

## A Study of Various Medicinal Plants used in Ulcer Treatment: A Review

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www.jrasb.com || Vol. 2 No. 1 (2023): February Issue

Received: 30-01-2023

Revised: 20-02-2023

Accepted: 02-03-2023

### ABSTRACT

Many people suffer from ulcer, a disorder of the digestive tract. Simply put, it's an inflamed break in the skin or the mucus membrane lining the digestive tract. Whenever there is a change in the equilibrium, such as increased aggression or decreased mucosal resistance, ulceration develops. Reasons for this could include drug use, poor diet, stress, and other similar factors. Peptic ulcers are a general term for any type of stomach or duodenal ulcer. To develop, peptic ulcers need mucosal defences to be compromised in addition to gastric juice acid and peptic activity. Ulcers can be treated with a variety of synthetic medications. However, compared to herbal remedies, these drugs are more costly and more likely to cause side effects. According to the research, many different ayurvedic doctors and traditional medicine practitioners use different medicinal plants and polyherbal formulations to treat ulcers. Peptic ulcer disease treatment should focus on symptom alleviation, ulcer healing, and preventing recurrence. In this article, we'll take a look at some medicinal plants that have been studied for their potential use in peptic ulcer treatment and prevention, both in ayurveda and Western medicine.

**Keywords-** Ulcer, Medicinal Plants, PPI, Gastric ulcer.

### I. INTRODUCTION

Necrosis, neutrophil infiltration, reduced blood flow, increased oxidative stress, and inflammation are all typical symptoms of peptic ulcers (PU) [1]. PUs can pass the gastrointestinal tract's muscularis mucosae. Epigastric discomfort that comes and goes and is

relieved by food or alkali, as well as other symptoms that cause physical and mental suffering, are the hallmarks of PU, a non-fatal illness [2].

The two most common subtypes of ulcerative colitis are gastric (which manifests along the stomach's smaller curvature) and duodenal (which manifests in the small intestine's duodenal bulb, which is frequently

damaged by stomach acid) [3]. Peptic ulcer disease (PUD) has been connected to an insufficient balance between aggressively damaging agents (like pepsin and HCl) and mucosa-protective factors (like prostaglandins, mucus and bicarbonate barrier, and proper blood flow) [4]. It was formerly thought that all ulcers in the upper GI tract were only brought on by the severe effects of pepsin and stomach acid on mucosa. However, recent studies have connected *Helicobacter pylori* infection to peptic ulcers, with long-term NSAID use and acetylsalicylic acid (ASA) consumption identified as contributory factors.

The aim of this report is to present a comprehensive overview of peptic ulcers, taking into account their epidemiology, primary symptoms and clinical features, pathogenesis, with a focus on *H. pylori* infection, pharmacological agents used for effective management, and highlighting the most recent challenges and opportunities in this field of study. Finally, in order to arouse readers' interest in the subject and ensure effective administration of health-related systems, plant product safety and security were addressed.

## II. METHODOLOGY

Using electronic data and scientific research information sources like PubMed, Scopus, the Scientific Information Database, Springer Link, and African Journals on Line in addition to Google Scholar, the institution of this review involved a thorough online and offline search of pertinent literature. We also examined plant-related monographs, product labels, and reports from the Centre for Plant Medicine Research in Mampong-Akuapem, Ghana, in addition to these primary materials. People searched the internet for information on peptic ulcer disease, herbal remedies, anti-ulcer activity, *Helicobacter pylori*, Enterica, dyspepsia, Natural Painkiller 500 capsules, Active and isolated substances, phytochemical constituents, pharmacological activity, and traditional uses of medicinal plants. Yet, a variety of other terms were also used to draw attention to important subjects. In addition to the initial keywords, we liberally used synonyms, alternative terms, and related concepts throughout the search. Boolean operators like "AND," "OR," "-", "NOT," and "+" were used in Google and Google Scholar searches to combine and exclude terms. Wildcard operators like (), (?), (\*), and (!) were used during database searches. Examples of medicinal plants explored include: *Spondias mombin*, *Momordica charantia*, *Persea americana*, *Paullinia pinnata*, *Psidium guajava*, *Cnestis ferruginea*, *Vernonia amygdalina*, *Trema orientalis*, *Latana carmara*, *Morinda lucida*, *Citrus aurantifolia* and *Bidens Pilosa*, *Maytenus senegalensis*, *Carapa procera*, *Trichilia monadelph*a and *Spathodia campunata* and *Cassia siebieriana*. as well as those who deal with the business side of the world, because the

latter. the period of the world as well as the..... These searches produced a tonne of papers, all of which were read. In addition, both in vitro and in vivo models for evaluating the capability of medicinal plants to treat peptic ulcers were included. Studies with comparable pharmacological activity that did not employ either of the aforementioned in-vivo or in-vitro paradigms were also included. Even distant continents like Africa were covered.

### 2.1. *Acacia arabica*

The *acacia arabica* (Mimoaceae) tree is widespread in India, particularly in arid and sandy regions. The locals call it "karuvelam," while the rest of the world knows it as the "babul tree." This plant has been analysed chemically and found to have the following components: a gum composed of arabic acid, calcium, magnesium, and potassium; a trace amount of malic acid; 14% moisture; 3-4% ash; and 14% sugar. Tannin is abundant in bark, and pods have around 22.44 percent of it each [14].

#### 2.1.1. *Ulcer treatment*

Ayurvedic Medicine's Ability to Treat Ulcers, It can be used as a wash for hemorrhagic ulcers and wounds when used as a gargle. When the delicate leaves are bruised and made into a poultice, they can be used to ulcers to serve as a stimulant and an astringent [14].

As Latest Research Has Shown. Using *acacia senegal* gum prevented stomach ulcers in rats subjected to cold restraint stress [15]. Protective effects against meloxicam-induced intestinal damage and reduced activity of intestinal enzymes were shown in a study using an aqueous extract of *A. arabica* gum [16].

Dynamic Components. Chemicals including phenolic acids, tannins, and flavonoids are taken into account.

### 2.2. *Adansonia digitata*

The *Adansonia digitata* tree, which is part of the Malvaceae family, is frequently referred to as the "boabab or monkey-bread tree of Africa." They name it "papurapuli" in their native language. It is commonly found in Bombay, Gujarat, the Coromandel Coast, and Ceylon, and is one among the world's largest and oldest trees. Pulp, which includes phobaphenes, mucilage and gum, glucose, tartrate and acetate of potash, and other salts are among the plant's chemical contents. Wax, glucose, salts, gum, and albuminoids are all components of a leaf. In addition to albuminous carbonate and chloride of sodium and potassium, bark also includes the glucoside adansonin.

#### 2.2.1. *Ulcer treatment*

There is Ayurveda evidence of antiulcer activity. The indolent syphilitic ulcer responds well to an application of fresh juice from the leaves combined with powdered ginger and fresh juice expressed from the root of *Salvadora indica*. The leaves can be utilised in poultices and fomentations for irritable, inflammatory ulcers [17].

### 2.3 *Aegle marmelos*

The plant *Aegle marmelos*, also known as a "bael tree," is widely distributed in India. It is a member of the Rutaceae family. "vilvam" is the native name for it. These plant chemicals include flavonoids, tannins, and saponins [18].

Traditional remedies that have been shown to be effective against ulcers. *A. marmelos* fruit has been used for centuries by the kani people of the Kanyakumari district of Tamil Nadu, India, to cure ulcers [18].

As Latest Research Has Shown. When rats have stomach ulcers generated by aspirin with pylorus ligation, they receive a daily dose of 1 gm/kg of an aqueous extract of the leaves for 21 days. There was a statistically significant drop in the number of ulcer lesions from baseline to treatment [19]. The seed-derived pyranocoumarin luvangetin [20] is under consideration.

### 2.4 *Allium sativum*

The plant species *Allium sativum*, which is a member of the Liliaceae family and which is more generally known by the English name "garlic," is referred to by its local name, "vellapundu." It's grown all over India. This plant contains the active component, an acrid volatile oil, as well as starch, mucilage, albumen, and sugar. Obtaining fragrant oil from seeds. Important nutrients and supplementary components containing vitamins are present in the juice as well as naturally bound sulphur, iodine, and salicylic acid combinations [21].

The Ayurvedic Treatment for Ulcers 2.4.1. Maggots in ulcers, ulcerated surfaces, and wounds can be effectively treated by applying a paste made from fried garlic and mustard or coconut oil. Wounds and smelly ulcers can be washed with a mixture of three or four parts garlic juice to one part regular or distilled water [21].

As Latest Research Has Shown. An oral extract of *A. sativum* bulb juice protected rats with stomach ulcers caused by cysteamine at 250 and 500 mg/kg. Experimentally produced stomach and duodenal ulcers in rats are prevented, and gastric ulcer healing is greatly accelerated, thanks to the extract [22].

Dynamic Components. There is some thought given to volatile oils, alliin, and allicin.

### 2.5. *Aloe vera*,

"Aloe gel" refers to a product made from the aloe vera plant, which is a member of the Liliaceae family. Kattalai is the native name for this, but you can find it all throughout India. Aloin, isobarbaloin, and emodin are some of the chemical components of this plant.

#### 2.5.1 Ulcer treatment

Ulcer treatment Ayurvedic Medicine for Treating Ulcers In the United States, persistent ulcers treated locally with leaves have shown promising results. After a few weeks, the ulcers will be healed, but first the discomfort will subside [23].

As Latest Research Has Shown. In rats with stomach ulcers brought on by indomethacin, aloe vera powder mixed with gum acacia at a dose of 200 mg/kg was found to be effective. In comparison to the control group, the extract had considerable antiulcer action [24].

Dynamic Components. Topics include barbalin, isobarbolin, and saponins.

### 2.6. *Annona squamosa*

*Annona squamosa*, a member of the Annonaceae family, is known as the custard apple. Grown in gardens around the country, it is known as "sitapalam" among natives. Alkaloids, flavonoids, saponins, and tannins are some of the chemical components of this plant. Oil and resin are extracted from the seeds, and acrid principle can be found in the seeds, leaves, and unripe fruit [25].

#### 2.6.1. Ulcer treatment

Ayurvedic Medicine's Capacity to Treat Ulcers. Ulcers that aren't healthy are treated using a paste made from ground leaves [25]. As Latest Research Has Shown. Leaf extract in water prevented stomach ulcers caused by pylorus ligation and ethanol in rats [26].

Dynamic Components. One such solution is tannic acid.

### 2.7. *Azadirachta indica*

The plant family Meliaceae includes the native and widely cultivated *Azadirachta indica*, which is found across much of India and especially in Bengal. It is known as neem outside of India, but the locals name it vembu. Nimbidin, phenolic chemicals, saponin, and flavonoids are all said to be present in this plant. The Margosine in this plant is the alkaloid responsible for its bitter taste. About 10 to 31 percent of the seeds are made up of a yellow, bitter, fixed oil. The oil has fatty acids that are both free and volatile. Stearic and oleic acids, together with maybe some lauric acid, make up the volatile fatty acids [27].

#### 2.7.1. Ulcer treatment

Ayurvedic Efficacy Against Ulcers, Unhealthy ulcerations benefit greatly with a poultice of leaves combined with sesamum seeds [27].

As Latest Research Has Shown. Gastric ulcers caused by pylorus ligation and cold restraint stress were prevented in rats by an extract of *Azadirachta indica* leaves [28].

Dynamic Components. The nimbidin fraction of neem seeds oil, which contains stearic and palmitic acid, is studied [29].

### 2.8 *Balsamodendron mukul*

"Gum-gugul" refers to *Balsamodendron mukul*, a member of the Burseraceae family. A variety of it called gukkulu is cultivated in the regions of Sind, Rajputana, Eastern Bengal, Berars, Assam, Khandesh, and Mysore. The volatile oil, gum-resin, and bitter principles are chemical components of this plant [30].

An Ayurvedic Approach to Treating Ulcers. Ulcers that aren't particularly painful can be treated with a mixture of guggul gum and lime juice or coconut oil

that is then applied topically as a lotion or plaster. Bad ulcers like Delhi sores are treated with an ointment containing *B. pubescens* gum, sulphur, catechu, and borax, which is sourced from Sind, Karachi, and Baluchistan [30].

### 2.9. *Bauhinia variegata*

The *Bauhinia variegata* (Caesalpiniaceae) plant is endemic to the woods of India and Burma, located in the foothills of the Himalayas. The natives of the area call it "shemmandarai," which translates to "orchid tree." Quercetin, rutin, apigenin, and apigenin 7-0-glucoside are some of the chemical components documented for this plant. Tannin (tannic acid) is found in bark, along with glucose and a brownish gum [31].

An Ayurvedic Approach to Treating Ulcers. A wash made from a decoction of the bark is helpful for ulcers. Take the bark of *Bauhinia variegata* (10 parts), 3 myrobalans, ginger, black-pepper, long-pepper, bark of *Crataeva nurvala*, cardamoms, cinnamon, and *Tejpatra* leaves, each one part; mix well; apply to ulcers. Reduce to a powder, then mix in 15 parts of guggula to create a pill. Taking half a tola of this with a decoction of *Sphaeranthus mollis*, *Triphala*, or catechu first thing in the morning is recommended [31].

As Latest Research Has Shown. Oral administration of 200 and 400 mg/kg of an ethanolic and an aqueous extract of the root of *B. variegata* protected rats with pylorus-ligation, ethanol, and aspirin-induced stomach ulcers. The extract markedly decreased basal gastric acid output and protected gastric mucosa [32].

Dynamic Components. We take flavonoids into account.

### 2.10 *Berberis aristata*

Nilgiri and temperate Himalayan regions from Bhutan to Kunawer are home to thriving populations of the shrub *Berberis aristata* (family Berberidaceae). Locals refer to it as "kasturimanjal," but it is more popularly known as "Indian or Nepal barberry." Both the roots and the wood of this plant are high in the bitter, yellow alkaloid berberine, which dissolves in acids and creates salts of the alkaloid; the root also includes two other alkaloids [33].

#### 2.10.1 Ulcer treatment

Ayurveda Medicine's Antiulcer Effects. Rasaut (in Hindi) is a crude extract made from the root, and the bark combined with honey is a good application to skin ulcerations [33].

### 2.11 *Beta vulgaris*

The scientific name of the plant we call "beetroot" is *Beta vulgaris* (Chenopodiaceae). The sugar-beet is a plant that originally grew wild along the Mediterranean coast but is now widely farmed in both Europe and the United States. As a result of the high demand for its edible roots and leaves, it is cultivated in gardens over most of India. White and red versions are available. Beetin, a chemical component of this plant, is the plant's active principle.

Ulcer treatment A infusion of the root with a

little vinegar added is great for all types of ulcers and running sores [34]. Antiulcer Activity in Ayurveda.

### 2.12. *Careya arborea*

The family Myrtaceae includes the "slow match tree," or *Careya arborea*. In the area, it is known as "pailacputatammi." In the sub-Himalayan region, it occurs frequently. The chemical components of this plant are found in its thick, red bark, which contains 8 percent tannin. Large, amorphous crystals of calcium oxalate can be seen in Liber [35].

#### 2.12.1. Ulcer treatment

Ayurvedic Medicine for Acid Reflux and Other Digestive Disorders Pulverized leaves applied as a poultice three to four times a day speed the healing of chronic sores [35].

As Latest Research Has Shown. For 5 days, rats were given 300 and 600 mg/kg of a *C. arborea* stem bark extract in ethanol to counteract the effects of ethanol, cold restraint stress, and pylorus ligation-induced ulcer models. Gastric ulcer healing is accelerated by the extract considerably compared to the control group [36].

Dynamic Components. Both tannins and saponins are taken into account.

### 2.13. *Carica papaya*

Papaya, or *Carica papaya*, is a fruit in the caricaceae family. In the area, people refer to it as "papali-pazham." It is naturalised to every country with a tropical climate, and to many subtropical areas. Papain, chymopapain, pectin, carposide, carpaine, carotenoids, and antheraxanthin are just some of the chemical components of this plant [37].

#### 2.13.1. Ulcer treatment

Traditional medicines' anti-ulcer effects, A lot of traditional treatments from the tropics rely on it. Unripe fruit is useful for treating indolent ulcers if eaten cooked. Ripe fruits are often eaten fresh, skin and seed removed, but unripe fruits can be prepared into salads, jellies, and stews. Consumption of the plant's unripe fruit has been related to a protective effect against stomach ulcers [37].

As Latest Research Has Shown. Oral administration of 50 and 100 mg/kg of a *C. papaya* seed extract diluted in water protected rats with an ethanol-induced stomach ulcer. The extract prevented ethanol from damaging the stomach lining. The amount of gastric juice produced and the acidity of that juice were both drastically reduced [38] thanks to the use of *C. papaya* extract.

Dynamic Components. Both chymopapain and papain have been shown to be effective in the treatment of gastrointestinal diseases and dysfunction [39].

### 2.14 *Euphorbia neriifolia*

"Common milk hedge" refers to the plant species *Euphorbia neriifolia* (Euphorbiaceae). The native word for it is "ilaikkalli." Central India is home to this leafless shrub, which is cultivated in Bengal. Components such as Euphorbon, resin, gum, caoutchouc, calcium malate, and so on can be found in

this plant [40].

#### **2.14.1. Ulcer treatment**

Ayurvedic Medicine for Treating Ulcers, Section 2.14.1. Those suffering from bad ulcers and scabies often apply plant juice mixed with clarified or fresh butter [40].

#### **2.15. Ficus religiosa**

Among plant families in the Urticaceae genus, *Ficus religiosa* is the most well-known and sometimes referred to as "holy". The natives have a name for it: arasha-maram. An important religious tree for Hindus, the peepul grows naturally in the wild and is widely cultivated across the country of India. This plant's chemical components include tannin-rich bark, caoutchouc (cochtone), and wax [41].

#### **2.15.1. Ulcer treatment**

Ayurvedic Medicine for Treating Ulcers Infusions or decoctions (simple kashayam) of the bark, sweetened with a little honey, are helpful for ulcers [41].

As Latest Research Has Shown. Two doses (250 and 500 mg/kg, oral) of *F. religiosa* hydro alcoholic extract leaves were tested for their ability to prevent stomach ulcer in rats exposed to 100% ethanol, aspirin, and pylorus ligation. When comparing the extract to the control group, the ulcer index value drops dramatically [42].

Dynamic Components. Flavonoids, saponins, and tannins, which have been shown to have beneficial biological effects, are among the bioactive chemicals taken into account [43].

#### **2.16. Galega purpurea**

"Purple tephrosia" (*Galea purpurea*) is a species of flowering plant in the Papilionaceae family. It's known by the local name of "kolluk-kay-welai" It can be found in all of India, but particularly in the southern part of the country. It prefers stony, hard-to-root areas to grow in. This plant produces gum, albumen, colouring matter, ash with manganese traces, brown resin, chlorophyll, a principle related to quercetin or querritrin, and the glucoside rutin [44].

The Ayurvedic Practice of Treating Ulcers, Section 2.16.1. Ucers can be treated by applying a paste made of powdered root and honey [44].

#### **2.17. Hibiscus rosa-sinensis**

The "changing rose," or *Hibiscus rosa sinensis* (Malvaceae), is a member of the mallow family. Among the locals, it goes by the name "chembaruthi." Originating in China, this plant is now widely cultivated in India for its decorative value. Flavonoids, anthocyanins, quercetin, cyanidin, kaempferol, and hydrocitric acid are all found inside this plant [45].

#### **2.17.1. Ulcer treatment**

Traditional medicines with anti-ulcer properties. Ulcers are historically treated using *H. rosa sinensis* root among the kani people in the Kanyakumari district of Tamil Nadu, India [45].

As Latest Research Has Shown. In pylorus ligated rats, both the aqueous and alcohol extracts of *H.*

*rosa sinensis* roots exhibited considerable antiulcer efficacy at dosages of 250 and 500 mg/kg. Hence, there is sufficient scientific evidence to suggest that these extracts can operate as an antiulcerogenic agent [46].

Dynamic Components. Quercetin and other flavonoids are under consideration.

#### **2.18. Hydrocotyle asiatica**

India penny-wort, or *Hydrocotyle asiatica*, is a member of the Umbelliferae family. It's known as vaellarai in the area. This little plant grows profusely in damp areas in India. The active principle of the leaves is a white crystalline oleaginous compound called vellarin, as well as resins, some fatty aromatic material, gum, sugar, tannin, albuminous debris, and salts, primarily alkaline sulphates [47].

#### **2.18.1. Ulcer treatment**

Ayurvedic Medicine for the Treatment of Ulcers. If you suffer from ulcers, try taking 3–5 grains of the powder three times day, and also applying a light dusting of the powder directly to your sores or, better yet, a poultice made from the fresh leaves [47].

#### **2.19. Indigofera Tinctoria**

Most people refer to *Indigofera tinctoria* (Papilionaceae) as "real indigo." The natives name it "neelum; avari." Plantations of this small, upright shrub can be found all over Northern India, but they are notably dense in the states of Bengal, Bihar, Orissa, Sind, Oudh, Southern India, Madras, and Bombay. Indican (a glucoside), the oxidised form of Luc-indigo, and Indigo-white, the byproduct of fermentation of the fresh green plant, are two of the chemical elements of this plant [48].

#### **2.19.1. Action Against Ulcers**

The Ayurvedic method. Crushed leaves are applied topically to treat skin conditions such eczema, psoriasis, and eczema, and to speed the healing of cuts, scrapes, and ulcers. Indigo powder is also applied topically to treat ulcers [48].

#### **2.20. Lawsonia alba**

"Henna" refers to *Lawsonia alba*, a member of the Lythraceae family. The natives have coined the term "maruthoni" to describe it. It is widespread throughout the country of India, where it serves as a staple for garden and hedge plantings. The chemical components of this plant include a dye (henna) yielding leaves at a rate of 12–15% Hanno, a tannin called tannic acid, and an olive green resin that is soluble in ether and alcohol. Oil is extracted from the seed. In addition to glucoside, the plant also contains [49].

#### **2.20.1. Ulcer treatment**

Ayurveda Medicine's Ability to Fight Stomach Ulcers. Wounds and ulcers can be treated using an ointment made from the leaves [49].

#### **2.21 Mangifera indica**

The "mango tree," or *Mangifera indica* (Anacardiaceae), is a tropical fruit tree that is widely grown around the world. The Maasai have their own word for it. Its cultivation spans the entire Indian

subcontinent. This plant contains alkaloids, sterols, saponins, tannins, and flavonoids [50].

#### 2.21.1. Ulcer treatment

Ayurvedic Medicine for the Treatment of Ulcers. In order to treat ulcers, leaf extracts were dissolved in rice bran oil and taken orally. The plant has traditionally been used to treat ulcers [50].

As Latest Research Has Shown. In a dose-dependent fashion, rats with stomach lesions were given 250, 500, and 1000 mg/kg of the flower decoction via oral administration. In this way, both the quantity and acidity of gastric juice were greatly diminished by the extract [51].

Dynamic Components. The potential use of mangiferin [52].

#### 2.22. *Mimosa pudica*

The "touch me not" tree, or *Mimosa pudica* (Fabaceae), is a member of the Fabaceae family. In the area, people refer to it as "thottal sinungee." It is naturalised to every country with a tropical climate, and to many subtropical areas. Flavonoids, quercetin, naringin, saponins, tannins, gums, mucilage, and cellulose are all present in this plant [53].

##### 2.22.1. Ulcer treatment

Ayurvedic Medicine's Ability to Treat Ulcers, Intestinal ulcers can be treated by drinking a decoction made from fresh leaves and seeds [53].

As Latest Research Has Shown. There is evidence that using an ethanolic extract of *Mimosa pudica* leaves as a natural antioxidant could be helpful in the treatment of ulcers [54]. Its antiulcer action was revealed to be dose-dependent.

Dynamic Components. Mimosine, an alkaloid, is being considered.

#### 2.23. *Momordica Charantia*

The "bitter gourd" (*Momordica charantia*; Cucurbitaceae) is a member of the gourd family. The natives have given it the name "pavakka-chedi." All over India, gardens are filled with this climbing shrub, which is grown specifically for its fruit. The chemical components of this plant include an acid that is yellow in colour, a resinous substance, some ash (6%), and a glucoside that is bitter in taste yet soluble in water but not ether. Albuminoids make up 1.62 percent, soluble carbohydrates make up 85.41 percent, dietary fibre makes up 1.51 percent, and ash makes up 8.53 percent in a fresh vegetable [55].

##### 2.23.1. Antiulcer Activity

The Ayurvedic method. When combined with cinnamon, long pepper, rice, and chaulmugra oil, the powdered whole plant makes a wonderful treatment for malignant ulcers [55]. This is also useful for dusting over leprous and other intractable ulcers and wounds to speed up the healing process.

As Latest Research Has Shown. The ulcers caused by pylorus ligation, aspirin, and stress in rats are treated with 200 mg/kg of an alcoholic extract of *M. charantia* fruit and 400 mg/kg of an aqueous extract.

These extracts demonstrated considerable reduction in ulcer index as compared to control [56].

Dynamic Components. Several compounds, including flavonoids, saponins, and sterols, are taken into account.

#### 2.24. *Moringa oleifera*

The family Moringaceae includes the well-known "drum-stick, horse radish tree," also known as *Moringa oleifera*. Murungai is the local name for it. You can find it in its natural habitat in the Western Hemisphere and the sub-Himalayas, as well as in India, Pakistan, Asia Minor, Africa, and Arabia. Alkaloids, flavonoids, saponin, tannins, zeatin, quercetin, kaempferol, and terpenoids are all present in this plant [45].

Traditional remedies that have anti-ulcer effects. Several portions of the plant have long been known for their therapeutic significance in folk medicine. Kani tribal members in the Pechiparai Hills of Tamil Nadu, India use the leaf tea to heal stomach ulcers. In Pakistan, *M. oleifera* flower buds are extensively ingested due to their purported antiulcer properties [45].

As Latest Research Has Shown. Oral administration of 125, 250, and 500 mg/kg of an ethanol extract of *M. oleifera* leaves protected rats with a pylorus-ligated stomach, an ethanol-induced stomach, a cold-restraint stress-induced stomach, and an aspirin-induced stomach from developing a gastric ulcer. Reduced ulcer and acid pepsin secretion were observed after using the extract [57].

Dynamic Components. Beta-carotene, beta-sitosterol, and quercetin are all under consideration.

#### 2.25. *Myrica nagi*

The family Myricaceae includes the well-known "box myrtle; bay-berry," or *Myrica nagi*. Those who live in the area know it by the name "marudampattai." It is a subtropical evergreen that grows in the Khasia Mountains, the hills of Burma, the Simla District, and as far south as Singapore. In both China and Japan, this tree is a staple in backyard gardens. Tannin, saccharine matter, and salts are all chemical components found in the bark of this plant. Myricotin, a pigment, is extracted from the powdered bark [58].

##### 2.25.1. Ulcer treatment

Antiulcer Properties of Ayurveda Medicine 2.25.1. Scrofula ulcers can be treated with a poultice created by mashing the bark, boiling it in water, and then stirring in Indian meal until the mixture reaches the desired consistency (Tukina). Myrtle wax, extracted from the boiled fruit, is applied topically to cure ulcers [58].

#### 2.26. *Myrtus communis*

*Myrtus communis* (Myrtaceae) is widely known as "myrtle." It is grown in gardens all throughout India. The ripe berries of this plant include the essential volatile oil (oil of Myrtle), resin, tannin, citric acid, malic acid, and sugar that make up the plant's chemical

ingredients. [59].

Ayurvedic Medicine for the Treatment of Ulcers. For example, leaf powder can be applied to wounds and ulcers for relief from pain and infection. Myrtle berry infusions are used to treat stomach and intestinal ulcers because the fruit has carminative properties [59].

As Latest Research Has Shown. Using an excision wound model in rats, a topical preparation of *M. communis* at low doses showed wound healing efficacy [60]. By decreasing stomach secretion and acidity and increasing its mucosal barrier, *M. communis* fruits protected against gastric ulcer produced by ethanol, indomethacin, and pylorus ligation in rats [61].

Dynamic Components. Myrtle is being considered (volatile oil).

### 2.27 *Ocimum sanctum*

Holy basil, or *Ocimum sanctum*, is a member of the Lamiaceae family. Tulsi is the local name for it. It's a common plant across all of India. Tulsi, which is what her name means, is "the unparalleled one." A lot of Hindus in the Indian subcontinent consider this to be a holy plant. The plant contains the chemicals alkaloids, tannins, saponins, flavonoids, and sterols [62].

It has been found that some Ayurvedic herbs have antiulcer properties. The herb has been used to treat a wide range of conditions, as detailed in Indian materia medica. Millions of people in India have been eating the fresh leaves as Prasad for a long time. Tulsi tea, made from the plant's leaves, is often used by those suffering from digestive issues [62].

As Latest Research Has Shown. Intraperitoneal administration of 1, 2, and 3 mL/kg of *O. sanctum* fixed oil was given to rats with ulcers produced by aspirin, indomethacin, alcohol, and stress. The ulcer index is decreased in a dose-related fashion [63].

Dynamic Components. Eugenol, which can be found in fixed oil, is under consideration [64].

### 2.28. *Odina wodier*

The name "odiyamaram" refers to the plant species *Odina wodier* (Anacardiaceae). Generally speaking, it is grown in the warmer regions of India. Barks containing tannin and ash containing a significant quantity of potassium carbonate [65] are the main chemical ingredients of this plant.

It has been found that some Ayurvedic herbs have antiulcer properties. Treatment of persistent ulcers with fresh juice extracted from the bark has been found to be effective. Chronic ulcers can be treated using a paste made of bark powder and neem oil. Leprous ulcers are treated with a paste made from powdered bark [65].

### 2.29. *Oryza sativa* (Rice)

Rice, or paddy, is the common name for the cereal grass *Oryza sativa* (Gramineae). A common term for it in the region is "arshi; nellu." It's a common plant across all of India. Across the tropical and subtropical regions of both hemispheres, this is a major staple crop for countries like India, Ceylon, Burma, China, Japan,

and Siam. Rice, one of the plant's chemical ingredients, contains more starch than any other starchy grain but very little fat, protein, or minerals [66].

#### 2.29.1. *Ulcer treatment*

Ayurvedic Medicine's Capacity to Fight Ulcers, Rice gruel or conjee water, as it is commonly called, (Decoction 1 in 40) or thicker liquid made by boiling the rice powder in water, with a pinch of salt and a squeeze of lemon, makes a good drink where there is an irritable or inflammatory state of the stomach, and without the lime-juice and salt in gastric ulcer. Schnabel, writing in the American Journal of Medical Science [66], describes successful treatment of stomach and duodenal ulcers with a rice-water mixture.

As Latest Research Has Shown. An oral dose of 1 millilitre per day for four days of an extract of *Oryza sativa* bran (rice bran oil) was used to prevent ulcers in rats caused by swimming stress and pylorus ligation. The extract significantly decreased the amount of stomach acid secreted at rest [67].

#### 2.30. *Peucedanum Grandis*

Wild carrot, or *Peucedanum grande*, is a member of the family Umbelliferae. Western India's highland regions are its natural habitat. The fruits of this plant, which contain a pale yellow essential oil, are the source of its chemical components [68].

The Ayurvedic Treatment of Ulcers, like fennel seeds, 1 in 10 fruit infusion is taken in doses of 1/2 to 1 ounce for carminative, stomach and intestinal diseases, etc. [68].

#### 2.31. *Phyllanthus Niruri*

Stonebreaker, sometimes known as seed-under-leaf, is the common name for *Phyllanthus niruri* (Euphorbiaceae). The natives have dubbed it "kizhkay nelli." Spreading from the southern and central parts of India to Ceylon, it is a common sight. Alkaloids, saponins, tannins, flavonoids, sugars, and glycosides are all present in this plant [69].

##### 2.31.1 *Ulcer treatment*

Ayurvedic Medications with Antiulcer Effects. Poultices made from the whole plant are applied to ulcers by pounding the root and mixing it with rice water [69].

As Latest Research Has Shown. Oral administration of 400 mg/kg of a metanolic extract of *P. niruri*'s aerial parts to rats considerably attenuated the formation of ulcer produced by indomethacin [70].

Alkaloids (4-methoxy-securinine), ellagic acid, beta sitosterol, gallic acid, and hypophyllanthin are all active constituents.

#### 2.32 *Pinus longifolia*

The "long-leaved pine," or *Pinus longifolia* (Coniferae), is a tree with extremely long needles. The locals name it shirsal. It is widespread in the regions around the Himalayas, the North Western Frontier Province (from Afghanistan to Kashmir), the Punjab (from Uttar Pradesh to Bhutan), Assam, and Upper and Lower Burma. The elements and compounds that make

up a substance: Incision of its sapwood produces an oleoresin from which turpentine is extracted; this turpentine, known as pinene, contains 20% of the volatile oil of turpentine, along with a trace amount of limonene, while the remaining 80% is widely utilised as calophony or resin [71].

Ayurvedic Medicine's Capability to Fight Acid Reflux and Ulcers, Section 2.32.1. For both external and internal burns, including ulcers, wood can be applied to relieve the pain and temperature of the affected area. It's where you may get the glue that's put on ulcers to make them heal faster [71].

### III. SAFETY OF PLANT PRODUCTS USED AS ANTIULCEROGENIC AGENTS

In an effort to find treatments for a wide range of illnesses, modern medicine turns to traditional medicine. Plants or plant parts have been used for decades to treat a wide range of medical conditions. Due to their numerous unfavourable side effects, traditional and folk medicines are now being sought after instead of conventional antiulcer medications. Pharmacology is working to determine the active ingredient(s) that are responsible for the beneficial effects of the traditionally used plants in antiulcer therapy. The contemporary strategy using cutting-edge technology is dependent on the use of laboratory animals. For research on ulcers, a few animal models, usually rat models, have been developed, but this is not the case for many other diseases. Animal research protocols must be approved by the Institutional Ethics Review Board (IRB).

To assess the acute gastroprotective activity of plant extracts, animal models of gastric ulcer brought on by ethanol and indomethacin (a non-steroidal anti-inflammatory drug) are typically used. However, animal models of chronic gastroprotective activity induced by acetic acid are frequently used. [72]

The growing interest in herbal medications is a result of numerous studies on animals demonstrating that plant extracts are safer than synthetic drugs [73]. However, research on acute and long-term toxicity is required before using plant extracts as antiulcer medications. It is crucial to carry out both acute toxicity studies (also known as single-dose studies) and chronic (or sub-acute) toxicity studies when evaluating plant extracts that contain a wide range of chemicals (also known as repeated-dose studies). One of the few guidelines for conducting toxicity studies is provided by the Organization for Economic Co-operation and Development (OECD) [74]. Rodents like rats and mice are used most often in in vivo drug testing. When examining the biological functions of plants, detecting acute toxicity should come first. Worldwide, toxicologists generally agree that a drug is not toxic if an acute dose of 5000 mg/kg body weight does not result in death in an acute toxicity assay [75]. In fact, the benefits

of using plant products as antiulcer agents due to their low toxicity are obvious, especially in situations where a single dose of 5000 mg/kg body weight does not elicit any change, as was seen in mice treated with hydroalcoholic extracts of *Serjania marginata* Casar. (Family Sapindaceae) [76] or ethanol extracts of *Crassocephalum vitellinum* (family. The dose at which half of the tested animals perish is known as the median lethal dose (LD50) [77]. This is how the findings of studies on acute toxicity are expressed. Nevertheless, before continuing with the development of pharmacological formulations, longterm toxicity in vivo should be assessed.

In studies utilising animal models of gastric ulcers, a number of herbs used in traditional medicine have been found to exhibit gastroprotective and therapeutic qualities. *Vernonia condensata* (Asteraceae) ethanol extract was administered to rats twice daily for seven days without causing any adverse effects, fatalities, or appreciable changes in organ weight. Rats were given a 10 mg/kg hydroalcoholic extract of *Maytenus robusta* (Celastraceae) twice daily for 7 days without experiencing any harm [49]. The same plant extract was found to be genotoxic to mammalian cells in vivo at doses of 250 and 500 mg/kg in a prior investigation, but not at 50 mg/kg [78]. In rats, a single oral dose of 5000 mg/kg of either the aqueous or chloroform extract of *Bauhinia purpurea* (Fabaceae) [79] or the ethanol extract of *Parkia speciosa* (Fabaceae) [62] resulted in no toxicity, behavioural abnormality, or mortality over the following 14 days. Its antiulcer activity was also confirmed in all used in vivo models of gastric ulcer. *Clausena excavata* (Rutaceae) methanol extract acute toxicity experiments utilising single doses of 2000 or 5000 mg/kg in rats produced equivalent outcomes, indicating that this drug is non-toxic due to its low toxicity. [80] This is because this extract's oral LD50 is higher than 5 g/kg body weight. Yet, it was discovered in this study that those who received extract at extremely high doses had much lower body weights than those who received extract at standard doses.

It was determined that the plant is safe and that the oral LD50 is more than 2 g/kg when the acute toxicity of the *Annona muricata* (Annonaceae) extract from the leaves was examined in rats at two doses (1000 mg/kg and 2000 mg/kg) [81]. As evidence of their in vivo gastroprotective benefits in several gastric ulcer models, hydroalcoholic extracts from *Brassica oleracea* (Brassicaceae) [82] and *Caesalpinia sappan* (Caesalpinaceae) [57] revealed no toxicity in rats after a single dose (2000 mg/kg). Despite the fact that the majority of studies on the acute oral toxicity of plant extracts show no signs of toxicity, in the case of the dichloromethane fraction of *Piper tuberculatum* (Piperaceae) fruit [83], following administration of an oral dose of 5000 mg/kg, in mice, respiratory changes, pilomotor erection, and reduction in locomotion and passivity were stated 10 min after treatment, resulting in



animal death after 4 hours. The same symptoms appeared after 30 minutes after receiving the same dose of this extract intravenously (i.v. ), and the animals soon passed away. The intraperitoneal LD50 was 0.26 g/kg, whereas the oral LD50 was 1.62 g/kg.

Studies on the acute toxicity of plant items used as antiulcer medicines have been conducted, but there are no data or occasional investigations on the chronic or sub-acute toxicity. Among the few significant exceptions in this area are discoveries from yarrow, or *Achillea millefolium* (Asteraceae), whose aqueous extract has been investigated. It has been demonstrated that yarrow's aqueous extract can repair chronic stomach lesions brought on by acetic acid and can guard against lesions brought on by ethanol and indomethacin. Male and female Wistar rats were used in studies on chronic toxicity that lasted 28 and 90 days, respectively [84]. A second group of animals, slaughtered 30 days following the end of the treatments, acted as a control group. All rats survived after receiving yarrow aqueous extract orally for 90 days. Inconsequential changes in liver weight, cholesterol, HDL cholesterol, and glucose levels were seen; however, these changes were not correlated with dosage or length of treatment. Body mass, clinical, or behavioural characteristics did not significantly change between the treated and satellite groups, indicating that the extract is safe to take. These findings supported the finding that there is no toxicological harm from chronic exposure over very extended time periods. In a Hippocratic test, acute administration of yarrow aqueous extract at doses up to 10,000 mg/kg (p.o.) and 3,000 mg/kg (i.p.) did not cause animal mortality.

In tests for subacute toxicity, *Sedum dendroideum* (Crassulaceae) hydroethanolic extract was revealed to have gastroprotective effects [85]. Male and female Wistar rats were given hydroethanolic extract (50 mg/kg) for 14 days after acetic acid-induced stomach ulcers. The daily tracking of body mass index, organ weight, biochemical markers, behavioural abnormalities, food patterns, and water intake revealed no appreciable changes [85].

There are many techniques to cure gastric ulcers, and one of them involves combining artificial medications with natural ones in order to lessen the long-term side effects of conventional therapy. Despite the animals being less active than the control group relative to the study's baseline, studies on male and female Swiss Albino mice indicated that the methanol extract of *Bambusa arundinacea* (Gramineae) exhibited antiulcer activity without significantly affecting autonomic responses. It was found that the LD50 was 2.55 g/kg (p.o.) and 1.81 g/kg (i.v. ). (i.p.). On the other hand, when phenylbutazone (an NSAID) and methanol extract from *B. arundinacea* were combined, a more effective anti-inflammatory drug was produced with less harmful side effects and no ulcer formation.

With this knowledge, it may be possible to conduct toxicity tests on specific chemicals and learn

more about the potential antiulcerogenic effects of plant products by analysing the main chemical constituents of plant extracts. Despite the lack of toxicology investigations, a study utilising the bark of *Euphorbia umbellata* (Euphorbiaceae) in methanol found that the polyphenols, particularly the derivatives of ellagic and gallic acids and flavonols, were responsible for the antiulcerogenic effects that were seen. Rats with chronic stomach lesions have been demonstrated to recover more quickly and with less toxicity when treated with the plant triterpene oleanolic acid.

#### IV. CONCLUSION

In recent years, scientists have paid more attention to herbal medicines and their properties. The potential of these plants as antimicrobials and therapeutics for a range of diseases has been investigated. Based on the aforementioned review, it was found that active components in herbal medicines were typically responsible for the biological effects, such as antioxidant, anti-inflammatory, and antiulcer properties, and that experiments showed a correspondence between ethnopharmacological and scientific research results in most cases. Antiulcerogenic activity was found in many naturally occurring compounds. These included lignin, flavonoids, alkaloids, triterpenoids, steroids, saponins, and coumarins. Researching new gastroprotective plants and identifying the natural compounds they contain is crucial for the development of safer, more effective, and less expensive treatments for a wide range of gastrointestinal conditions.

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