In Agasthiyar Kanma Kandam – 300 attributes Gunmam to be the cumulative effects of sins committed by an individuals. But Yugimuni in his Yugi Vaithya Chinthamani – 800 says there are two main reasons for the onset of Gunmam viz., personal habits like excessive intake of astringent and spicy food, unhealthy food habit and mental make-up like emotional imbalance.

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Plants used in Peptic ulcer diseases (Gunmam): Modern allopathic drugs are used in the treatment of Peptic ulcer but most of these drugs exhibit serious side effects. The use of phyto constituents as drug therapy to treat major ailments has proved to be clinically effective and less relatively toxic than the existing drugs and also reduces the offensive factors serving as a tool in the prevention of peptic ulcer. The chemical constituents present in the herbal medicine or plant are a part of the physiological functions of living flora and hence they are believed to have better compatibility with human body. Plant extracts are the most attractive source since longtime and a large number of plants have been shown to produce promising anti ulcerogenic effects (Akhtar *et al.*, 1992).

1. *Cocculus hirsutus*

Common name Kattukodi
Family name Menispermaceae

Traditional uses

Cocculus hirsutus DC. root decoction is given orally for stomachache (Parthiban *et al.*, 2017).

Phytochemical evaluation: The plant of *Cocculus hirsutus* (L.) Diels. has been reported to contain essential oil, β -sitosterol, ginnol, glycosides, sterols and alkaloids (Das *et al.*, 1964). Preliminary phytochemical analysis of the leaves showed the presence of alkaloids, phenolic compounds, flavonoids, glycosides, and carbohydrates (Merchant *et al.*, 1962). Preliminary Phytochemical screening of leaf of *Cocculus hirsutus* showed the presence of phytoconstituents like flavonoids, phenolics, saponins and steroids (Kushpoo *et al.*, 2016). The plant of *Cocculus hirsutus* has been reported to contain essential oil, β - sitosterol, ginnol, glycosides, sterols and alkaloids. The phytochemical studies showed the presence of bis-benzyl isoquinoline alkaloids; viz. shaheenine, cohirsinine, hirsutine, jaminine (jamine- N –oxide, cohirsine, dehydrocohirsine, Cohirsitine and haiderine which are isolated from stem and roots (Guha *et al.*, 1979).

Anti ulcer activity: Ethanolic extract of *Cocculus hirsutus* significantly reduced ($P < 0.01$) the acid secretory parameters i.e. total and free acidity as well as the gastric volume and an ulcer index suggests that acid inhibition accelerates ulcer healing. The decrease in gastric volume and simultaneous decrease in acidity may be one of the reasons for the ulcer healing (Swathi *et al.*, 2013). The ethanolic leaves extract of *Cocculus hirsutus* showed the best anti-ulcer activity (Rao *et al.*, 2011).

2. *Cissus quadrangularis*

Common name Pirandai
Family Vitaceae

Traditional uses: *Cissus quadrangularis* L. stem is used in GIA (stomach pain, constipation, vomiting and intestinal ulcer (Ganesh *et al.*, 2016). Roasted stem eaten to cure stomach pain (Karuppasamy, 2007)

Phytochemical evaluation: Phytochemical studies on methanol extract revealed the presence of triterpenes including α - and β - amyrins, β sitosterol, ketosteroids, phenols, tannins,

carotene and vitamin C. Seven alicyclic lipids constituents have also been reported from *Cissus quadrangularis*. Unsymmetric tetracyclic triterpenoids such as d-amyrin, onocer-7-ene-3a, 21b-diol, damyrene and 3,3',4,4'-tetra hydroxy biphenyl, 3,3',4,4'- tetrahydroxybiphenyl have been isolated from plant and were quantitatively determined by HPTLC and HPLC methods in samples collected from five different geographic zones of India. Several other constituents such as flavonoids quercetin and kaempferol, and stilbene derivatives, quadrangularins A,B,C and many others e.g. resveratrol, piceatanon, pallidol, perthenocissi and phyto-sterols have been isolated from plant. Stem extract contains a high percentage of calcium ions and phosphorus, both essential for bone growth (Deka *et al.*, 1994).

Anti ulcer activity: The methanolic extracts of the plant are proved to possess pharmacological activities such as antioxidant, antiulcer, analgesic, anti-inflammatory (Unnatti 2011). Pretreatment with *Cissus quadrangularis* significantly prevented the gastric mucosal lesion development and decreased the gastric toxicity produced by ulcerogen. In addition, ulcerated rats showed depletion of gastric wall mucus, glycoproteins and non-protein sulphhydryls level whereas treatment with *Cissus quadrangularis* reverted this decline in aspirin – induced pyloric ligation rats (Mallika Jainu *et al.*, 2006). Methanol extract showed significant antiulcer activity in experimentally induced ulcer in rat model by decreasing gastric secretions and by enhancing glycoprotein levels. Triterpenoids and β - sitosterol present in methanol extract possess anti-lipid peroxidating effect and thus prevent gastric damage (Gutierrez and Vargas, 2006). Anoop and Jegadeesan, 2009 reported that the drug was found to increase the defensive factors by virtue of its ulcer score, carbohydrate protein ratio and decrease in aggressive factors like free acidity, pepsin apart from other biochemical parameters. Extract significantly reduced the formation of gastric and duodenal lesions by virtue of its cyto-protective and mucin productive activities.

Solanum nigrum

Common name Manathakkali
Family Solanaceae

Traditional uses

The fresh leaves are consumed for intestinal ulcer by Paliyar tribals in Dindugal district, Tamil Nadu, India (Mayilsamy and Rajendra, 2013).

Phytochemical evaluation: *Solanum nigrum* possesses numerous compounds that are responsible for pharmacological activities. Its active components are glycoalkaloids, glycoproteins, and polysaccharides, polyphenolic compounds such as gallic acid, catechin, protocatechuic acid (PCA), caffeic acid, epicatechin, rutin, and naringenin (Ravi *et al.*, 2009). Eltayeb *et al.* (1997) demonstrated that the steroidal alkaloid solasodine was highest in the leaves.

Anti ulcer activity: *Solanum nigrum* extracts showed concomitant attenuation of gastric secretory volume, acidity and pepsin secretion in ulcerated rats (Akhtar and Munir, 1989) Aqueous leaf extract of *Solanum nigrum* protected against pylorus ligation induced gastric ulcers in rats (Kavithshree *et al.*, 2012).

The anti-ulcerogenic effects of the methanolic extract of *Solanum nigrum* berries on aspirin induced ulceration in rats with respect to antioxidant status in the gastric mucosa have been investigated. The results indicate that *Solanum nigrum* berries may exert its gastroprotective effect by a free radical scavenging action. *Solanum nigrum* berries may have considerable therapeutic potential in the treatment of gastric diseases (Jainu and Devi, 2004).

Cucumis trigonus

Common name Mithukkam
Family Cucurbitaceae

Traditional uses: Hnatyszyn *et al.*, (1999) reported that *Cucumis trigonus* was used widely as an antiulcer and diuretic agent in South American folk Medicine. Germano *et al.* (1998) investigated that *Cucumis trigonus* was used in the traditional medicine of Mali for the treatment of gastric and duodenal ulcers.

Phytochemical evaluation: The preliminary phytochemical investigations on the ethanolic fruit extract of *Cucumis trigonus* revealed that the presence of alkaloid, gums, mucilage, protein, flavonoids. Tannin and phenol and steroids were absent. Moreover, flavonoid was found in rich amount (Bharathajothi *et al.*, 2011).

Anti ulcer activity: Vela *et al.* (1997) suggested that *Cucumis trigonus* is used in the folk medicine to treat gastric and intestinal disturbances. The freeze-dried aqueous extract of the whole plant tested in rodents up to the dose of 2000 mg/Kg animal not produced any toxicity. In order to assess the antiulcer activity of this plant, the test animals were treated with a single oral administration of an aqueous extract of stem bark of *Cucumis trigonus*. After 8hrs. which showed a significant increase in the mucosal production (Hnatyszyn *et al.*, (1999).

Basella rubra

Common name Kodi Pasalai
Family Chenopodiaceae

Traditional uses: Leaves are used in catarrhal affections and to hasten suppuration and decoction of roots relieves bilious vomiting (Nadkarni, 1908)

Phytochemical valuation: *Basella rubra* contains amino acids, vitamins, organic acids, polysaccharides and biflavonoids. A glycoprotein with strong antiviral activity (against potato virus) has been isolated from leaves. The fatty acid composition of the seed oil has also been reported (Chatterjee and Chandra, 1991). Two novel antifungal peptides, designated α - and β -basubrins have been isolated from the seeds of *Basella rubra* (Wang and Bun, 2001). The plant was found to be rich in calcium constituents. The fatty oils from the seeds were found to contain palmitic, oleic and linolenic acid (ICMR, 2004). Carotenoids have been detected in leaves of *Basella rubra* and the major carotenoids detected in all the species were beta-carotene, small amounts of alpha carotene and traces of other carotenoids (Panteado *et al.*, 2001).

Anti ulcer activity: Aqueous extract of the leaves of *Basella rubra* (10 and 20mg/kg p.o.) showed significant and dose-

dependent antiulcer activity against ethanol and pylorus ligated induced ulcer in rats. Study was compared with ranitidine (50 mg/kg p.o.) as standard drug (Shrikalp Shrikant Deshpande *et al.*, 2003). The aqueous extract of *Basella rubra* Linn. possesses significant and dose dependent anti-ulcer and cytoprotective effects. The aqueous extract of *Basella rubra* Linn. has demonstrated antiulcer activity and leaves masticated kept in mouth helped relief aphthae (Shu-Mei Lin *et al.*, 2010).

Hemidesmus indicus

Common name Nannari
Family Asclepiadaceae

Traditional uses: Jain and Singh, 1994 have reported that *Hemidesmus indicus* is employed in traditional medicine for gastric ailments.

Phytochemical evaluation: The preliminary phytochemical investigation showed the presence of alkaloids, carbohydrates, flavonoids, Glycosides and Tannins (Korrapati Vishali *et al.*, 2011). Tannins 2.5 % present in leaves and roots are reported to contain sitosterol. (Kumara and Nishteswar, 2013) A new ester identified as lupeol octacosanoate in addition to the known compounds viz., lupeol, (α -amyrin), lupeol acetate, (α -amyrin acetate), and hexatriacontane. (Chatterjee Ipsita *et al.*, 2006) Coumarins, triterpenoid saponins, essential oil, starch, tannic acid, triterpenoid saponins present. (Joseph *et al.*, 1918)

Anti ulcer activity: The ethanol extract of *Hemidesmus indicus* root possesses significant antiulcer property which could be either due to cytoprotective action of the drug or by strengthening of gastric mucosa and thus enhancing mucosal defense (Korrapati Vishali *et al.*, 2011). The combined ethanolic extracts of *Hemidesmus indicus* and *Ficus religiosa* at the doses of 100, 200, 400, 800 mg/kg body weight orally administered in albino rats showed good anti ulcer activity in the pylorus ligation model but in aspirin induced ulcer model, the combined extract have shown less significant activity (Sony, 2013).

Cassia fistula

Common name Sarakkontrai
Family Caesalpinaceae

Traditional uses: The leaves are known for their laxative, antiperiodic, ulcer healing and anti-rheumatic properties. Leaves were also found effective against cough and ringworm infections (Chopra, 1956). The ulcer healing power of *Cassia fistula* was reported (Kirtikar and Basu, 1975).

Phytochemical evaluation: Agrawal *et al.*, (1972) isolated fistulic acid from the pods, kaempferol and a leucopelargonidin tetramer having free glycol unit, from the flowers. Besides phenolics and their derivatives, a certain amount of alkaloid has been reported in the flowers of the plant (Asseleh *et al.* 1990). A bianthoquinone glycosides, fistulin, together with kaempferol and shinin has been isolated from the ethanolic extracts of the flowers of the plant (Kumar *et al.*, 1996). The young and old leaves of the plant contain highest amount of phenolic, flavonoid and proanthocyanin contents (Luximon-Rama *et al.*, 2002).

Antiulcer activity: Antiulcer effect of methanolic extract of *Cassia* species seed extract was evaluated using pylorus ligation and indomethacin induced ulcers in wistar albino rats. Various biochemical parameters such as gastric volume, free and total acidity were estimated. A significant reduction of ulcer index as well as gastric acid output in extract treated animals was observed with respect to control animals. The extract exhibited 75% protection in pylorus ligation model and 70.31% protection in indomethacin induced ulcers (Gill *et al.*, 2011)). The plant is very effective in treating the intestinal disorders like ulcer (Biswas *et al.*, 1973).

Aegle marmelos

Common name Vilvam
Family Rutaceae

Traditional uses: The leaves are soaked overnight in water and this water is strained and taken in morning, this really works to treat the ulcer and give relive to patients (Pushpendra *et al.*, 2012).

Phytochemical evaluation: Different organic extracts of the leaves of *A. marmelos* have been reported to possess alkaloids, cardiac glycosides, terpenoids, saponins, tannins, flavonoids and steroids (Venkatesan *et al.*, 2009; Sivaraj *et al.*, 2011). *Aegle marmelos* fruit pulp reported for the availability of steroids, terpenoids, flavonoids, phenolic compounds, lignin, fat and oil, inulin, proteins, carbohydrates, alkaloids, cardiac glycosides and flavonoids (Rajan *et al.*, 2011). Bael is reported to have number of coumarins, alkaloids, steroids, and essential oils. Root and fruits contain coumarins such as scoparone, scopoletin, umbelliferone, marmesin and skimming. Fruits in addition contain xanthotoxol, imperatorin and alloimperatorin and alkaloids like aegeline and marmelline. It also contains polysaccharides like galactose, arabinose, uronic acid and Lrahaminose, which may obtain after hydrolysis. Different types of carotenoids have been reported in the *Aegale marmelose*, these are responsible for the imparting yellow pale colour to fruit. Mamelosin, skimmianine and umbelliferone are the therapeutically active principale of bael plant. Minor constituents are like ascorbic acid, sitosterol, crude fibers, tannins, α - amyryn, carotenoids, and crude proteins are also present (Pushpendra *et al.*, 2012).

Anti ulcer activity: Aqueous extract of *Aegle marmelos* leaves was prepared and used for investigation. A daily dose of 1 gm/kg body weight of extract administration orally for 21 days. The volume of gastric secretion, ulcer lesion count, pepsin count, PH total activity, hexoseamine content were estimated (Ilavarasan and Monideen, 2002; Shanthi *et al.*, 2011).

Conclusion

This article reviews drugs derived from plants such as flavonoids, saponin, gums and mucilage and tannins for the treatment of peptic ulcer and it is evident that plant extracts have significant antiulcer activity in animal models. The review data suggested that medicinal plant those are evidently reported for its antiulcer activity.

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