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Review Article

Traditional Medicinal Plants for Helicobacter Disease

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Abstract

Helicobacter pylori is one of the most common infectious bacteria in the world that causes gastric diseases leading to cancer. Helicobacter pylori is a small, spiral Gram-negative bacillus plays role in pathogenesis of number of diseases lead from asymptomatic gastritis to gastric cancer. The increase of multiple antibiotic resistance rates of H. pylori noticed worldwide, that make attention to natural compounds from divers medicinal plants as source to control affection of Helicobacter pylori. Most of medicinal plants have a rare side effect, besides the cheer price in compared with the chemical drugs. Traditional medicinal plants contain many active ingredients such as antioxidant, flavonoids, and glycosides and so on. These ingredients affect in resistant of viruses. The present review article aims to clarify the effect of some medicinal plants and medicinal plants, their ingredients on Helicobacter pylori disease.

Keywords: Cheap Prices; Diseases; Helicobacter Pylori; Medicinal Plants; Natural Compounds

Introduction

Peptic ulcers are painful sores in the lining of the stomach or duodenum, affecting nearly 10% of the global population [1]. The primary etiological factors are Helicobacter pylori infection and frequent NSAID use, contributing to 60%–90% and 30%–50% of ulcer cases, respectively [2]. Symptoms range from mild discomfort to severe pain and include nausea, vomiting, bloating, and heartburn [3]. Complications such as gastrointestinal bleeding, perforation, and gastric outlet obstruction can arise if left untreated, increasing the risk of gastric cancer [4]. Timely diagnosis and proper management are crucial.

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Traditional medicine offers a promising avenue, with medicinal plants gaining attention for their gastroprotective properties [5]. The rich biodiversity of medicinal plants, ranging from arid deserts to lush coastal regions, harbors numerous plants with a history of use in treating gastrointestinal disorders [6].

This review article aims to summarize current scientific evidence on the gastroprotective efficacy of medicinal plants, examining their key phytochemical constituents. By establishing the therapeutic potential of these traditional medicines, we hope to pave the way for novel botanical treatments for peptic ulcers and Helicobacter pylori.

Aegle marmelos

A. marmelos, commonly known as bael, is a tree from the Rutaceae family widely used in traditional ayurvedic medicine for gastrointestinal problems. Different parts of *A. marmelos* , like the fruit, leaves, and roots, have exhibited anti-ulcer effects in animal models against gastric ulcers induced by ethanol. Specific phytochemicals isolated from bael a, if the coumarin marmin, obtained from leaves, can inhibit the growth of H. pylori and help protect gastric epithelial cells. Another key coumarin named Angeline, abundant in bael leaves has shown anti-secretory, cytoprotective, and antioxidant effects in the gastric mucosa in rats. However, despite the promising gastroprotective results in preliminary preclinical studies, rigorous randomized controlled trials in humans evaluating safety and efficacy are lacking for bael preparations. Further research warrants exploring its anti-ulcer effects in clinically relevant models along with bioactivity-guided fractionation to identify its active constituents [7].

Aegle marmelos, an herb used in traditional Indian medicine, belongs to the Rutaceae family. The leaves have numerous ethnobotanical applications. A paste from the leaves treats ulcers; the leaves, roots, and fruits of *Aegle marmelos* possess antimicrobial properties that can combat a range of bacterial types [8], they added that essential oil from the leaves shows action against Aeromonas species and *Escherichia coli*, while the root's ethanolic extract demonstrates antimicrobial activity against *Vibrio cholerae, Salmonella typhimurium, and Staphylococcus aureus*. Leaf extracts have proven effective against *Escherichia coli*, enhancing bael's value in traditional medicine Limonene, the primary constituent of bael leaf extract, offers therapeutic properties such as analgesic, anti-inflammatory, anti-bacterial, anti-pyretic, and wound healing [9].

Allium sativum

Garlic, which belongs to the family Amaryllidaceae, has used as a digestive stimulant and ulcer remedy in traditional medicine [10]. They added that the active compounds responsible for these gastroprotective effects identified as organosulfur compounds, namely S-allylcysteine and S-allylmercaptocysteine, found in garlic. Despite promising preclinical findings, the efficacy of garlic in treating patients with Peptic Ulcer Disease [PUD] remains largely unvalidated clinically. Thus, further clinical studies warranted to elucidate the therapeutic potential of garlic in managing PUD [11]. Highlight its

potential benefits, particularly in protecting against NSAID-induced ulcers in rats. Aged garlic extract found to safeguard against these ulcers by preventing the depletion of the important antioxidant glutathione and reducing lipid peroxidation. Moreover, it exhibited inhibitory effects on the growth of H. pylori bacteria and their adhesion to gastric epithelial cells in laboratory settings.

Various studies support the inhibitory effect of garlic on the growth of *H. pylori* [12,13]. Showed that garlic has a wide range of antibacterial activities and effective against H. pylori infection. In addition, [14] reported that consumption of four grams of garlic powder leads to eradication of bacteria in 87% of H. pylori positive individuals. However, [15], indicated that the study did not reveal any association between consumption of garlic powder and eradication of H. pylori infection.

Calophyllum brasiliesnse

Calophyllum brasiliesnse Camb. [Clusiaceae] is a popular remedy employed in folk medicine for the treatment of several ailments, including rheumatism, varicose, hemorrhoids, and chronic ulcers [16]. The activity against protozoans and human pathogenic yeasts [17], cancer chemopreventive properties, antifungal [18,19] and analgesic activities [20] have been reported in different studies [21]. They found in vivo assays that treatment with hydroethanol extract and dichloromethanic fraction reduced the ulcerated area in ulcerated rats inoculated with H. pylori in a dose-dependent manner. They evaluated the effects of various extracts of the *C. brasiliens of* estem bark against H. pylori *in vivo* and *in vitro*. Among the tested products, the hydroethanol extract and dichloromethan fraction showed the greatest activity and potency against the H. pylori strains [22]. They showed that a fraction containing a mixture of chromanone acids of the *C. brasiliense of* stem bark prevented the gastric ulceration caused by ethanol and indomethacin treatments due to the reduction of malondialdehyde and catalase levels in the gastric tissue. They illustrated that extract and a mixture of chromanone acids, indicating that both fractions possess some anti H. pylori activity.

Camellia sinensis

Camellia sinensis L. [Theaceae] is a plant species whose leaves and leaf buds are the source of tea, the most common beverage in the world. There are several reports of in vivo and in vitro antibacterial effects of *C. sinensis* extracts [23]. In [24], the study showed extracts of black and green tea inhibited in vitro growth of six clinical isolates of H. pylori in an agar diffusion assay; they added that the results of a study revealed the protective effect of green tea against stomach cancer [25]. Recently, it showed that non-fermented and semi-fermented methanol: water mixture extracts of young shoots of *C. sinensis* can inhibit the growth of H. pylori and, in lower concentrations, inhibit the function and the production of the enzyme urease, which is a major colonization factor for this bacterium. The lower concentration of non-fermented extract was bactericidal for H. pylori. The superior activity of this extract is due to its rich polyphenolic compounds and catechin content. Decrease in H. pylori numbers and low urease production affect H. pylori colonization and, therefore, decrease the risk of chronic gastritis, peptic ulceration, MALT lymphoma, and gastric adenocarcinoma [26]. Green tea extract clearly suppresses H. pylori induced gastric lesions in Mongolian gerbils [27]. Oral administration of green tea catechins in combination with sucralfate in Mongolian gerbils infected with H. pylori revealed that the colony-forming units of H. pylori were significantly decreased [28]. Harmony findings, in another study, revealed that green tea concentrates could influence gastric colonization or gastric pathology in H. pylori infected or VacA-treated mice [29].

Curcuma longa

Turmeric, derived from the rhizome of *C. longa* belonging to the Zingiberaceae family, has a long history of use in both Ayurvedic and Chinese medicinal practices for the treatment of gastric ulcers [30]. Within turmeric, the active compound curcumin has garnered attention for its remarkable gastroprotective properties. Studies have demonstrated its effectiveness against various ulcer-inducing agents such as indomethacin, ethanol, stress, and pylorus ligation in rat models. Curcumin exerts its protective effects through multiple mechanisms, including antioxidant activity, inhibition of gastric acid secretion, mucosal protection, and anti-H. Pylori activity [31].

Additionally, curcumin has found to work synergistically with conventional treatments such as omeprazole and probiotics like *Lactobacillus acidophilus* to enhance its anti-ulcer effects. Despite its potential benefits, curcumin's poor bioavailability poses a challenge to its therapeutic application. Ongoing research focuses on developing innovative drug delivery systems to enhance curcumin's bioavailability, thereby maximizing its efficacy as an anti-ulcer agent [32].

Turmeric contains a variety of phytochemicals, including alkaloids, tannins, phenolic compounds, terpenoids, phytosterols, saponins, and flavonoids [33]. In particular, curcumin, the main active component of turmeric, has reported to exhibit antibacterial activity against both Gram-negative and Gram-positive bacteria, including *Staphylococci* spp. [34]. One study showed in vitro antimicrobial activity of curcumin against H. pylori [35].

Feijoa sellowiana

Cratoxylum arborescens [Guttiferae] is derived from the Latin word "arbor", which means tree, and it is widely distributed in Sabah and Sarawak. The bark, roots, and leaves of this plant are traditionally used for the treatment of diverse ailments such as fever, cough, diarrhea, itchiness, ulcer, chicken pox, and abdominal complaints. Our previous phytochemical investigation on C. arborescens have led to the isolation and identification of oxygenated and prenylated xanthones α-mangostin, which demonstrated interesting *Feijoa sellowiana* [*F. sellowiana* or *Acca sellowiana*], also known as pineapple guava or guavasteen, is a subtropical species of the *Myrtaceae* family. *F. sellowiana* grows in Mediterranean regions and used for human consumption. Fresh *F. sellowiana* fruits have the typical strong 'Feijoa-like' taste and contain various health-improving components such as vitamin C, minerals [e.g., potassium and phosphorus], iodine [36], dietary fibers, and are especially rich in bioflavonoids [vitamin P] [37].

Different biological activities have reported for this fruit and its components. Various studies demonstrated a potent antimicrobial activity against Gram-positive and Gram-negative bacteria as well as fungi and Helicobacter pylori [38]. According to available evidence, the aqueous extract of the *F. sellowiana* fruit possesses antioxidant activities, and its acetonic extract can exert anti-cancer activities in different cancer cell models, with low toxicity on normal cells. Moreover, its peel contains vitamin C and polyphenols, which favor antioxidant, immune-stimulating, antiinflammatory, and anti-microbial activities and the anti-cancer potential of the fruit [39]. Finally, a study by [40], analyzing the chemical components of *F. sellowiana*

acetonic extract, identified Flavone as the biologically active component.

Glycyrrhiza glabra

Glycyrrhiza glabra [licorice] has traditionally used as a herbal medicine in various countries for many years [41]. *G. glabra* reported for various clinical effects. Such as antiinflammatory, antimicrobial, Essential oil from the leaves shows action against Aeromonas species and *Escherichia coli*, while the root's ethanolic extract demonstrates antimicrobial activity against *Vibrio cholerae, Salmonella typhimurium, and Staphylococcus aureus*. Leaf extracts have proven effective against *Escherichia coli*, enhancing bael's value in traditional medicine, antiviral, antiprotozoal, antioxidative, hepatoprotective, anxiolytic, and even antitumor [42]. Moreover, a root extract of *G. glabra* also reported to have favorable gastrointestinal effects, including antiulcer activity, protection of gastric epithelial cells, and regulation of gastrointestinal motility [43]. *In vitro*, aqueous extract of *G glabra* suppressed H. pylori activity through inhibiting the adhesion of H pylori to the gastric cells [44], they added that Licorice, derived from the roots of *G. glabra* [Leguminosae], has a long history of use in traditional medicine systems as an expectorant and treatment for peptic ulcers and other gastrointestinal problems. Several deglycyrrhizinated licorice preparations, which contain glycyrrhizin, isoliquiritigenin, and polysaccharides, have exhibited gastroprotective effects in animal models and human studies of peptic ulcer disease. For licorice's antiulcer properties include increasing the production of gastric mucus and prostaglandins, antioxidant effects, and inhibiting H. pylori colonization.

Nigella sativa

N. sativa [black seed] is an annual herbaceous plant that belongs to the Ranunculaceae family. It grows up to 30–60 cm tall with finely divided leaves and small black seeds. The seeds of *N. sativa* have utilized traditionally in North Africa for the treatment of various gastrointestinal disorders, including stomach ulcers. The therapeutic effects of *N. sativa* have attributed to its various bioactive compounds, such as thymoquinone, thymohydroquinone, and thymol [45]. Thymoquinone, a major active component of *N. sativa*, has demonstrated to exhibit anti-ulcer activity in several experimental models of gastric ulceration. In a study by [46], thymoquinone found to protect against ethanol-induced gastric mucosal injury in rats. Similarly, [47], reported that thymoquinone inhibited gastric acid secretion and increased mucus production in rats with indomethacin-induced gastric ulcers. In addition, thymoquinone showed exhibit antimicrobial activity against H. pylori, a bacterium commonly associated with stomach ulcers [48]. Meanwhile, other bioactive compounds in *N. sativa*, such as thymohydroquinone and thymol, have also reported to possess anti-ulcer activity. Thymohydroquinone has shown to reduce gastric acid secretion and increase mucus production in rats with ethanol-induced gastric ulcers [49]. Moreover, thymol showed to exhibit anti-inflammatory and antioxidant properties, which may contribute to its gastroprotective effects [50]. *In vitro* studies have also confirmed the anti-ulcer activity of *N. sativa* extracts, for instance [51]. Reported that an ethanolic extract of *N. sativa* inhibited the growth of H. pylori *in vitro*. Similarly.

Osyris quadripartita

O. quadripartita, commonly known as African sandalwood, is a species of flowering plant in the family Santalaceae [52]. *O. quadripartita* has scientifically validated for its therapeutic effect on gastric ulcers. Studies have shown that *O. quadripartita* possesses significant anti-ulcer activity [53]. The plant extract demonstrated a dose-dependent and time dependent reduction in gastric ulcer index in both pylorus ligation-induced and ethanol-induced ulcer models, comparable to standard drugs like ranitidine and sucralfate. Additionally, OQ's oral median lethal dose [LD_{50}] estimated to be higher than 2000 mg/kg, indicating its safety profile [54]. Furthermore, OQ's anti-ulcer properties have attributed to the presence of secondary metabolites, such as flavonoids, tannins, and saponins, in the plant extract [55]. These findings validate the traditional use of OQ in Ethiopian folk medicine for treating peptic ulcers and highlight its potential as a natural remedy for gastric ulcer management.

Plantago major L.

P.major also seems to have antiulcerative activities; however, the mechanism of action not fully understood, but the healing effect of leaf extracts on gastric ulcers of rat models was significant, and it is possible that this compound contains anti *H.pylori* activity [56]. Furthermore, this plant has demonstrated cytoprotective activities against viruses, which are likely due to chlorogenic acid and caffeic acid [57]. Reduction in the number of bacteria in mice serum and inhibition of bacterial growth by a disk diffusion method is other antimicrobial capacities that aresuggested to be the effect of polysaccharide compounds [58].

P. major, commonly referred to as greater plantain, has garnered attention for its potential to treat various gastrointestinal ailments, including peptic ulcer diseases. Particularly in regions like North Africa, where traditional herbal remedies hold significance, greater plantain has been historically utilized for its medicinal properties [59]. Research indicates that *P. major* may possess anti-inflammatory and mucoprotective properties, which could be advantageous in relieving symptoms and facilitating healing in individuals with peptic ulcers. Studies have demonstrated promising findings, suggesting that extracts derived from *P. major* can mitigate ulcer formation and shield the gastric mucosa from damage caused by substances like alcohol and NSAIDs [60]. Moreover, its wide availability and minimal toxicity enhance its appeal as an herbal treatment option. Nonetheless, further investigation, particularly through clinical trials involving human participants, imperative for comprehensively grasping the effectiveness and optimal use of *P. major* in managing peptic ulcer diseases, not only in North Africa but also in other regions [61].

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