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Anti-Ulcer Plants from North-East India - A Review

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ABSTRACT

Ulcer is an open sore or an outer or inner surface of the body brought about by a break in the skin or mucus membrane usually, a blood stream issue which neglects to mend. Ulcer ranges from little excruciating wounds in the mouth to bedsores and genuine sores of the stomach or digestive tract. Ulceration happens when there is an unsettling influence of the ordinary harmony brought about by either upgraded animosity or reduced mucosal resistance. It might be because of the ordinary use of medications, sporadic sustenance propensities, stress, thus forth. Ulcers can likewise be brought about by an infection, called *H. pylori*. Regular indications of gastric ulcers incorporate weight reduction, poor hunger, swelling, burping, spewing and once in a while heaving blood. The present review focuses on history of ulcer, its types, pathophysiology, anti-ulcer therapeutic plants and current status of worldwide clinical preliminaries led on ulcers. Various synthetic drugs are accessible to treat ulcers. Conventional medicines or to bring up obviously, the restorative plants have more extensive scope of helpful focal points in the best possible administration of ailment, as they have better pharmacological activity alongside low rate of reactions or the antagonistic impacts. Anti-ulcer therapeutics has more extensive market all-inclusive referring to the reality of predominance of ulcers in people and animals. Medicinal plants additionally in this manner have immense market for themselves in our definitive objective of giving recuperating contact to the illnesses individual. Clinical preliminaries are going on around the world, including India, in their push to think of explicit restorative methodologies to manage ulcers and event of different infections. Time will be no far, when clinical preliminaries led, would help in bringing out clear remedial objective to diminish the event of ulcers and better administration of this disease to serve the mankind.

Keywords: Ulcer, Ulcer formation, Medicinal plants, Active constituent, Application.

INTRODUCTION

Ulcer is a typical issue of the gastrointestinal system, which makes much inconvenience patients, disturbing their every-day schedules and causes mental misery [1]. Ulcers are injuries on the outside of the skin or a mucous layer portrayed by a shallow loss of tissue which vitiates and would prompt draining and turn out as bleeding sore or bleeding ulcers [2]. As per Robins pathology, ulcer is the break of the progression of skin, epithelium or mucous membrane brought about by sloughing out of aroused necrotic tissue [3]. Ulcers are most basic on the skin of the lower limits and in the gastrointestinal tract, despite the fact that they might be experienced at practically any site. There are numerous sorts of ulcer, for example, mouth ulcer, throat ulcer, peptic ulcer, and genital ulcer. Of these peptic ulcers is seen among numerous individuals. In this cutting-edge time additionally 75-80% of the world populaces still utilize herbal drug fundamentally in creating nations, for essential social insurance as a result of better social worthiness, better similarity with the human body and lesser symptoms [4]. Therapeutic plants are being used for human wellbeing the board since ages and still today it is filling the need with dependability through scientific legitimacy [5]. Customary recuperating is the most seasoned type of organized technique for treatment that depends on basic theory and set of standards by which it is polished. Northeast region of India involving conditions of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim Tripura still pursue the deep rooted old traditional healing systems dependent on Ayurveda, Unani and other partnered practices. Each state is having its very own tongue, plant and creature assets for meeting out the prerequisite of network including wellbeing facilities. The focal points of conventional mending systems are that they can convey unquestionably a bigger number of administrations than every single other arrangement of medication. This is reasonable and independent type of wellbeing thinks about village India Vis a Vis northeast. A few sections of Northeast are difficult to reach because of poor correspondence. This administration can be drilled in any remote dimension. People healers are effectively accessible and moderate and satisfactory in the whole town, their administrations rely on nearby assets like Flora fauna, minerals etc. For esteem in present day herbal medicines security doesn't involve worry for these plants as it has been demonstrated throughout the years by their customary use. The point where more examination is required is to create standard systems for standardization of herbals [6]. Histological examinations uncovered that these therapeutic plants did not demonstrate any intense danger. Fundamental photochemical screening of this restorative plant distinguished the nearness of imperative secondary metabolites like flavonoids and tannins which are the dynamic standards of antiulcer activity [7]. Present examination was directed to review medicinal plants considered as gastroprotective and recuperating agents on ulcers in ayurvedic assets and next to that to assemble proof for their adequacy and biological components in current investigation.

REGULATION OF ACID SECRETION BY PARIETAL CELLS

The ulcers respond well to different anti-ulcer drugs, for example, acid pump inhibitors, sucralfate, and several growth factors. Besides, both steroidal and non-steroidal anti-inflammatory drugs adversely sway mending of the experimental ulcers. The different ulcer models are presently utilized as the standard model for screening compounds as potential anti-ulcer drugs. The development of ulcer is summarized in Figure 1. The control of acid emission by parietal cells is particularly critical in the pathogenesis of peptic ulcer, and establishes a specific focus for medication activity. The discharge of the parietal cells is an isotonic arrangement of HCl (150 m mol/L) with a pH under 1, the concentration of hydrogen ions being in excess of a million times higher than that of the plasma. The Cl⁻ is effectively transported into canaliculi in the cells that speak with the lumen of the gastric organs and consequently with the stomach itself. This Cl⁻ emission is joined by K⁺, which is then traded for H⁺ from

inside the cell by a K^+/H^+ ATPase and bicarbonate ions. The later exchanges over the basal membrane of the parietal cell for Cl^- . The main improvements following up on the parietal cells are: gastrin, histamine, acetylcholine, prostaglandins.

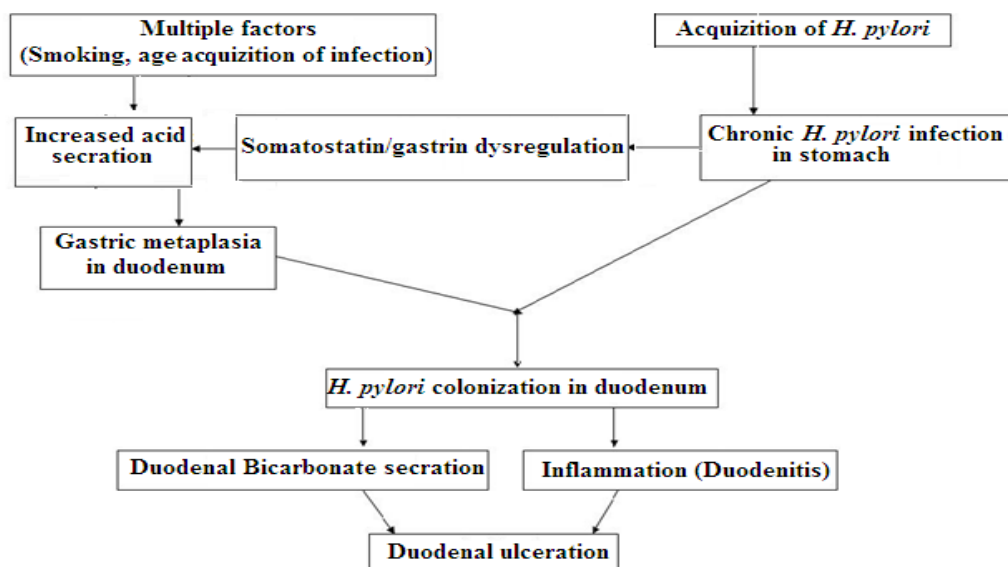


Figure 1: Formation of ulcer.

HISTORY

The prior portrayal of ulcer goes back to a time of 3000 BC and even before that. Hippocrates (460-360 BC) known as 'father of drug', portrayed an ulcer while characterizing, cancer and named it as carcinos and carcinoma alluding them as non-ulcer forming and ulcer forming tumors [8]. In pre-sixteenth century Hippocrates himself depicted gastric ulcer and side effects identified with it. He even portrayed the administration of ulcer, which could be found in Corpus Hippocraticum, a gathering of Hippocrates work by his adherents. The incomparable Arabic doctor Avicenna (980-1037) considered the connection between gastric agony and the eating times. The first recorded instance of gastric ulcer was portrayed by the Italian doctor named Marcello Donati (1538-1602) who announced the case in 1586. In the middle of that age unmistakably gastric agony and ulcer had cozy connections and regularly relied on the way of life and dietary patterns of the individual. The principal clear portrayal of the side effects and dreary life structures of gastric ulcers was year 1793 pursued by his first distribution on ulcer in the year 1799. In 1875, Bottcher et al. guessed that ulcer was brought about by microorganisms; in any case, nobody trusted them around then. As it was imagined that microscopic organisms couldn't endure the acidic conditions and the utilization of antibiotics was esteemed as pretense. Schwann (1810-1882) found pepsin in 1834 and it was obvious to the scientific brotherhood as another known reason for peptic ulcer. Amid the age 1889 winding molded microscopic organisms had been distinguished in both mucosa and gastric substance of ulcer patients; this was trailed by perception of *Helicobacter pylori* by Howard steer in the biopsies of patient with the ulcer in the year 1971. Revolution in the therapeutic science came in the year 1982, when *Helicobacter pylori* was first recognized and refined independently and was uncovered as one of the known reason for peptic ulcer by John Robin Warren and Barry Marshal the two Australian doctors, for which they were likewise granted Nobel prize in 2005, which demonstrated Koch's third hypothesize that the pathogenesis of ulcer and numerous ailments incorporating malignancy lied within the sight of a bacteria (*Helicobacter pylori*). After the progressive disclosure of pathogen for example

Helicobacter pylori the treatment objectives changed to the utilization of antibiotics and bismuth pursued by utilization of acid blockers. After the disclosure of *Helicobacter pylori* amid the age of 1995, right around 75% patients with ulcer were treated with hostile to secretory operators or medications and just 5% got antibiotic treatment. This was trailed by national battle to teach the majority about the known reason for ulcer for example *H. pylori* and changed the treatment alternatives accessible with the medical fraternity [5]. It took two decades to comprehend that *H. pylori* was causative specialist for an ulcer, various examinations and animal models were set up to think of the instrument through which *Helicobacter pylori* sets up itself in gastric condition and is in charge of the pathogenesis of gastric ulcer. The greater part of the number of inhabitants in world is influenced by *H. pylori*, just 5-10% create ulcer.

ULCER TYPES

Distinctive kinds of ulcers have been delineated by restorative researchers and are known by the cause or spot of event in human body. Be that as it may, the most widely recognized classes of ulcers are:

Peptic ulcers

Peptic ulcers are bruises or wound that creates within covering of the stomach, the upper segment of the small digestive system or throat. They structure when the stomach related juices harm the dividers of the stomach or digestive tract. Peptic ulcers are frequently caused from aggravation in the wake of being contaminated with *Helicobacter pylori* microscopic organisms and long haul utilization of painkillers. Kinds of peptic ulcers are gastric ulcers, esophageal ulcers, and duodenal ulcers.

Arterial ulcers

Arterial ulcers are open wounds that basically create on the external side of the lower leg, feet, toes and impact points. Blood vessel ulcers create from harm to the supply routes because of absence of blood stream to tissue.

Venous ulcers

Venous ulcers are the most widely recognized type of leg ulcers. These are open injuries regularly framing on the leg, beneath the knee or on the internal region of the lower leg. They commonly create from the damage of the veins brought about by deficient blood stream back to the heart.

Mouth ulcers

Mouth ulcers are little injuries or sores that create in the mouth or the base of the gums. They are regularly known as ulcer. These ulcers are activated by various causes including gnawing within the cheek, nourishment hypersensitivities, hormonal changes, nutrient insufficiencies, bacterial disease.

Genital ulcers

Genital ulcers are bruises that create on genital regions including the penis, vagina, and rear-end or encompassing zones. They are usually brought about by explicitly transmitted contamination, yet genital ulcers can likewise be activated by injury incendiary sicknesses or unfavourably susceptible response to healthy skin items.

HERBAL PROTECTION

Herbs can be utilized as an elective solution for various pharmacological clutters. Distinctive bioactive compound separated from herbs are in effect effectively utilized for the treatment of ulcer. Because of the reactions of substance drugs,

medicinal plants cures are picking up notoriety. A few logical examinations uncover that herbal extracts and dynamic constituents separated from various herbs can utilized as ulcer defensive operators.

FINDINGS AND DISCUSSION

An investigation done by Saikia et al. [9] found that the home greenery enclosures of upper Assam to be wealthy in therapeutic verdure. Out of 323 species considered 96 have restorative esteem. Another examination by Sharma et al. [10], done in the territory of Mizoram show incredible assorted variety of restorative plants and potential remedial applications. Literary works propose that poly herbal formulations of therapeutic plants are viewed as potential hotspot for the treatment of ulcers. Mix of ayurvedic information with present day medication can deliver better antiulcer medications of normal birthplace from restorative plants with fewer reactions [11]. Our examination demonstrated that these researched therapeutic plants could anticipate ulcer in a dose-dependent manner. Histological investigations uncovered that these therapeutic plants did not demonstrate any intense poisonous quality. Primer photochemical screening of this therapeutic plant distinguished the nearness of vital optional metabolites like flavonoids and tannins.

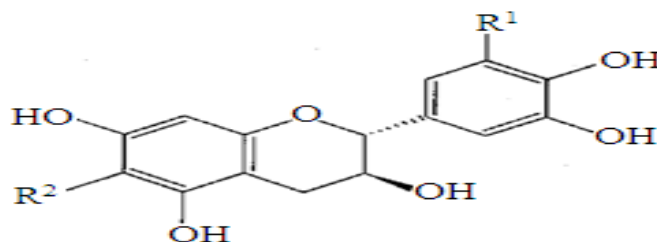


Figure 2: Catechin ($R^1=H$; $R^2=H$).

Acacia arabica [12] (Family: Fabaceae alt. Leguminosae), is regular all over India in dry and sandy regions. It is regularly known as 'babul tree' and locally called as karuvelam. Chemical constituents in this plant are polysaccharide arabin (mixture of calcium, magnesium and potassium salts of arabic acid), catechin (Figure 2), epi-catechin (Figure 3), arabic acid on hydrolysis gives D-galactose, L-arabinose, L-rhamnose and D-gluconic acid. Like-wise it is containing enzymes oxidase and peroxidase. It is utilized as swish in haemorrhagic ulcer and wounds. Wounded delicate leaves shaped in a poultice and applied to ulcers goes about as stimulant and astringent. It demonstrates security in meloxican-induced intestinal damage.

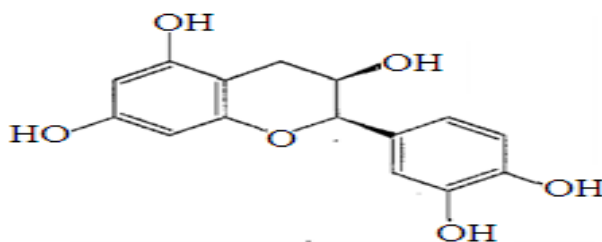


Figure 3: Epi-catechin.

Aegle marmelos, a plant indigenous to India has been used by the inhabitants of the Indian subcontinent for over 5000 years. *Aegle marmelos* belonging to the family Rutaceae; Subfamily: Aurantioideae) is commonly known as bael (or bili or bhel), also Bengal quince, golden apple. The chemical investigation of the leaves of this plant has revealed the presence of number of

alkaloids [13], coumarins [14], Tannins, Saponins, fatty acids and amino acids. Maity et al. studied the chemical constituents from various parts of the plant and their corresponding therapeutic effects. The following results were obtained [15]:

| Part of plant | Chemical constituent | Therapeutic effect: |
|---------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Leaf | Skimmiamine (Figure 4), aegelin, lupeol, cineol, citral, citronellal, cuminaldehyde, eugenol, marmesin | Anti-cancer, cardio-active, anti-inflammatory, anti-septic, antiallergic etc. |
| Fruit | Marmelosin (Figure 5), luvangetin, auraptin, psoralen, marmelide | Anti-ulcer, cardio-protective, heartbeat inhibitor, anti-diarrheal antispasmodic |
| Bark | Immature-marmin, skimmiamine | Anti-ulcer, antidiarrheal |
| | Mature-fagarine | |
| Unripe fruit | Tannin | Astringent |

Table 1: Chemical constituents from various parts of the plant and their corresponding therapeutic effects.

Fruits and bark used for treatment of ulcer. It is also used for gastric ulcer induced by aspirin plus pylorus. Scientific studies have reported that the fruit possesses broad range of therapeutic effects that includes free radical scavenging, antioxidant, inhibition of lipid peroxidation, antibacterial, antiviral, anti-diarrheal, gastroprotective, anti-ulcerative colitis, hepatoprotective, anti-diabetic, cardioprotective and radioprotective effects.

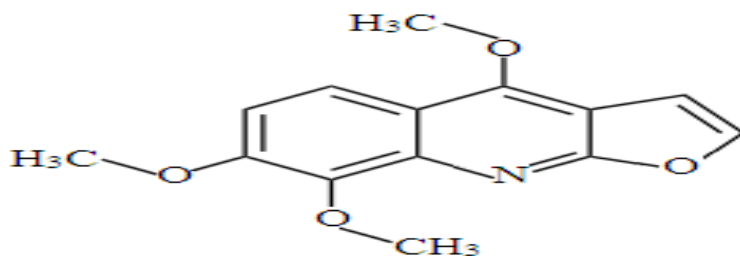


Figure 4: Skimmiamine.

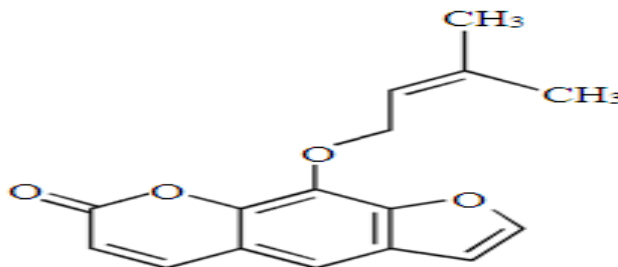


Figure 5: Marmelosin.

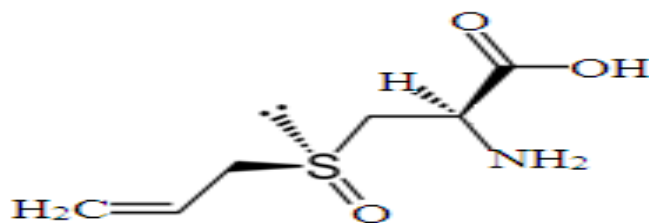


Figure 6: Allicin.

Allium sativum, commonly known as garlic, has a place with the Liliaceae (onion) family and is one of the nature's most adaptable restorative plants. The garlic plant's knob is the most normally utilized piece of the plant as it contains 84.09% water, 13.38% organic matter, and 1.53% inorganic issue, while the leaves are 87.14% water, 11.27% organic matter, and 1.59% inorganic component [16]. The phytochemicals for the strong flavor of garlic are created when the cells of the plants are harmed through hacking, chewing, or smashing, in this manner causing the breakdown of a few sulfur-containing compounds put away in the cell fluids. It has been demonstrated that sulfur compounds, for example, allicin (diallyl-dithiosulfinate, Figure 6) are imperative constituents of garlic [17]. It is brought up that other sulfur compound, for example, diallyl disulphide (DDS), S-allylcysteine (SAC) and diallyl trisulfide (DTS), ajoene (Figure 7) are likewise present. Garlic juice blended with 3 or 4 sections of customary or refined water has been utilized as a moisturizer for washing wounds and foul ulcers.



Figure 7: Ajoene.

Aloe vera having a place with the family Liliaceae is usually known as 'aloe gel'. It is commonly called 'kattalai' which is discovered all over India. Chemical constituents in this plant are aloin (Figure 8), isobarbaloin, and emodin (Figure 9), *Aloe vera* powder was blended with gum acacia; the arrangement was managed orally in rodents at portion of 200 mg/kg against indomethacin incited gastric ulcer. The concentrate demonstrated huge antiulcer action practically identical to control [18]. Announced constituents in plant are aminoacids, anthraquinones, catalysts, hormones, lignin, minerals, salicylic corrosive, saponins, sterols, sugars, nutrients [19]. The counter ulcer activity of the plant is accounted for in Indomethacin induced ulcer display. Dynamic compound constituents in this plant are aloin, emodin, aleosin (Figure 10). Leaves are effectively utilized in the nearby treatment of chronic ulcers.

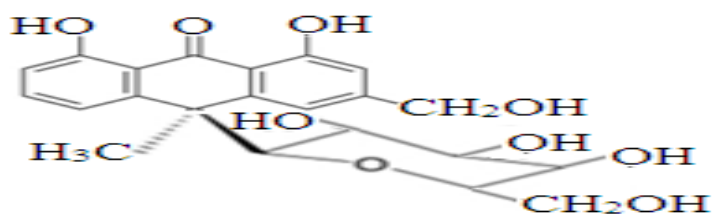


Figure 8: Aloin.

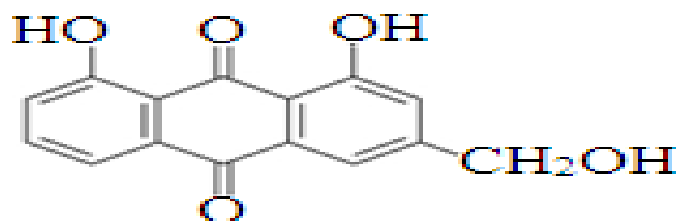


Figure 9: Emodin.

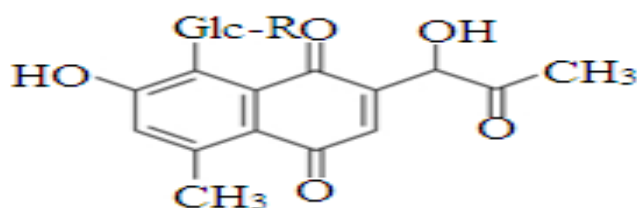


Figure 10: Aleosin.

Azadirachta indica, having a place with the family Meliaceae, is indigenous to and developed about all over India. It is normally known as 'neem' and locally called 'vembu'. Chemical constituents revealed in this plant are nimbidin (Figure 11), phenolic compound, saponin and flavonoids. It contains a harsh alkaloid named margosine. Seeds contain about 10-31% of a yellow severe settled oil and azadirachtin (Figure 12). The oil contains free and unstable unsaturated fats. The unstable unsaturated fats likely comprise of a blend of stearic and oleic acids with a little measure of lauric acid. *Azadirachta indica* leaf extracts ensured against pylorus ligation and cold limitation stress prompted gastric ulcer in rodents [20]. Poultice of leaves is valuable in undesirable ulcers.

Balsamodendron mukul (Family: Burseraceae) is regularly known as 'gum-gugul'. It is developed on the Sind, Rajputana, Eastern Bengal, Berars, Assam, Khandesh, and Mysore which is privately called 'gukkulu'. Chemical constituents in this plant are unstable oil, gum-sap, and harsh standards. Guggul gum is mixed with lime juice or coconut oil; it is connected as a mortar or as a cream in lethargic ulcers. It is also contain monoterpenoids (myrcene, dimyrcene and polymyrcene), diterpenoids (α -camphorene (Figure 13), cembrene-A (Figure 14), cembrene and other cembrenoids) and sesquiterpenoids, bicyclic sesquiterpene and cadinene). Gum got from different species, *B. pubescence* found in Sind, Karachi, and Baluchistan, is utilized as salve in terrible ulcers, for example, Delhi bruises, joined with sulfur, catechu and borax.

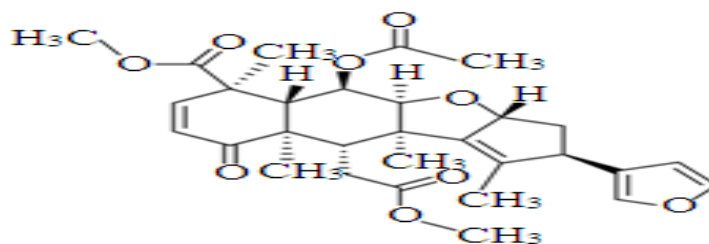


Figure 11: Nimbidin.

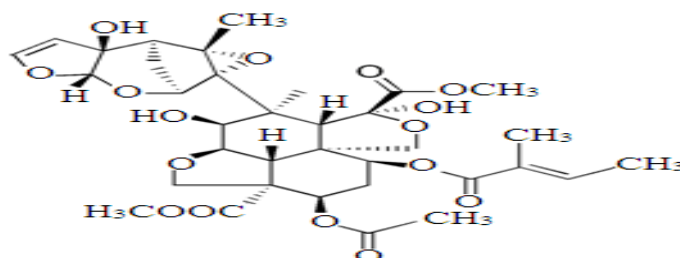


Figure 12: Azadirachtin.

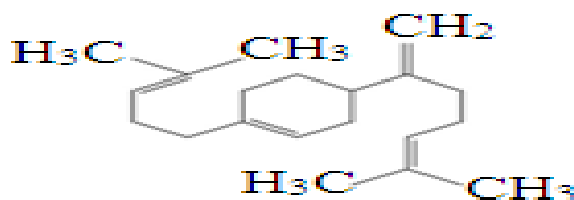
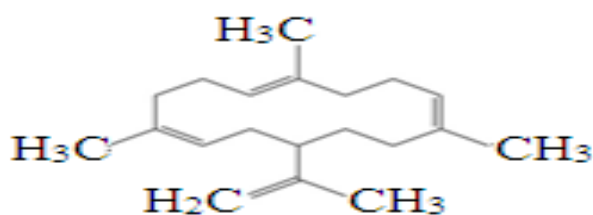
Figure 13: α -camphorene.

Figure 14: Cembrene-A.

Bauhinia variegata (Family: Caesalpiniaceae) is indigenous to and develop on the Sub-Himalayan tract and the woodlands of India and Burma. It is normally known as 'orchid tree' and privately called 'shemmandarai'. Chemical constituents detailed in this plant are quercetin, rutin, apigenin, and apigenin 7-O-glucoside. Bark contains tannin (tannic corrosive), glucose, and a tanish gum. The stem bark is accounted for to contain 5, 7-dihydroxy and 5, 7-dimethoxy flavanone-4-O- α -L rhamnopyrosyl- β -D-glycopyranosides, kaempferol-3-glucoside (Figure 15), lupeol (Figure 16,) and betasitosterol. Seeds contain protein, greasy oil containing oleic acid, linoleic acid, palmitic acid and stearic acid. Blooms contain cyamidin, malvidin peonidin and kaempferol. Root contains flavanol glycoside. Decoction of the bark is helpful for wash in ulcers.

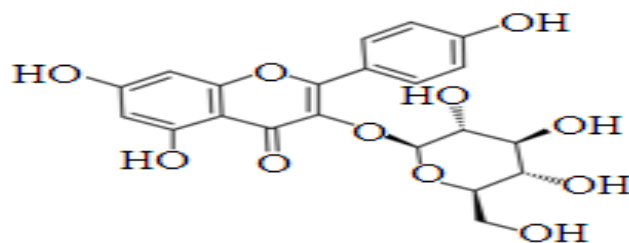


Figure 15: Kaempferol-3-glucoside.

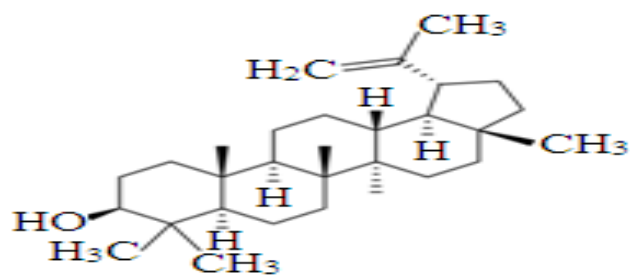


Figure 16: Lupeol.

Beta vulgaris (Family: Chenopodiaceae) is commonly known as “beetroot.” It is native of the sea-coasts of tree Mediterranean, now extensively cultivated in Europe and America, and is known as sugar-beet. It is also cultivated in gardens in many parts of India for the sake of its flesh roots and leaves. There are two kinds: white and red. Chemical constituents in this plant are flavonoids ((+)-Dehydrovomifoliol, vitexin 7-O-b-D-glucopyranoside (Figure 17), vitexin 2'- O-b-D-glucopyranoside, 3-hydroxy-5a, 6a-epoxy-b-ionone (Figure 18) and phenolic compounds. A decoction of the root with a little vinegar added is excellent for all kinds of ulcers and running sores [21].

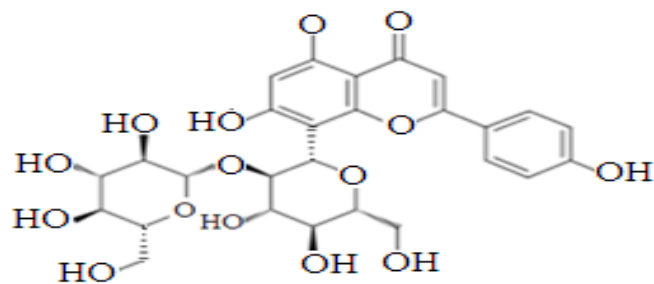


Figure 17: Vitexin 7-O-b-D-glucopyranoside.

Careya arborea has a place with the family Myrtaceae and it is usually known as ‘moderate match tree’. It is locally called as pailacputatammi. It is frequent in Sub-Himalayan tract. Chemical constituents in this plant are thick red bark containing tannin 8%. The ethanol stem bark concentrate of *C. arborea* was managed at the dosages of 300 and 600 mg/kg orally in rats for 5 days against ethanol, cold restraint stress, and pylorus ligation induced ulcer models. The extracts fundamentally expand recuperating of gastric ulcer when contrasted with control [22]. Flowers of *C. arborea* have triterpenoids, steroids and tannins. Fruits containing phenolic compounds viz. gallic acid, 3, 4-dihydroxybenzoic acid, quercetin 3-O-glucopyranoside, kaempferol 3-O-glucopyranoside and quercetin 3-O-(6-O-glucopyranosyl)-gluco pyranoside. Seeds of *C. arborea* are accounted for to have starch (Soni, 1991), α -spinasterone, α -spinasterol and triterpenoids viz. 16 desoxy barringtogenol C, barringtogenol C (Figure 19) and barringtogenol D. Acid hydrolysis of ethanolic extract of leaf contain a triterpenoid lactone careyagenolide, maslinic acid and 2 α -hydroxy ursolic acid and from its methanol extract a triterpenoid saponin arborenin and desacylescins III were disengaged [23]. Other chemical constituents are taraxerol (Figure 20), ellagic corrosive, N-hexacosanol, taraxerol acetic acid derivation, quercetin and β -sitosterol, careaborin and tannins. Stem bark is accounted for to contain terpenes, sterols, tannins and saponins. Leaves made into a mash and utilized as a poultice 3 to 4 times each day quickly recuperate adamant ulcers.

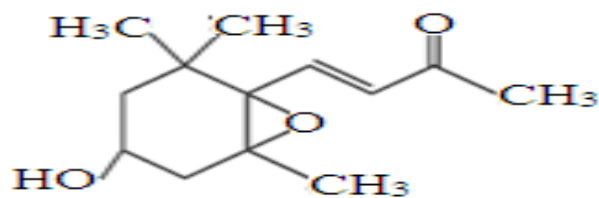


Figure 18: 3-hydroxy-5a, 6a-epoxy-b-ionone.

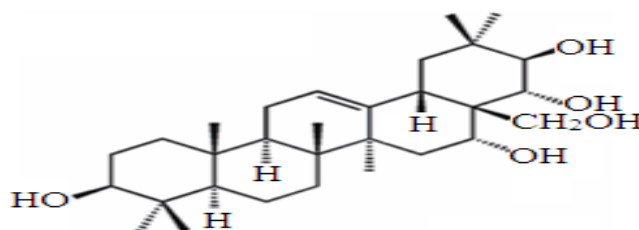


Figure 19: Barringtogenol C.

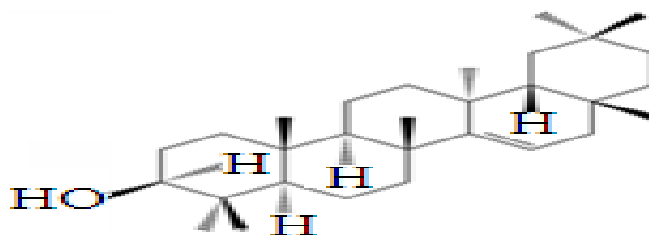


Figure 20: Taraxerol.

Carica papaya (Family: Caricaceae) is regularly known as Papaya and surely understood for different restorative properties. The natural products are accounted for to have antiulcer activity [24]. The seeds are accounted for to apply antimicrobial, anthelmintic, antiamebic properties. The fruit had indicated hepatoprotective activity and furthermore utilized for pediatrics burns. The seed separates are demonstrated to show articulated hyper trophy and hyperplasia of pituitary gonadotrophs. The dusts from flower of the plant have histaminergic properties. The chemical constituents in this plant are papain (Figure 21), chymopapain, gelatin, carposide, carpaine, carotenoids, pectin (Figure 22) and antheraxanthin [25]. *Carica papaya* likewise contains some other dynamic concoction compounds like cyclic ketonic ether (2.17%), alkene liquor (45.86%), sweet-smelling thiophene dioxide (11.78%), unsaturated fat ester (12.02%) and alkaloid (28.18%). The significant constituents in the leaf extract of *C. papaya* were 3, 7, 11, 15-tetramethyl-2-hexadecen-1-ol (37.78%) and 9-octadecenamide (28.18%). Unripe organic products can be cooked for slothful ulcers.

Ficus religiosa (Family: Urticaceae) is regularly known as commonly known as regular milk support. It is privately called ilaikkalli. It is found in Central India and developed in Bengal. A small amount of triterpenoids like Glut-5-en-3- β -ol, Glut-5(10)-En-1-one, taraxerol and β -amyrin have been isolated from the powdered plant, stem and leaves of *E. neriifolia*. Antiquorin has been disengaged from ethanolic extract of crisp base of *E. neriifolia*. Neriifolione, a triterpene and another tetracyclic triterpene named as nerifoliene alongside euphol were segregated from the latex of *E. neriifolia* [26]. Latex portion

was found to contain euphol, neriifoliol, neriifolene, euphorbon, resin, gum, caoutchouc, malate of calcium, and so forth. Euphol, monohydroxy triterpene, neriifoliol, taraxerol, beta-amyrin, overabundance 5-(10)-en-1-one, neriifolone, cycloartenol. Phytochemical examinations on *Euphorbia neriifolia* yielded in the detachment of a few classes of auxiliary metabolites, a considerable lot of which communicated natural exercises, for example, triterpenes (neriifolone) flavonoids and steroidal saponins. *E. neriifolia* dominantly contains sugar, tannins, flavanoids, alkaloids and triterpenoidal saponin. 9, 9-cylolanost-20 (21)-ene-24-ol; 8, 24-euphadien-3-beta-ol-3-one (Neriifolone, Figure 23) [27]. New latex yields 10.95% strong with 18.32% complete resinous issue, and 24.50% and 16.23% of all out diterpene and triterpene individually. Plant juice is to a great extent utilized with cleared up or crisp margarine as an application to undesirable ulcers and scabies.

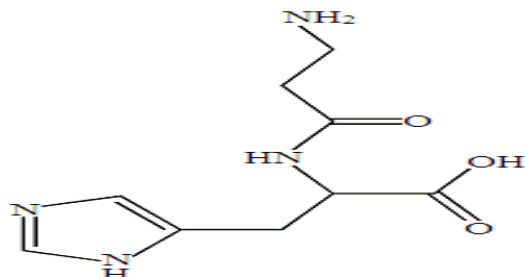


Figure 21: Papain.

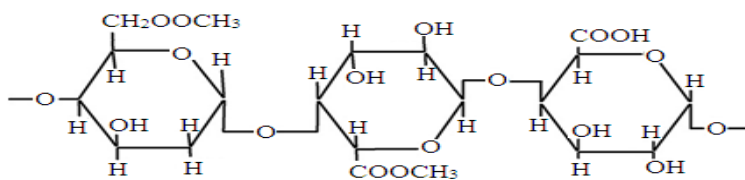


Figure 22: Pectin.

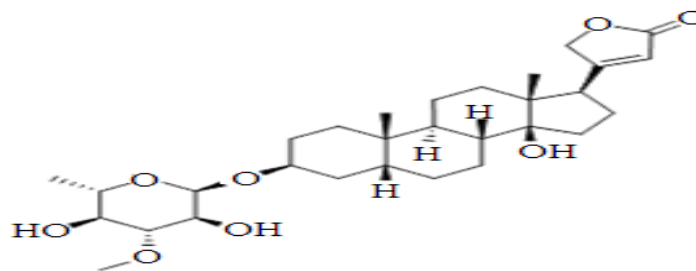


Figure 23: Neriifolone.

Ficus religiosa (Family: Urticaceae) is commonly known as sacred fig. It is locally called arasha-maram. This sacred peepul is a large tree round wild and cultivated all over India by the Hindus. Chemical constituents in this plant are bark containing tannin, caoutchouc (cochtone), and wax. Bark is valuable in ulcers in imbuement or decoction (basic kashayam) with somewhat honey. The stem bark of *F. religiosa* are accounted for phyto constituents of phenols, tannins, steroids, alkaloids (Piperine, Figure 24; *Piper longum*, Figure 25) and flavonoids, β -sitosteryl-D-glucoside, vitamin K, n-octacosanol, methyl oleanolate, methyl piperate (Figure 26), lanosterol, stigmasterol, N-isobutyl-ecosa-trans-4-dienamide (Figure 27) lupen-3-one

[28]. The active constituent of the root bark of *F. religiosa* was observed to be β -sitosterol-D-glucoside, which demonstrated a peroral hypoglycemic impact in fasting and alloxan-diabetic rabbits and in pituitary-diabetic rats. The fruits are containing 4.9% protein (amino acids, isoleucine, and phenylalanine), flavonols to be specific myricetin (Figure 28), kaempferol (Figure 29) and quercetin (Figure 30) [29]. The seeds contain phytosterolin, β -sitosterol, and its glycoside, albuminoids, sugar, greasy issue, shading matter, caoutchoue 0.7%-5.1%. Leaves of the plants were containing carbohydrate, lipid, calcium, sodium, potassium, and phosphorus. It has been found that the dried bark of *F. religiosa* containing phytosterols, flavonoids, tannins and furano coumarin derivatives (bergapten and begaptol). From the literature review it has been reported that the aqueous alcoholic extract of leaves significantly decreases the ulcer index value when compared to control [30].

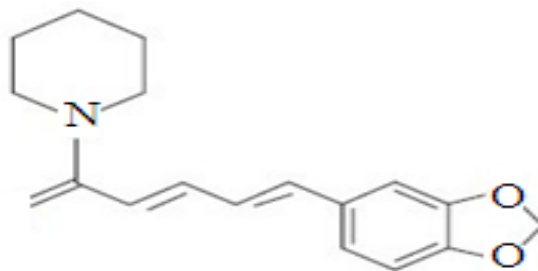


Figure 24: Piperine.

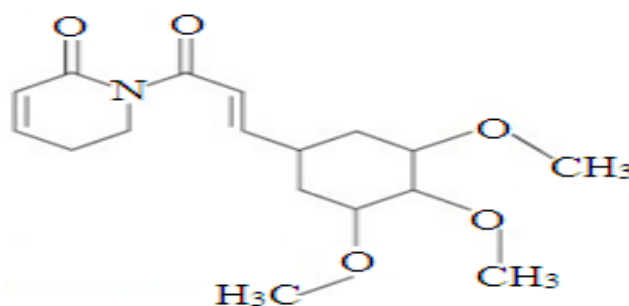


Figure 25: Piper longumine.

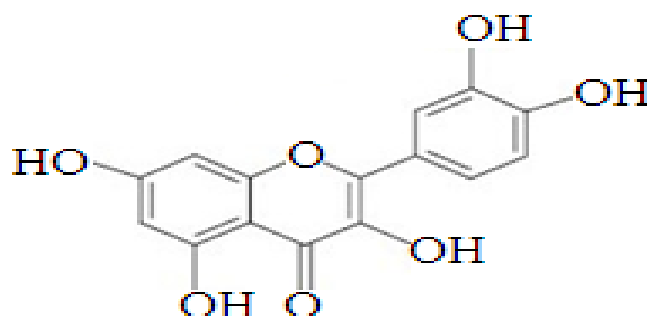


Figure 26: Methyl piperate.

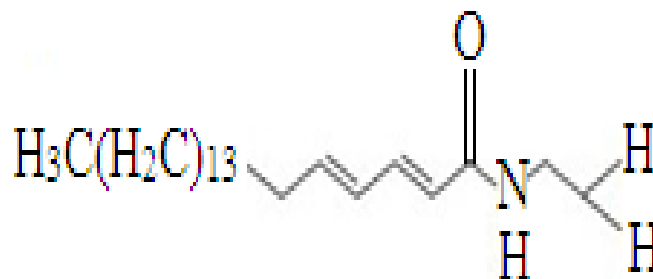


Figure 27: N-isobutyl-ecosa-trans-4-dienamide.

Galega purpurea (Family: Papilionaceae) is usually known as purple tephrosia. It is locally called kolluk-kay-welai. It is found all through India, particularly in Southern India. It develops on hard stony ground too hard to even consider being established. Chemical constituents in this plant are yields gum, a trace of albumen and colouring matter, ash containing a trace of manganese, brown resin and chlorophyll and a principle allied to quercetin or querritrin, glucoside rutin and triterpenoid (Figure 31) [31]. Root powdered and mixed with honey is connected to ulcers.

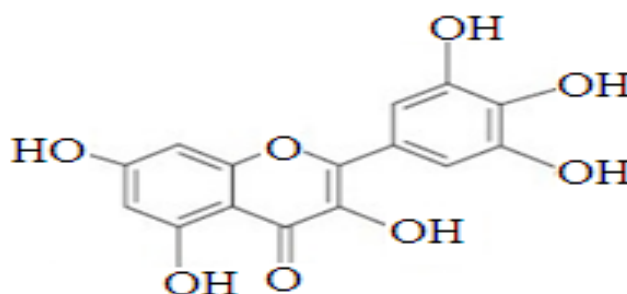


Figure 28: Myricetin.

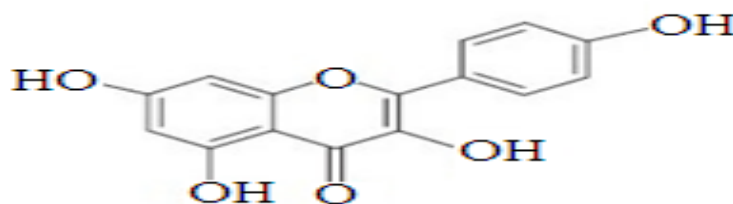


Figure 29: Kaemferol.

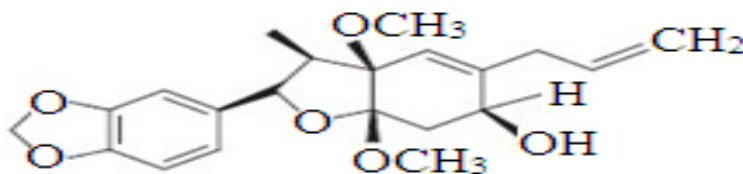


Figure 30: Quercetin.

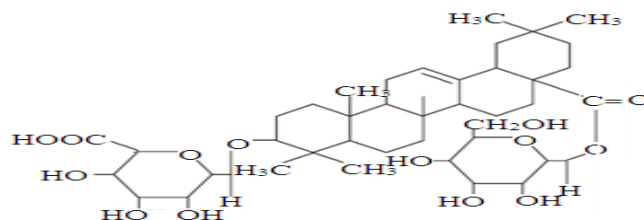


Figure 31: Triterpenoid.

Hibiscus rosa-sinensis (Family: Malvaceae) is ordinarily known as changing rose. It is commonly known as chembaruthi. It is local to China and developed broadly as a fancy plant through India. Compound constituents in this plant are flavonoids, anthocyanins, quercetin, cyanidin, kaempferol, and hydrocitric corrosive [32]. The primer phytochemical examination demonstrated that *Hibiscus rosa-sinensis* contained tannins, anthraquinones, quinines, phenols, flavanoides, alkaloids (Cyclo peptide alkaloids, Figure 32), terpenoids, saponins, glycosides, protein, free amino acids, and starches, sugars, adhesive, steroids [31,33-36]. *Hibiscus rosa-sinensis* contained cyclopropanoids, methyl sterulate, methyl-2-hydroxy sterulate, 2-hydroxysterulate, malvalate, beta-sitosterol and beta-rosasterol (Figure 33). The major anthocyanin in the flower was cyanidin 3-sophoroside [37]. The foundation of *H. rosa-sinensis* is generally utilized for the treatment of ulcer among the kani clans in Kanyakumari locale, Tamil Nadu, India [33]. A ongoing examination uncovered that the alcoholic extract of *H. rosa-sinensis* roots had noteworthy antiulcer action in pylorus ligated rats at the portions of 250 mg/kg and 500 mg/kg. Accordingly, it has been deductively demonstrated that these extracts have enough potential as an antiulcerogenic property [38].

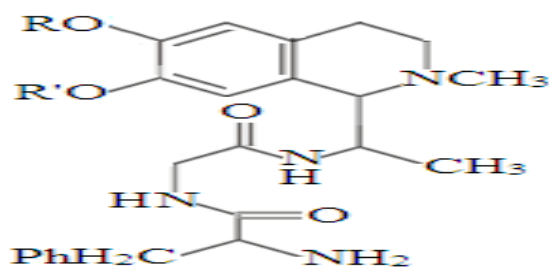


Figure 32: Cyclipeptide alkaloids.

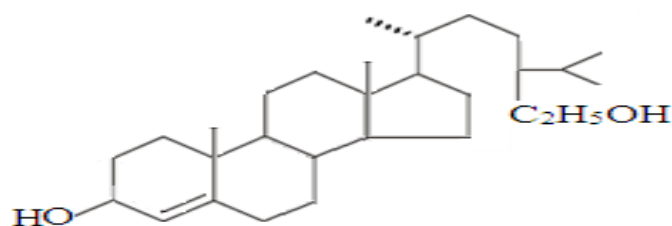


Figure 33: β -rosasterol.

Hydrocotyle asiatica (Family: Umbelliferae) is usually known as Indian penny-wort. It is locally known as vaellarai. This little weed is basic all over India, developing copiously in soggy areas. *Hydrocotyle asiatica* is accounted for to have following kinds of active constituents, for example, Triterpenoids (Include asiaticoside, centelloside, madecossoside, thankuniside, isothankunic corrosive, centellose, Asiatic (Figure 34), centellic and madecassic acids and brahmoside, brahminoside, brahmicaicid, the structure of their genin, brahmica corrosive has been set up as 2,6-hydroxy, 23-hydroxy-methyl ursolic acid. Asiaticoside (Figure 35) and madecossoside (Figure 36) prevailed in the leaves with less in roots [39], alkaloids, glycosides, flavanoids, volatile and fatty acids. Active constituents in this plant are an oleaginous white crystalline substance vellarin which is the dynamic guideline of the leaves, tars and some fatty aromatic body, gum, sugar, tannin, albuminous matter, and salts, generally soluble sulfates. For ulcerations, the powder, in 3 to 5 grain portions, might be given thrice day by day; in the meantime a portion of the powder might be sprinkled on the ulcers or ideally poultices of the crisp leaves might be connected.

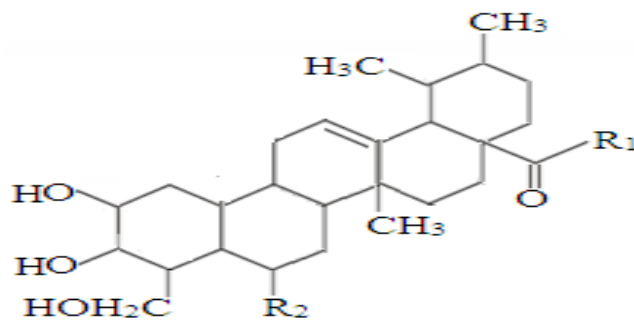


Figure 34: Asiatic acid derivatives.

Indigofera tinctoria (Family: Papilionaceae) is normally known as evident indigo. It is commonly called as neelum and avari. This little erect shrub is developed broadly in Northern India. *Indigofera tinctoria* is generally containing flavonoids (Indigotin (Figure 37), glabretaphrin, semiglabin (Figure 38), flavonol glycoside) [40], alkaloids (Indigo, 2, 2'-bisindole alkaloid) [41], steroids, unsaturated fats containing amino gathering. Leaves pounded are utilized as stimulant poultice or mortar in different skin affections and to rinse and to mend wounds and ulcers. Powdered indigo is additionally utilized for sprinkling on ulcers.

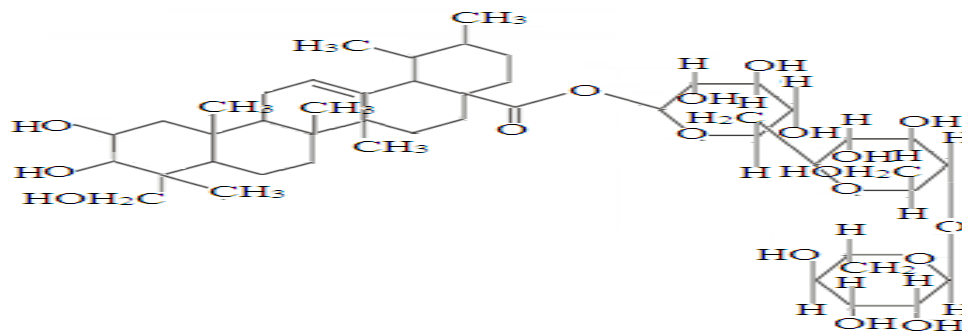


Figure 35: Asiaticoside.

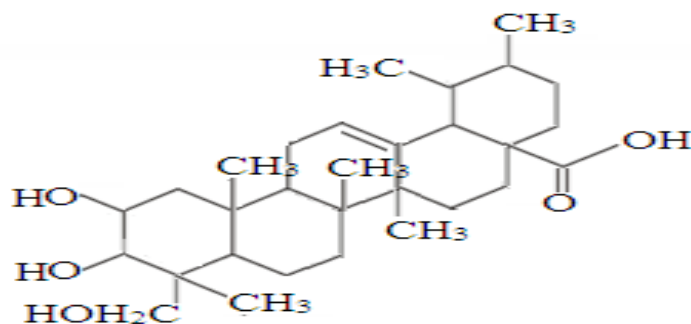


Figure 36: Madecassic acid.

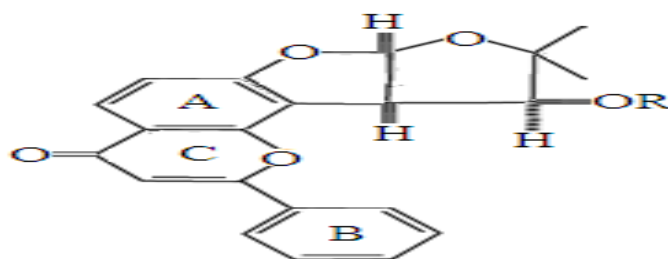


Figure 37: Indigotin.

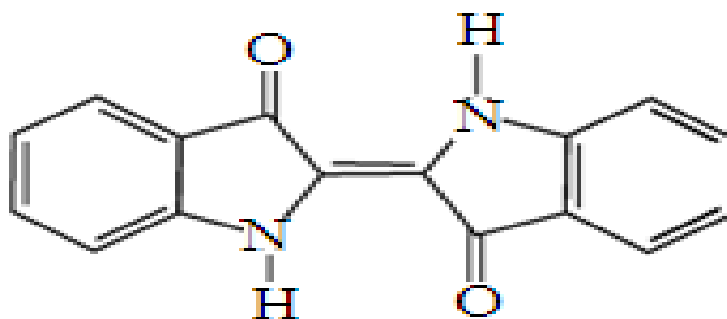


Figure 38: Semiglabin.

Mangifera indica (Family: Anacardiaceae) is regularly known as mango tree. It is locally called as mangai. It is developed all through India. The active constituents in this plant are starch, tannins, alkaloids, saponins, steroid, xanthone glycosides (Mangiferin, Figure 39), flavonoids (5-hydroxy-3-(4-hydroxyphenyl)-pyrano (3, 2-G) chromene-4 (8H)- one, 6-(p-hydroxybenzyl) taxifolin-7-O-b-D-glucoside (tricuspid) and (-)- epicatechin (2-(3, 4-dihydroxyphenyl)-3, 4-dihydro-2H-chromene-3, 5, 7-triol), and protein. Likewise containing some essential oil, for example, humulene, elemene, ocimene, linalool, nerol and numerous others. The plant likewise contains water dissolvable nutrients involving ascorbic acid, riboflavin, niacin and thiamine. It is a decent wellspring of minerals, for example, Na, Ca, Mg, K, Zn, P, Cu and Cd. Leaf extricates were disintegrated in rice grain oil and given orally for ulcer. Generally, the plant is accounted for to have antiulcer activity. The flower decoction was regulated in the portions of 250, 500, and 1000 mg/kg orally; in rats with gastric sores in portion subordinate way. Subsequently, the extract fundamentally diminished the gastric juice volume and gastric causticity.

Mimosa pudica (Family: Fabaceae) is commonly known as touch me not. It is locally called thottal sinungee. It is also called as sensitive plant or shy plant. It grows in all tropical and subtropical regions of the world. It is containing various chemical compounds such as alkaloid (Mimosine, Figure 40), flavonoid, C-glycosides, sterols, terenoids, tannins, and fatty acids [42]. The roots of the plant have been appeared to contain up to 10% tannin. A substance like adrenaline has been found inside the plant's leaves. *Mimosa pudica*'s seeds produce adhesive made up of D-glucuronic acid and D-xylose. Decoction of the new leaves and seeds are devoured for intestinal ulcer.

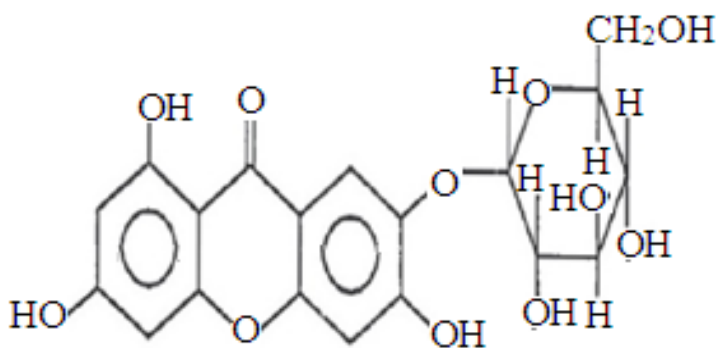


Figure 39: Mangiferin.

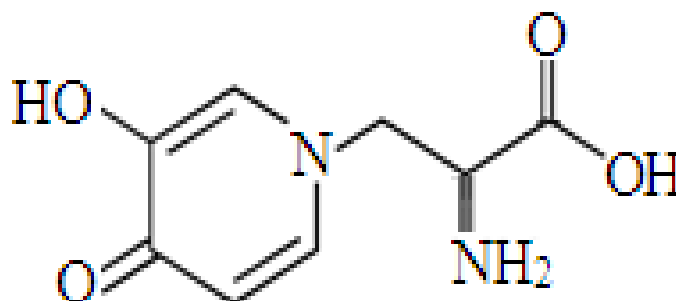


Figure 40: Mimosine.

Momordica charantia (Family: Cucurbitaceae) is ordinarily known as bitter gourd. It is commonly called as pavakka-chedi. This climbing plant is developed in greenery enclosures wherever in India, for its organic product. The principle constituents of severe melon (Karela) are triterpene, protein, steroid, alkaloid (momordicin, Figure 41 and charantin, Figure 42), inorganic, lipid, and phenolic mixes [43]. This plant is likewise containing bitter glucoside solvent in water and insoluble in ether, a yellow acid, resin, and ash 6%. Crisp vegetable contains 88.75% moisture, albuminoids 1.62%, dissolvable starches 85.41%, woody fiber 1.51%, and ash 8.53%. Entire plant powdered is utilized for cleaning over diseased and other immovable ulcers and in mending wounds. At the point when blended with cinnamon, rice and chaulmugra oil, it shapes a decent salve in threatening ulcers.

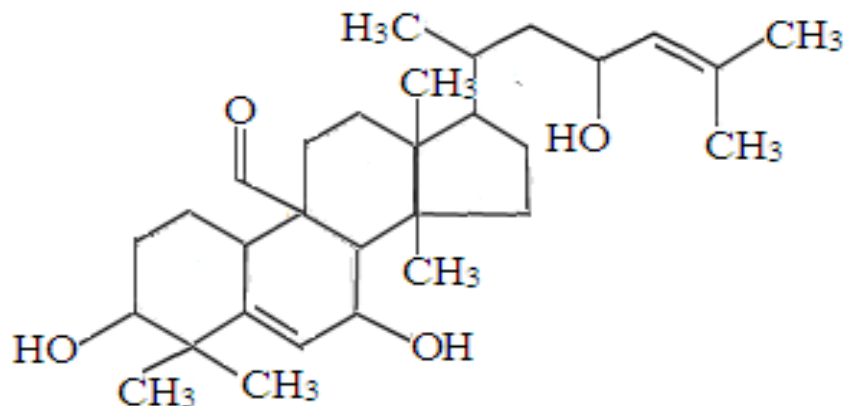


Figure 41: Momordicin.

Moringa oleifera (Family: Moringaceae) is commonly known as drum-stick and locally called as murungai. It is local toward the Western and sub-Himalayan district, India, Pakistan, Asia Minor, Africa, and Arabia. Active constituents in this plant are alkaloids, flavonoids, saponin, tannins, zeatin, quercetin, kaempferol, and terpenoids [44].

Chemical examination of the extract of the *Moringa oleifera*, were yielded β -carotene (Figure 43), phytol unsaturated fat ester, polyphenol, chlorophyll A, β -sitosterol (Figure 44), triacylglycerols, unsaturated fats etc. The therapeutic estimation of the diverse parts of the plant has for quite some time been perceived in old stories medication. It is utilized as vegetable and furthermore in Indian society prescription for the treatment of different sicknesses [45]. The leaf tea treats gastric ulcers by Kani tribals of Pechiparai Hills, Tamil Nadu, India. Flower buds of *M. oleifera* are broadly expended in Pakistan and have been accounted for to have antiulcer property [44]. In Recent Studies has been revealed that the alcoholic leaves extract of *M. oleifera* was managed in the portions of 125, 250, and 500 mg/kg orally, in rats against pylorus ligation, ethanol, cold limitation stress, and headache medicine actuated gastric ulcer. The extract indicated declines in ulcer and acidic pepsin discharge.

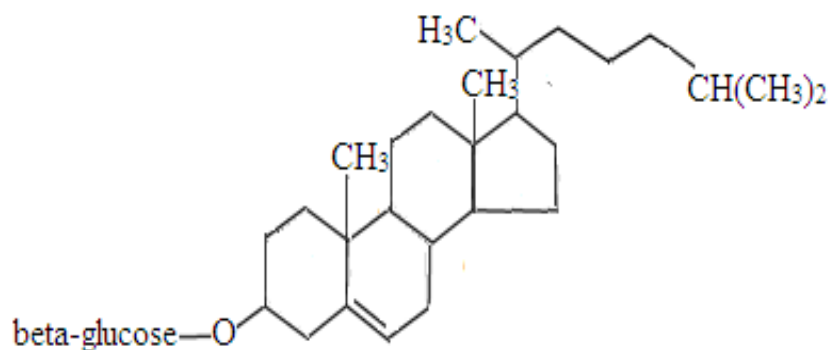
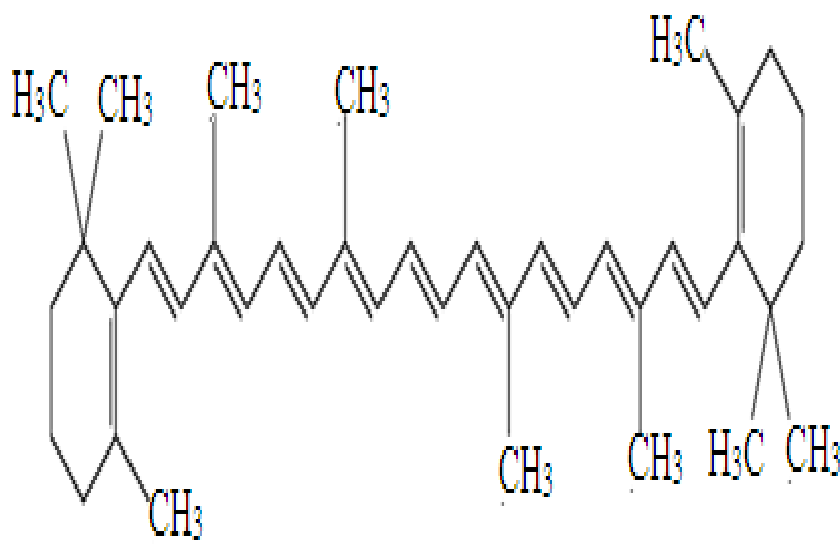
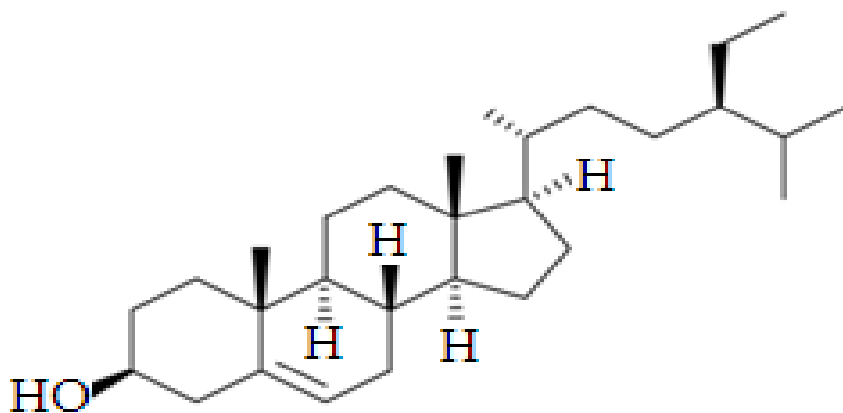


Figure 42: Charantin.

Figure 43: β -carotene.Figure 44: β -sitosteroli.

THE POTENTIAL MEDICINAL PLANTS USED IN ULCER

Regardless of being one of the notable therapeutic plants utilized in Indian customary prescription to treat a few afflictions, thinks about relating to the pharmacological properties of some restorative plants are rare. We contemplated the antiulcer activity and intense toxicity of some therapeutic plants. Our investigation demonstrated that these explored restorative plants could forestall ulcer in rats in a portion subordinate way. Histological examinations uncovered that these therapeutic plants did not demonstrate any acute toxicity. Primer photochemical screening of this restorative plant distinguished the nearness of

critical optional metabolites like terpenoids, flavonoids and tannins. Some therapeutic plants utilized in the treatment of ulcer as recorded in the accompanying Table 2.

| Name | Common name | Part of the plant used | Chemical constituents |
|-------------------------------|----------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Asparagus racemosus</i> | Satmul, satumul | Whole plant | Saponins (shatavarins I-IV), isoflavones, asparagine, racemosol, polysaccharides, mucilage, vitamins A, B ₁ , B ₂ , C, E, Mg, P, Ca, Fe, and folic acid essential oils, asparagine, arginine, tyrosine, flavonoids (kaempferol, quercetin, and rutin), resin and tannin. |
| <i>Aegle marmelos</i> | Bael tree | Leaves, fruits | Tannins, saponins. |
| <i>Allium sativum</i> | Garlic | Bulb | Volatile oil, allian, alliin. |
| <i>Aloe vera</i> | Aloe gel | Leaves | Aloin, isobarba loin emodin. |
| <i>Angoneissus latifolia</i> | Axlewood | Bark | Tannin. |
| <i>Azadirachta indica</i> | Neem | Leaves | Stearic and palmilic acid. |
| <i>Bacopa monnieri</i> | Brahmi | Whole Plant | Saponins (Bacosides A and B) |
| <i>Balsamodendron indica</i> | Gumgugul, gukkulu | Stem | Volatile oil, gum, resin. |
| <i>Bauhinia variegata</i> | Orchid tree, shemmandarai | Bark | Tannins, glucose. |
| <i>Beta vulgaris</i> | Beetroot | Root | Betin. |
| <i>Careya arborea</i> | Godhajam, slow match tree | Leaves, Bark | Tannin, saponin. |
| <i>Carica papaya</i> | Papaya | Fruit | Papain, pectin. |
| <i>Coriandrum sativum</i> | Dhanya | Seed | Flavonoids (quercetin-3-glucoronide), linalool, camphor, geranylacetate, geraniol, isocoumarin, coumarin, coriandron |
| <i>Euphorbia nerifolia</i> | Common milk hedge | Stem | Tannin, caoutcheric. |
| <i>Ficus religiosa</i> | Sacred fig, ahot, pippol | Bark | Tannin, caoutcheric, Wax. |
| <i>Galega purpurea</i> | Purple tephroseia | Root | Brown resin. |
| <i>Hemidesmus indicus</i> | Anantamul, Dudhi | Root | Borneol, linaly acetate. |
| <i>Hibiscus rosa sinensis</i> | China rose | Root | Flavonoids, quercetin. |
| <i>Jasminun grandiflorum</i> | Jasmine | Leaves | Resin, salicylic acid. |
| <i>Mangifera indica</i> | Mango | Leaves, Flower | Alkaloids, saponins, tannins. |
| <i>Mimosa Pudica</i> | Touch me not plant | Leaves, seeds | Flavonoids, saponins, mucilage. |
| <i>Momordica charantia</i> | Bitter gowid kerela | Whole plant | Glucoside, resin. |
| <i>Moringa oleifera</i> | Horse raddish, Senjana, Malethei | Leaves, Flower buds | Alkaloids, flavanoids, saponin, tannin. |
| <i>Myrtus communis</i> | Myrtle | Leaves, Fruits | Volatile oil, resin, citric acid. |
| <i>Myrica nagi</i> | Bayberry, Soh-phi | Bark fruits | Tannin, saccharim. |

| | | | |
|---------------------------|-----------------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------|
| <i>Ocimum sanctum</i> | Tulsi | Leaves | Alkaloids, saponins, flavonoids, tannins. |
| <i>Oryza saliva</i> | Rice, paddy | Seeds | Starch |
| <i>Phyllanthus niruri</i> | Seed under leaf plant | Whole plant | Alkaloids, Saponins, Tannins, Glycoside. |
| <i>Ricinus communis</i> | 'castor plant, palm of Christ', Endi | Seed | steroids, saponins, alkaloids, flavonoids, and glycosides |
| <i>Solanum nigrum</i> | Makhoi, Blacknight shade | Fruits | M-coumaric acid, Gentistic acid, Luteolin. |
| <i>Scorparia dulcis</i> | Sweet broom weed, Mithi patti | Aerial parts | Terpenes, Tannins, Coumarina. |
| <i>Trapa natans</i> | Water chestnut, Pani Singori, Singhara | Seeds | flavonoids, tannins, glycosides, saponins, steroids, phenolic compound carbohydrates, proteins, vitamins and essential minerals |

Table 2: List of anti-ulcer drugs.

CONCLUSION

It is clear that the medicinal plants play a vital role against various diseases. Various herbal plants and plants extracts have significant antiulcer activity. It has muco-protective activity and gastric anti-secretary when compared with that of reference drugs. A variety of plants have been reported to possess antiulcer activity, which is due to presence of substances such as flavonoids and tannins. From this study on traditional medicines we can say that the medicinal plants found in North-East India have a vital role against many diseases. High efforts should be made to use the ethno-pharmacological knowledge. In view of increasing popularity of alternative system of medicine, it is necessary to conduct research to support the therapeutic claim and also to ensure that the plants are given importance according to their therapeutic value.

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CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests regarding the publication of this paper.

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