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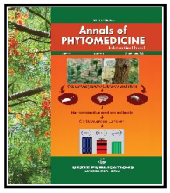

Review Article : Open Access

Therapeutic potential of indigenous medicinal plants against gastric ulcer

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Abstract

Ulcers are a frequent gastrointestinal condition that affects many different sections of the body. The intestinal mucosal layer that lines the gastrointestinal tract can be disrupted or breached by ulcers. Peptic ulceration is now known to be caused by an imbalance of aggressive and defensive elements. There are already a plethora of synthetic pharmaceuticals available to treat peptic ulcers and their consequences, but these therapies are either excessively expensive or have a variety of negative effects. Peptic ulcers are currently being treated using a variety of medicinal herbs and polyherbal formulations. In this review article, we look at various medicinal plants that can be utilized in both ayurvedic and western medicine to heal peptic ulcers and reduce their consequences. Apart from their antiulcer activity, the medicinal plants possesses tremendous therapeutic potentials like *Asparagus racemosus* L. is known to be quiet effective in the treatment of problems associated with female reproductive system, *Solanum nigrum* L. cures psoriasis and ringworm, inflammatory disorders, menstrual cramps. *Carica papaya* L. known to possess antithrombocytopaenic, immunomodulatory and anti-inflammatory potentials.

1. Introduction

Herbal drugs have become a matter of worldwide importance in the last decade, affecting both global health and global trade. India has long been renowned as a rich source of therapeutic agents among prehistoric cultures. Herbal medicines continue to play an important part in the healthcare systems of many people across the world. Herbs are harvested from many parts of the plant, including the roots, leaves, barks, seeds, and flowers (Malik *et al.*, 2020). Herbal plants are a source of numerous herbal drugs that are very effective in the treatment of various ailments and are almost widely utilized to cure a wide range of illnesses, and their popularity has been gradually expanded around the world. The indigenous people have a wealth of knowledge about the flora that surrounds them. They nurture and pass on knowledge to ethnobotanists across the world for a variety of purposes, including modern medicine (Alam *et al.*, 2019). The general populace is increasingly turning to herbal medicines to avoid taking modern medicinal pharmaceuticals on their own initiative (Idris *et al.*, 2021). There are an unimaginable number of plants on our green globe that are regarded as wild or weeds due to their lack of clear economic value. Many plant species that were previously thought to be useless, have now been discovered to be extremely valuable in terms of phytochemicals. The major sources of new phytochemicals are found in wild plants, shrubs, and trees (Alam and Khan, 2020).

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In this article, we will find out some herbal plants possessing antiulcer potentials. The word “ulcer” originated from the Latin word “ulcus”, which means a sore, wound, or ulcer (Ravisankar *et al.*, 2016). Peptic ulcers are most commonly found on the mucosa of the stomach, and duodenal ulcers are found in the duodenum region of the small intestine (Inaparthi *et al.*, 2014; Mohan, 2015), are sores that are open on the skin or mucous membrane of the stomach and duodenum that are characterized by a breach in the inner lining of the gastrointestinal tract because of gastric acid secretion or pepsin (Chan and Graham, 2004). In this situation, the mucosal epithelium is exposed to acid and pepsin. In this condition, gastric ulcers can be exacerbated by stress, smoking, nutritional deficits, and the use of NSAIDs: nonsteroidal anti-inflammatory medicines (Belaiche *et al.*, 2002). The imbalance between aggressive forces such as acid, pepsin, and *Helicobacter pylori* and defensive factors such as bicarbonate secretion, prostaglandins, gastric mucus, and intrinsic resistance of mucosal cell factors causes peptic ulcers (Dashputre and Naikwade, 2011). Both *H. pylori* and regular use of nonsteroidal anti-inflammatory drugs (NSAIDs) increase the risk of peptic ulcer development (Teka *et al.*, 2016; Kumar *et al.*, 2011). NSAIDs suppress the production of the enzyme cyclooxygenase (COX), which has been demonstrated to slow the progression of ulcers by blocking the conversion of arachidonic acid to prostaglandins (Vane and Botting, 1998). Complications occurring due to peptic ulcer disease continue to be a major cause of morbidity around the world, putting a significant strain on healthcare resources (Tanih *et al.*, 2010). Peptic ulcer disease is predicted to cause 15,000 fatalities each year. The goal of gastric ulcer treatment is to lower stomach acid production while also encouraging gastric mucosal protection (Valle, 2005). Although, powerful antiulcer drugs are available, the majority of them have a number of side effects, emphasizing the need to seek out new alternatives (Lavnya

et al., 2012). Due to the numerous adverse effects associated with the use of modern medications for a variety of ailments, medicinal plants are increasingly being regarded as the primary source of novel drugs, as they have fewer or no deleterious effects. Because, herbal medications are thought to be safe for treating ulcers with fewer side effects, are cost-effective, and substantially less hazardous, significant research is being done to find potent antiulcer drugs of plant origin (Srinivas *et al.*, 2013).This article examines the characteristics of a few of the plants that have been claimed to have antiulcer potential and ulcer-healing abilities.

2. Symptoms and clinical features of peptic ulcer

Peptic ulcers (PU) extend throughout the muscularis mucosae and are typically characterized by various stages of necrosis, neutrophil infiltration, decreased blood flow, and inflammation enhanced oxidative stress (Silva *et al*., 2013). Most of the patients having peptic ulcer often have abdominal pain, feeling of nausea and discomfort, one of the most striking symptom of gastric and duodenal ulcer is epigastric pain, this pain often worsen and feels like a burning sensation after having food. Antacids can usually ease the pain of a duodenal ulcer (Najm, 2011), meals on the other hand, frequently worsen gastric ulcer pain. Other symptoms includes bloating and a feeling of abdominal fullness in the abdomen melena, hematemesis and acute peritonitis is a rare complication (Ramasubramaniaraja and Babu, 2011), stools that are dark or black (Roy, 2016).

3. Approaches for treatment of peptic ulcers

Peptic ulcers are treated with a variety of medications; however, the most of them have substantial side effects such as arrhythmias, gynecomastia, impotence, arthralgia, hypergastrinemia, and haemopoeitic alterations (Akthar *et al*., 1992).

In recent years, an alternative strategy has been to investigate medicines from the ayurvedic or traditional medicinal system. The use of phytoconstituents as a pharmacological therapy to treat major disorders has been shown to be clinically successful and less toxic than currently available medications, as well as reducing offensive factors and functioning as a tool to prevent the peptic ulcers (Jainu *et al*., 2006).The main advantages of medicinal plants are, they are economical, readily available and has no side effects. (Bhatt *et al*., 2019).

A number of medicinal plants have been claimed to have antiulcer properties. In this review, we have organized the medicinal plants and their parts that have been utilized in various animal models to effectively lessen the repercussions of peptic ulcer disease in a variety of animal models.

4. Various experimental animal models for peptic ulcer induction

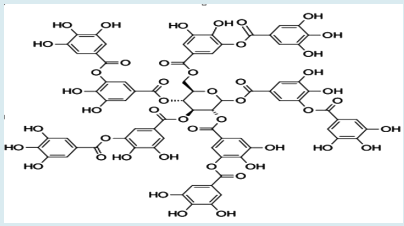
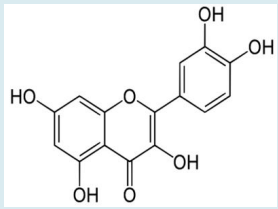
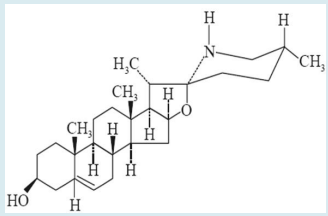
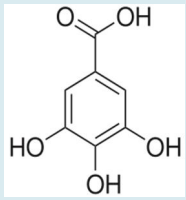
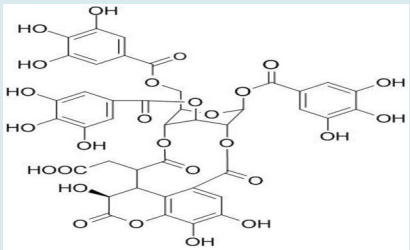
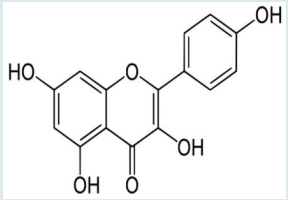
Physiological, pharmacological, and surgical interventions can cause peptic ulcers in a variety of animal species. However, rats are used in the majority of peptic ulcer research. Several models are employed in experiments to test or evaluate antiulcer action of medications or treatments, some of them are listed below in Table1.

There are several compounds called bioactive chemicals that are found in a variety of plants. Bioactive natural compounds always have played an important role as innovative potential therapeutic agents. They have a significant direct and indirect impact on human health, as well as extensive therapeutic characteristics. They possess antioxidant, anti-inflammatory properties which justify their role as an antiulcer compounds (Karasawa and Mohan, 2018). Some important bioactive compound that are being obtained from these medicinal plants and are listed below in Table 2.

Table 1: *In vivo* models used for preclinical evaluation of antiulcer activity

S. No.	Animal model	Reference
1.	Water-immersion stress or cold-water-restraint or cold-restraint stress	Kitagawa *et al*., 1979; Brodie and Hanson, 1960
2.	NSAIDs-(indomethacin, aspirin, and ibuprofen) induced gastric ulcers	Rainsford.,1987
3.	Ethanol-induced gastric ulcers	Sener *et al*., 2004; Takagi *et al*., 1970
4.	Histamine-induced gastric ulcers	Adinortey *et al., 2013*
5.	Reserpine-induced gastric ulcers	Kagoshima *et al*., 1982
6.	Serotonin-induced gastric ulcers	Hashizume *et al*., 1978; LePard and Stephens,1994
7.	Pylorus-ligated-induced peptic ulcers	Shay *et al*., 1945
8.	Diethyldithiocarbamate-(DDC)-induced peptic ulcers	Oka *et al*., 1990
9.	Methylene blue-induced ulcers	Shah *et al*., 2006
10.	Ischemia-reperfusion-(IR)induced gastric ulcers	Wada *et al*., 1996
11.	Cysteamine-induced duodenal ulcers	Szabo, 1978
12.	Indomethacin-histamine-induced duodenal ulcers	Takeuchi *et al*., 1986
13.	Ferrous iron-ascorbic acid-induced gastric ulcers	Naito *et al*., 1995
14.	Acetic acid-*H. pylori*-induced ulcers	Takagi *et al*., 1970; Okabe and Amagase, 2005
15.	Acetic acid-induced gastric ulcers	Konturek *et al*., 2003

Table 2: Some important major bioactive chemical constituents of selected medicinal plants

S. No.	Plant name	Important chemical constituent	Chemical structure	References
1.	*Asparagus racemosus* L.	Tannic acid		Ahmad, 2014
2.	*Hibiscus rosa-sinensis* L.	Quercetin		Zhang *et al*., 2020
3.	*Solanum nigrum* L.	Solasodine		Al Sinani *et al*., 2013
4.	*Psidium guajava* L.	Gallic acid		Reckziegel *et al*., 2016
5.	*Terminalia chebula* R.	Chebulinic acid		Lu *et al*., 2012
6.	*Carica papaya* L.	Kaempferol		Lee *et al*., 2014

5. Pharmacological activities exhibited by selected medicinal plants

5.1 *Asparagus racemosus* L.

Asparagus racemosus L. commonly known as satavar, is a member of the Asparagaceae family of plants that is known to be quiet effective in the treatment of problems associated with female reproductive system (Sharma and Sharma, 2017). It shows a wide range of pharmacological activities among which, some of the reported activities are antihepatotoxic activity (Muruganadan *et al*., 2000), aphrodisiac activity (Thakur *et al*., 2009), antioxidant activity (Kamat *et al*., 2000), antiurolithiac activity (Narumalla *et al*., 2012), antistress activity (Sharma *et al*., 2017), uterine relaxant activity (Suwannachat *et al*., 2012), antineoplastic activity (Liu *et al*., 2009), antidepressant activity (Singh *et al*., 2009), antihyper glycaemic activity (Hannan *et al*., 2007), versatile female tonic (Sharma *et al*., 2011), diuretic activity (Kumar *et al*., 2010), hypolipidemic activity (Visavadiya *et al*., 2009), antidiarrhoeal effect (Karmakar *et al*., 2012), antipyretic activity (Vasundra *et al*., 2013), immunomodulatory action (Gautam *et al*., 2012) and wound healing activity, *etc*. (Kodancha *et al*., 2011). Apart from these pharmacological activities, *A. racemosus* crude extract also possess significant antisecretory and antiulcer activity, when compared to the control group, crude extract in daily oral dose of 100 mg/kg/day up to 15 days considerably lowered ulcer index. The decrease in stomach lesions was similar to that seen with the conventional antiulcer medicine ranitidine (30 mg/kg/day orally). Crude extract also decreased gastric secretion volume, free and total acidity (Bhatnagar *et al*., 2006). Some important chemical constituents reported in *A. racemosus* are asparagine, arginine (Mishra *et al*., 2017), sarsasapogenin and shatavarin I-IV, isoflavone, 8-methoxy-5,6,42 -trihydroxyisoflavone-7-Oα-d-glucopyranoside (Negi *et al*., 2010), *etc*.

5.2 *Hibiscus rosa-sinensis* L.

This plant is belonging to Malvaceae family, the common name is “changing rose” locally also called gudhal, originally it is a native of China and is widely grown in India. Various chemical constituents present in *H. rosa-sinensis* are flavonoids, anthocyanins, quercetin, cyanidin, kaempferol and hydrocitric acid (Vimala and Shoba, 2014). At different doses, the aqueous and ethanolic extracts of *H. rosa-sinensis* roots possess antiulcer activity in pylorus-ligated rats (Srivastava *et al*., 2013). Some other activities exerted by *H. rosa-sinensis* are antibacterial activity (Ruban *et al*., 2012), anticonvulsant activity (Kasture *et al*., 2000), analgesic activity (Sawarkar *et al*., 2009), antioxidant activity (Mandade *et al*., 2011), anti-inflammatory activity (Tomar *et al*., 2010), antipyretic activity (Sawarkar *et al*., 2011), wound healing activity (Nayak *et al*., 2007), antianxiety activity (Khan *et al*., 2011).

5.3 *Solanum nigrum* L.

Solanum nigrum L., a member of the Solanaceae family, is popularly referred to as “black nightshade berries.” The major chemical constituents are gentisic acid, luteolin, apigenin, kaempferol, and m-coumaric acid, alkaloids, saponins, flavonoids, and phytosterols (Mayilsamy *et al*., 2013). In rats with pylorus ligation produced stomach ulcers, aqueous extract of leaves of *S. nigrum* showed strong antiulcer potential at 200 and 400 mg/kg doses (Kavitha *et al*., 2012). It cures psoriasis and ringworm, inflammatory disorders, menstrual cramps, fevers, diarrhea, eye infections, hydrophobia (Kirtikar *et al*., 1935; Nadkarni *et al*., 1976). Other pharmacological activities reported on *S. nigrum* are hepatoprotective activity, antioxidant activity, anticonvulsant activity, immunostimulant activity, antitumor activity, anti-inflammatory activity, cytotoxic activity, anti HCV activity, *etc*. (Goutam *et al*., 2018).

5.4 *Psidium gsajava* L.

Psidium guajava L. of the Myrtaceae family, is best known as “guvava. The major chemical constituents are quercetin, avicularin, apigenin (Wang *et al*., 2010), gallic acid, catechin, epicatechin (Liu *et al*., 2014), kaempferol (Wang *et al*., 2017). The methanolic extract of leaf of *P. guajava* was given orally to rats at various doses for 10 days to treat ethanol-induced stomach ulcers. In comparison to the control, the extract reduces ulcer indices significantly when compared to control (Umana *et al*., 2012). At doses of 500 and 1000 mg/kg body weight, *P. guajava* reported to cause reduction in ulcer index of ethanol induce ulceration in the stomach of wistar rats**.** *P. guajava* has been shown to have pharmacological actions such as antidiabetic, antidiarrhoeal, hepatoprotective, anticancer, antioxidant, anti-inflammatory, antiestrogenic and antibacterial *in vitro* and *in vivo* studies (Eziuche *et al*., 2022).

5.5 *Terminalia chebula* R.

Myrobalan is the common name for *Terminalia chebula* R., a Combretaceae plant often referred to as “harad.” According to a recent study, the methanolic extract of *T. chebula* was given orally at doses of 250 and 500 mg/kg. Both the pylorus ligation and the ethanol-induced gastric ulcer resulted in stomach damage. The methanolic extract reduces gastric volume, free acidity, and ulcer index when compared to the control (Raju *et al*., 2009). Some other pharmacological activities exhibited by *T. chebula* are neuroprotective activity (Yuh-Chiang *et al*., 2017), antibacterial activity (Phadke *et al*., 1989), antiepileptic activity (Debnath *et al*., 2010), antioxidant activity, neuroprotective activity (Chang *et al*., 2011), hepatoprotective activity (Tasduq *et al*., 2006), cardiotonic activity (Reddy *et al*., 1990), cytoprotective activity (Na M *et al*., 2004), antidiabetic (Sharma *et al*., 2011), antiarthritic and analgesic activity (Seo *et al*., 2012), antihyperlipidaemic (Shirin *et al*., 2010), antifungal activity (Venkatachalam *et al*., 2020), antiviral activity, anticarcinogenic activity, wound healing activity, *etc*. (Chattopadhyay *et al*., 2007). Major chemical constituents present in *T. chebula* are flavonoids, flavins, terpenoids, steroids, various phenols, tannic acid, ethyl gallate, chebulic acid, chebulagic acid, corilagin, ascorbic acid (vitamin C), gallic acid, ellagic acid, eugenol, chebulinic acid, ethylgallate, methyl gallate, chebulaginic acid, *etc*. (Riaz *et al*., 2017).

5.6 *Carica papaya* L.

Carica papaya L. belongs to the Caricaceae family. The methanolic extract of *C. papaya* reduced stomach ulcers by 56%, 76%, and 82% at 125, 250, and 500 mg/kg doses, respectively (Pinto *et al*., 2015). Some of the pharmacological activities shown by *C. papaya* are antithrombocytopaenic activity (Dharmarathna et al., 2013), analgesic activity (Suwendar, 2014), antimicrobial activity (Baskaran *et al*., 2012)**,** antitumor activity and immunomodulatory activity (Otsuki *et al*., 2010), antidiabetic activity (Juarez-Rojop, 2014), anthelmintic activity (Sanghvi, 1989), nephroprotective activity (Suyono *et al*., 2016), anti-inflammatory activity (Owoyele

et al., 2008), and wound healing activity (Ukoba *et al*., 2016), *etc.* The chief constituents present are manghaslin, clitorin, rutin, nicotiflorin, papain, chymopapain, cystatin, tocopherol, and caffeic acid carpaine (Ramasawamy *et al*., 1960), pseudocarpaine (Govindachari *et al*., 1954), and dehydrocarpaine I and II (Tang, 1979).

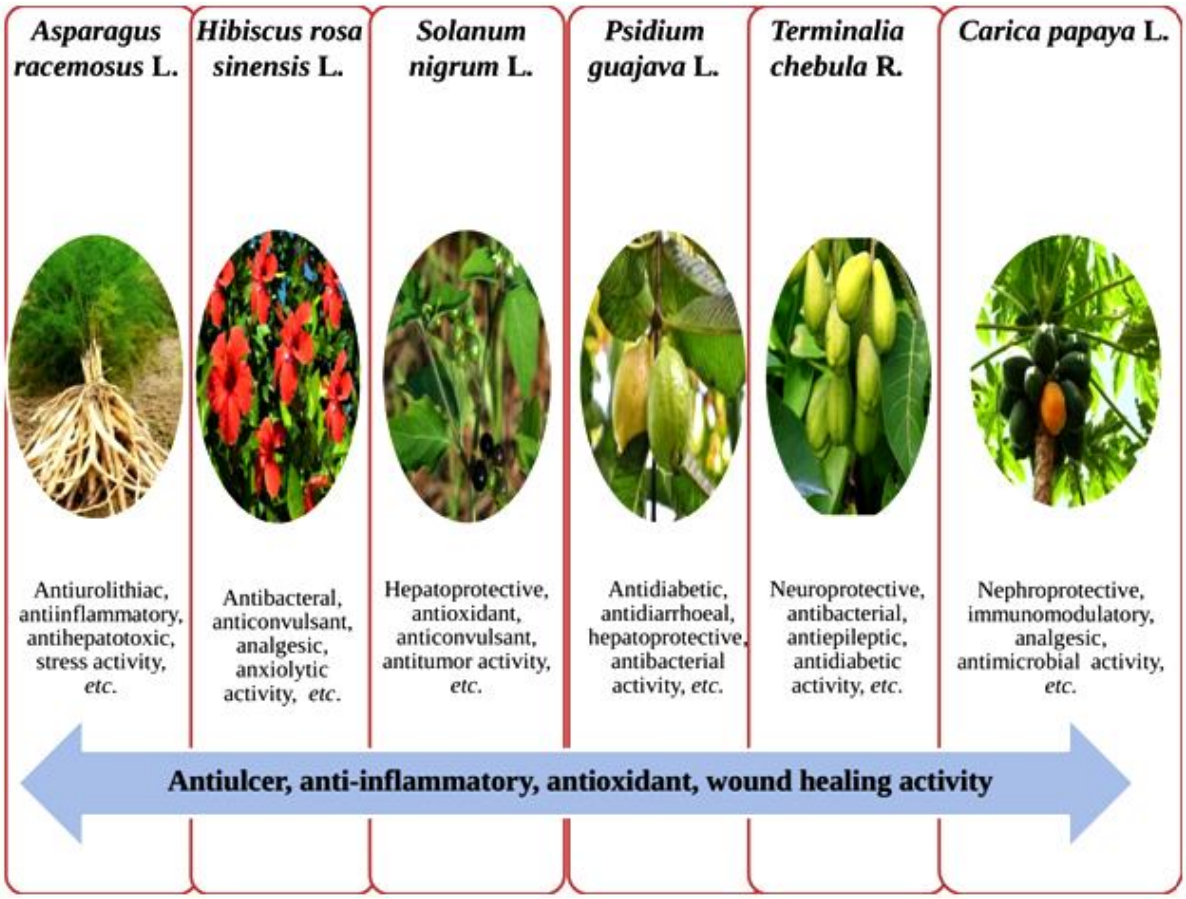


Figure 1: Some important pharmacological activities of indigenous medicinal plants.

Table 3: Indigenous medicinal plants, their parts used and major active constituents

Sr. No.	Medicinal plant	Family	Part(s) used	Major active constituents	Reference
1.	*Asparagus racemosus* L.	Asparagaceae	Fruits, roots	Asparagine, arginine, tyrosine, flavonoids (kaempferol, tannin quercetin, and rutin) and resin	Negi *et al*., 2010
2.	*Hibiscus rosa-sinensis* L.	Malvaceae	Flowers, leaves root	Phenols, tannins, alkaloids, flavonoids, anthraquinones	Al Snafi *et al*., 2018
3.	*Solanum nigrum* L.	Solanaceae	Leaves, fruits, stem	Polyphenols, entisic acid, luteolin, apigenin, kaempferol, and m-coumaric acid	Hsiu *et al*., 2010
4.	*Psidium guajava* L.	Myrtaceae	Leaves, fruits	Beta sitosterol, uvaol, oleanolic acid, ursolic acid *etc*.	Sabira *et al*., 2014
5.	*Terminalia chebula* R.	Combretaceae	Leaves, fruits	Tannins (gallic acid, chebulic acid, punicalagin, corilagin, ellagic acid, chebulegic acid, chebulinic acid), flavonol glycosides, triterpenoids, chebulin, phenolic compounds, *etc*.	Said *et al*., 2012
6.	*Carica papaya* L.	Caricaceae	Peel, fruits, leaves, roots, seeds, flower	latex Trans-geranylacetone, palmitic acid, myristic acid, methyl palmitate, oleic acid, steric acid, decylene, *etc*.	Anjana *et al*., 2018

6. Utilization of herbal plants in development of antiulcer medicines

It is evident now that the antiulcer effects are now known to exist in a variety of plants. Herbal medicines have been utilized for the treatment of numerous disorders since ancient times. Peptic ulcer disease is a global problem and sometimes it can lead to some serious life threatening side effects. Nowadays, the medicines that are utilized in the treatment of peptic ulcers may also have various side effects like gastrointestinal disturbances such as nausea, vomiting, diarrhea, constipation, headache, rash, dizziness, fatigue, dry mouth, *etc*. So, it is essential to develop and utilize a formulation of plant origin to minimize the side effects caused by drugs in the modern medicine system. Some medicinal plants with antiulcer effects are discussed in this review article. These plants are *A. racemosus, H. rosa-sinensis, S. nigrum, P. guajava, T. chebula*, and *C. papaya*. Apart from antiulcer properties, some of their important chemical ingredients and few other parameters of these plants utilized for antiulcer activity are discussed. Other pharmacological activities exhibited by these medicinal plants are also demonstrated here in this review article. Antiulcer effects are mostly due to chemical ingredients such as alkaloids, flavonoids, terpenoids, and tannins.

7. Conclusion

The peptic ulcer disease (PUD) mechanism results from an imbalance between gastric mucosal protective and aggressive factors. The mucosal protective factors are mucous, bicarbonate, mucosal blood flow and prostaglandins while aggressive factors are *H. pylori*, acid, pepsin, smoking, NSAIDs, *etc*. Out of this, prevalence of any one or more aggressive factors can cause peptic ulcers. However, today's ulcer treatment focuses on potentiating defense factors as well as reducing acid secretion. While the currently available treatment options have significant side effects, nowadays, proton pump inhibitors are the most widely used and over prescribed medications. The proton pump inhibitors are reported to possess some side effects, which include a headache, diarrhea, constipation, and cramping, these are minor and easily managed. Recent studies; however, have suggested a link between proton pump inhibitors and other antiulcer medications used and a number of serious side effects, which has caused considerable concern among patients and physicians. Some of the negative effects of proton pump inhibitors are related to their suppression of gastric acid secretion, which allows ingested microbial pathogens that would have been devastated by gastric acid to colonize the upper gastrointestinal tract and cause infections. This article looks at a few of the herbal medications that have been shown to have antiulcer activity in animal studies. Various experimental data now show that various herbal medications are extremely effective in the treatment of stomach ulcers, but only a few have reached the clinical trial stage, and even fewer have been commercialized. As a result, it can be inferred that the advantages of these studies are not reaching the general public. As a result, researchers must devote more time and effort to the standardization of such potential herbal medications in order for them to be clinically effective and competitive.

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Conflict of interest

The authors declare no conflicts of interest relevant to this article.

References

Adinortey, M.B., Ansah C.; Galyuon I. and Nyarko, A. (2013). *In vivo* models used for evaluation of potential antigastroduodenal ulcer Agents. Ulcers, **13**:1-12.

Ahmad, T. (2014). Reviewing the tannic acid mediated synthesis of metal nanoparticles. J. Nanotechnol., **14**:1-11.

Akthar, M.S.; Akthar, A.H. and Khan, M.A. (1992). Assessment of antiulcer efficacy of stem bark extract of *Nauclea latifolia* (African Peach) in rats. Int. J. Pharmacog., **30**:97-98.

Al Sinani, S.S.; Eltayeb, E.A.; Kamal, Y.T. and Ahmad, S. (2013). Quantitative estimation of solasodine in *Solanum incanum* plants grown in Oman by HPTLC. Int. J. Pharmacogn. Phytochem., **28**(1):1132-1139.

Alam, A. and Khan, A.A. (2020). *Argemone mexicana* L.: A weed with versatile medicinal and pharmacological applications. Ann. Phytomed., **9**(1): 218-223.

Alam, A.; Kanchan and Emmanuel, I. (2019). Contemporary medicinal uses of ethnomedicinally important plant: Arjuna [*Terminalia arjuna* (Roxb.) Wight and Arn.]. Ann. Phytomed., **8**(1):63-69.

Al-Snafi, A.E., (2018). Chemical constituents, pharmacological effects and therapeutic importance of *Hibiscus rosa-sinensis*: A review. IOSR J. Pharm., **8**,7(II):101-119.

Anjana, GV.; Priya, D.; Srimathi, R. and Shantha, K.B. (2018). A review on medical advantages and chemical constituents of *Carica papaya* Linn. Asian J. Pharm Clin Res., **11**(9):53-57.

Baskaran, C.; Rathabai, V.; Velu, S. and Kubendiran, K. (2012). The efficacy of *Carica papaya* leaf extract on some bacterial and a fungal strain by well diffusion method. Asian Pac. J. Trop. Dis., **2**(2):s658-s662.

Belaiche, J.; Burette, A.; Vos, M. De.; Louis, E.; Huybrechts, M. and Deltenre, M. (2002). Observational survey of NSAID-related upper gastrointestinal adverse events in Belgium. Acta Gastroenterol. Belg., **65**:65-73.

Bhatnagar, M. and Sisodia, S.S. (2006). Antisecretory and antiulcer activity of *Asparagus racemosus* Wild against indomethacin plus phyloric ligation-induced gastric ulcer in rats. J. Herb. Pharmacother., **6**(1): 13-20.

Bhatt, P.R.; Pandya, K.B.; Patel, U.D.; Modi, C.M.; Patel, H.B. and Javia, B. (2019). Antidiabetic, antioxidant and anti-inflammatory activity of medicinal plants collected from nearby area of Junagadh, Gujarat. Ann. Phytomed., **8**(2):75-84.

Brodie, D.A. and Hanson, H.M. (1960). A study of the factors involved in the production of gastric ulcers by the restraint techniques. Gasteroenterology, **38**:353-360.

Chan, F.K.L. and Graham, D.Y. (2004). Review article: Prevention of non-steroidal anti-inflammatory drug gastrointestinal complications-review and recommendations based on risk assessment. Aliment. Pharmacol. Ther., **19**(10):1051-1061.

Chang, C.S. and Lin, C.S. (2012). Phytochemical composition, antioxidant activity, and neuroprotective effect of *Terminalia chebula* Retzius extracts., **12**:1-7.

Chattopadhyay, R.R. and Bhattacharyya, S.K. (2007). Plant review *Terminalia chebula*: An update. Pharmacog. Rev., **1(1)**:151-156.

Dashputre, N.L. and Naikwade, N.S. (2011). Evaluation of antiulcer activity of methanolic extract of *Abutilon indicum* Linn. leaves in experimental rats. Int. J. Pharm. Sci. Drug Res., **3**(2):97-100.

Debnath, S.; Kannadasan, M.; Ghosh, S.; Ghosh, N.; Chakraborty, R. and Sen, S. (2010). Antiepileptic activity of the *Erythrina fusca* Lour. bark against the animal models of MES, PTX and PTZ induced epileptic seizalcoholic extract of *Erythrina fusca* Lour bark against the animal models. Int. J. Chem Res., **1**:(2):7-10.

Dharmarathna, S.L.C.A.; Wickramasinghe, S.; Waduge, R.N.; Rajapakse, R.P.V.J. and Kularatne, S.A.M. (2013). Does *Carica papaya* leaf extract increase the platelet count? An experimental study in a murine model. Asian Pac. J. Trop. Biomed., **3**(9):720-724.

Eziuche, A.U..; Okezie, E.; Miracle, E.U.; Emmanuel, DD.; Benedict, C.O.; Chibuike, I.; Victor C.U.; Celestine, N.E. and Ositadinma, C.U. (2022). The ethnobotanical, phytochemistry and pharmacological activities of *Psidium guajava* L. Arab. J. Chem., **15**(5):1-25.

Gautam, M.; Diwanay, S.; Gairola, S.; Shinde, Y.; Patki, P. and Patwardhan, B. (2004). Immunoadjuvant potential of *Asparagus racemosus* aqueous extract in experimental system. J Ethnopharmacol., **91:**(2-3):251-255.

Goutam, M.; Shramana, S.; Snehashis Kundu. and Shymodip, K. (2018). Ethnopharmacological activity of *Solanum nigrum*. J. Pharm. Innov., **7**(10):692-698.

Govindachari, T.R.; Pai, B.R. and Narasimhan, N.S. (1954). Pseudocarpine, a new alkaloid from *Carica papaya*. J. Chem. Soc., **9**:1847-1849.

Hannan, J.M.; Marenah, L.; Ali L.; Rokeya B.; Flatt, P.R. and Abdel-Wahab, Y.H. (2007). Insulin secretory actions of extracts of *Asparagus racemosus* root in perfused pancreas, isolated islets and clonal pancreatic beta-cells. J. Endocrinol., **192**(1):159-168.

Hashizume, T.; Hirokawa, K.; Aibara, S.; Ogawa H. and Kasahara A. (1978). Pharmacological and histological studies of gastric mucosal lesion induced by serotonin in rats. Archives Internationales de Pharmacodynamie et de Therapie., **236**(1):96-108.

Hsiu, C.H. (2010). Chemical composition of *Solanum nigrum* L. extract and induction of autophagy by leaf water extract and its major flavonoids in AU565 breast cancer cells. J. Agric. Food Chem., **58**:8699-8708.

Idris, S.; Mishra A. and Khustar, M. (2021). Phytochemical estimation of germinated *Trigonella foenum-graecum* L. seed extract for better application in phytotherapy. Ann. Phytomed., **10**(2):213-222.

Inaparthi, V.K.; Prasad, N.B.; Nagaraju, K.; Prasanthi and K; Srinivasa. (2014). Evaluation of antiulcer and *in vitro* antioxidant activities of aqueous and methanolic extracts of *Neolamarckia cadamba* leaves and bark in Wistar albino rats. Int. J. Pharm. Sci. Res., **5**(5):1852-1858.

Jainu, M.; Mohan, K.V. and Devi, C.S.S. (2006). Gastrorotective effect of *Cissus quadrangularis* extract in rats with experimentally induced ulcer. Indian J. Med. Res., **123**:799-806.

Juarez-Rojop, I.E. (2014). Phytochemical screening and hypoglycaemic activity of *Carica papaya* leaf in streptozotocin-induced diabetic rats. Rev. Bras. Farmacogn., **24**(3):341-347.

Kagoshima, M. and Suguro, N. (1982). Gastric movements and reserpine induced ulcers in rats. Nihon Yakurigaku Zasshi., **80**(3):231-238.

Kamat, J.P.; Boloor, K.K.; Devasagayam, T.P. and Venkatachalam, S.R. (2000). Antioxdant properties of *Asparagus racemosus* against damaged induced by gamma radiation on rat liver mitochondria. J. Ethanopharmacol., **71**:425-435.

Karasawa M.M.G. and Mohan C. (2018). Fruits as prospective reserves of bioactive Compounds: A review. Nat. Prod. Bioprospect., **8**(5):335-346.

Karmakar, U.K.; Sadhu, S.K.; Biswas, S.K.; Chowdhury, A.; Shill, M.C. and Das, J. (2012). Cytotoxicity, analgesic and antidiarrhoeal activities of *Asparagus racemosus*. J. Appl Sci., **12**(6):581-586.

Kasture, V.S.; Chopde, C.T. and Deshmukh, V.K. (2000). Anticonvulsive activity of *Albizale lebbeck, Hibiscus rosa-sinesis.* and *Butea monosperma* in experimental animals. J. Ethnopharmacol., **71**(1-2):65-75.

Kavitha, G.G.; Shree, S.; Parvathi, P.S.S.; Ramkumar and Shanmuga, P.S. (2012). Pharmacological and phytochemical evaluation of antiulcerogenic potential of *Solanum nigrum*. Indian J. Pharm. Sci. Res., **3**(8):2837-2840.

Khan, M.J.; Ajazuddin.; Vyas, A.; Singh, M. and Singh, D. (2011). Acute and chronic effect of *Hibiscus rosa-sinensis* flower extract on anxiety. J. Plant Sci., **6**(2):102-107.

Kirtikar, K.R.; and Basu, B.D. (1935). Indian Medicinal Plants. Lalit Mohan Publication., Allahabad., **2**:1347-1348.

Kitagawa, H.; Fujiwara, M. and Osumi, Y. (1979). Effects of water-immersion stress on gastric secretion and mucous blood flow in rats. Gastroenterology, **77**:298-302.

Kodancha, P.G.; Kumar, S.M.C.; Rajput, R.; Patil, V.; Udupa, A.L.; Gupta, S.; Rathnakar, U.P.; Rao, S.; Benegal, D.; Benegal, A. and Shubha, H.V.(2011). Wound healing profile of *Asparagus racemosus* (Liliaceae) Wild. J. Curr. Pharma Res., **1**(2):111-114.

Konturek, P.C.; Brzozowski, T. and Kania, J. (2003). Pioglitazone, a specific ligand of peroxisome proliferator-activated receptor-gamma, accelerates gastric ulcer healing in rat. Eur. J. Pharmacol., **472**(3):213–220.

Kumar, M.; Niyas, M.; Mani, T.; Rahiman, O. and Kumar, S. (2011). A review on medicinal plants for peptic ulcer. Der Pharmacia Lettre., **3**(3):414-420.

Kumar, M.C.S.; Udupa, A.L.; Sammodavardhana, K.; Rathnakar, U.P.; Shvetha, U. and Kodancha, G.P. (2010). Acute toxicity and diuretic studies of the roots of *Asparagus racemosus* Wild in rats. West Indian Med J., **59**(1):3-6.

Lavnya, A.; Kumar, M.P.; Anbu, J.; Anjana, A. and Assay, S. (2012). Antiulcer activity of *Canavalia virosa* (ROXB) W & A leaves in animal model. Int. J. Life Sci. Pharma. Res., **2**(4):39-43.

Lee, H.S.; Cho H.J.; Yu, R., Lee K.W.; Chun, H.S. and Park, J.H.Y. (2014). Mechanisms underlying apoptosis-inducing effects of kaempferol in HT-29 human colon cancer cells. Int. J. Mol. Sci.,**15**:2722-2737.

LePard, K.J. and Stephens Jr, R.L. (1994). Serotonin inhibits gastric acid secretion through a 5-hydroxytryptamine1-like receptor in the rat. J. Pharmacol. Exp. Ther., **270**(3):1139-1147.

Liu, C.W.; Wang, Y.C.; Lu, H.C. and Chiang, W.D. (2014). Optimization of ultrasound-assisted extraction conditions for total phenols with antihyperglycemic activity from *Psidium guajava* leaves. Process. Biochem., **49**:1601-1605.

Liu, W.; Huang XF.; Qi Q.; Dai QS.; Yang L.; Nie FF.; Lu Na.; Gong D.D.; Kong L.Y. and Guo Q.L. (2009). Asparanin induces G(2)/M cell cycle arrest and apoptosis in human hepatocellular carcinoma HepG2 cells. Biochem. Biophys. Res. Commun., **381**(4):700-705.

Lu, K.; Chakroborty, D.; Sarkar, C.; Lu, T.; Xie, Z.; Liu, Z. and Basu, S. (2012). Triphala and its active constituent chebulinic acid are natural inhibitors of vascular endothelial growth factor-a mediated angiogenesis. PLoS One., **7**(8):e43934:1-7.

Malik, T.; Madan, V.K. and Prakash, R. (2020). Herbs that heal: Floristic boon to the natural healthcare system. Ann. Phytomed., **9**(2):1-9.

Mandade, R.; Sreenivas, S.A.; Sakarkar, D.M. and Chaudhary, A. (2011). Radical scavenging and antioxidant activity of *Hibiscus rosa-sinensis* extract. Afr. J. Pharmacy Pharmacol., **5**(17):2027-2034.

Mayilsamy, M. and Rajendran. A. (2013). Ethnomedicinal plants used by Paliya tribals in Dindigul district of Tamil Nadu, India. IJSID., **3**(1):146-152.

McKay, T.B.; Lyon, D.; Sarker-Nag, A.; Priyadarsini, S.; Asara, J.M. and Karamichos, D. (2015). Quercetin attenuates lactate production and extracellular matrix secretion in keratoconus. Sci. Rep., **5**:1-7.

Mishra, J.N. and Verma N.K. (2017). *Asparagus racemosus:* Chemical constituents and pharmacological activities: A review.European J. Biomed. Pharm. Sci., **4**(6):207-213.

Mohan, H. (2015). Textbook of pathology. 7th edition, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi. pp:533-537.

Muruganadan, S.; Garg, H.; Lal, J.; Chandra, S. and Kumar, D. (2000). Studies on the immunostimulant and antihepatotoxic activities of *Asparagus racemosus* root extract. J. Med. Arom. PI. Sci., **22**:49-52.

Na, M.; Bae, M.; Keng, S.S.; Min, BS.; Yoo, J.K.; Kamiryo, Y.; Senoo, Y.; Yokoo, S. and Miwa, S.(2004). Cytoprotective effect on oxidative stress and inhibitory effect on cellular aging of *Terminalia chebula* fruit. Phytother. Res., **18**(9):737-741.

Nadkarni's, K.M. and Indian Materia Medica. (1976). 1:1017-1019, Popular Prakashan, Mumbai, India.

Naito, Y.; Yoshikawa, T.; Yoneta, T.; Yagi, N.; Matsuyama, K.; Arai, M.; Tanigawa, T. and Kondo, M. (1995). A new gastric ulcer model in rats produced by ferrous iron and ascorbic acid injection. Digestion, **56**(6):472-478.

Najm, W.I. (2011). Peptic ulcer disease. Prim Care Clin. Office Pract., **38**(2011):383-394.

Narumalla, J.; Somashekara, S.; Chikkannasetty.; Damodaram, G. and Golla, D. (2012). Study of antiurolithiatic activity of *Asparagus racemosus* L. on albino rats. Indian J. Pharmacol., **44**(5):576-579.

Nayak, S.B.; Sivachandra, R.; Rao, C.A.V.; and Orette, F.A. (2007). Effects of *Hibiscus rosa-sinensis* L. (Malvaceae) on wound healing activity: a preclinical study in a Sparague Dawley rat. Int. J. Low Extrem Wounds, **6**:76-81.

Negi, J. S.; Singh, P.; Joshi, G.P.; Rawat, M.S. and Bisht, V.K. (2010). Chemical constituents of *Asparagus*. Pharmacogn. Rev., **4**(8):215-220.

Oka, S.; Ogino, K.; Hobara, T.; Yoshimura, S.; Yanai, H.; Okazaki, Y.; Takemoto, T.; Ishiyama, H.; Imaizumi, T.; Yamasaki, K. and Kanbe, T. (1990). Role of reactive oxygen species in diethyldilthiocarbamate induced gastric ulcer in the rat. Experentia, **46**:281-283.

Okabe, S. and Amagase, K. (2005). An overview of acetic acid ulcer models: the history and state of the art of peptic ulcer research. Biol. Pharm. Bull., **28**(8):1321-1341.

Otsuki, N.; Dang, N.H.; Kumagai E.; Kondoc, A.; Iwataa, S. and Morimoto, C. (2010). Aqueous extract of *Carica papaya* leaves exhibits antitumor activity and immunomodulatory effects. J. Ethnopharmacol., **127**(3):760-767.

Owoyele, B.V.; Adebukola, O.M.; Funmilayo, A.A. and Soladoye, A.O. (2008). Anti-inflammatory activities of ethanolic extract of *Carica papaya* leaves. Inflammopharmacology, **16**:168-173.

Phadke, S.A. and Kulkarni, S.D. (1989). Screening of *in vitro* antibacterial activity of *Terminalia chebula* Eclaptaalba and *Ocimum sanctum*. Indian J. Med. Sci., **43**(5):113-117.

Pinto, L.A.; Cordeiro, K.W. and Carrasco, V. (2015). Antiulcerogenic activity of *Carica papaya* seed in rats. Naunyn-Schmiedeb. Arch. Pharmacol., **388**(3):305-317.

Rainsford, K.D. (1987). The effect of 5-lipoxygenase inhibitors and leukotriene antagonists on the development of gastric lesions induced by non-steroidal anti-inflammatory drugs in the mice. Agents Actions, **21**:316-319.

Raju, D.; Ilango, K.; Chitra, V. and K. Ashish. (2009). Evaluation of antiulcer activity of methanolic extract of *Terminalia chebula* fruits in experimental rats. J. Pharm. Sci. and Res., **1**(3):101-107.

Ramasawamy, A.M. and Sirsi, M. (1960). Antituberculosis activity of some chemical constituents from higher plants. Indian J. Pharm., **22**:34-35.

Ramasubramaniaraja, R. and Babu, M.N. (2011). Peptic ulcer and phytochemistry: an overview, J. Pharm. Res., **4**:156-160.

Ravisankar, P.; Koushik, O.S.; Reddy, A.A.; Kumar, U.E.; Anvith, P.S. and Pragna, P. (2016). A detailed analysis on acidity and ulcers in esophagus, gastric and duodenal ulcers and management. IOSR-JDMS., **15**(1):94-114.

Reckziegel, P.; Dias, V.T.; Benvegnu, D.M.; Boufleur, N.; Barcelos, R.C.S.; Segat, H.J.; Pase C.S.; Santos, C.M.M.D.; Flores E.M.M. and Burger, M.E. (2016). Antioxidant protection of gallic acid against toxicity induced by Pb in blood, liver and kidney of rats. Toxicol. Rep., **3**:351-356.

Reddy, V.R.C.; Kumari, S.V.R.; Reddys, B.M.; Azeem, M.A.; Prabhakar M.C. and Rao, A.V.N.A. (1990). Cardiotonic activity of the fruits of *Terminalia chebula*. Fitoterapia, **41**:517-525.

Riaz, M.; Khan. O.; Sherkheli, M.A.; Khan, M.Q. and Rashid, R. (2017). Chemical constituents of *Terminalia chebula*. Indian J. Nat Prod., **13**(2):1-16.

Roy, S. (2016). Clinical study of peptic ulcer disease. Asian J. Biomed. Pharm. Sci., **6**:41-43.

Ruban, P. and Gajalakshmi, K. (2012). *In vitro* antibacterial activity of *Hibiscus rosa-sinensis* flower extract against human pathogens. Asian Pac. J. Trop. Biomed., **2**(5):399-403.

Sabira, B.; Syed, Nawazish, A.; Saima, T.; Syed, T.A.; Syed, I.H.; Bina, S.S. and Aqeel, A. (2014). Chemical constituents and antioxidant activity of fresh leaves of *Psidium guajava* cultivated in Pakistan. J. Chem. Soc. Pak., **36**(1):119-122.

Said, M.; Barkat, A.K.; Naveed, A.; Tariq, M.; Akhtar, R.; Irshad, H.; Haroon, K. and Amir, B. (2012). The morphology, extractions, chemical constituents and uses of *Terminalia chebula*: A review. J. Med. Plant Res., **6**(33):4772-4775.

Sanghvi, P.K.; (1989). Epidemiological studies on guinea worm in some newly discovered villages of Jhabua district (M.P) and test of *Carica papaya* leaves of Guinea worm infection. Indian J. Med. Sci., **43**:123-124.

Sawarkar, A.; Jangde C.R.; Thakre P.D.; Kadoo R. and Shelu S. (2009). Analgesic activity of *Hibiscus rosa-sinensis* L. in rats. Indian Vet. J., **6**(4):49-51.

Sener, G.; Pasakalogu, K. and Ayanoglu, D.G. (2004). Protective effect of increasing doses of famotidine, omeprazole, lansoprazole, and melatonin against ethanol-induced gastric damage in rats.Indian J. Pharmacol., **36**(3):171-174.

Seo, J.B.; Jeong, J.Y. Park, J.Y; Jun, E.M, Lee, S.I.; Choe, Sung, S.; Park, D.Y.; Choi, E.W. and **Lim, J.S.(2012).** Antiarthritic and analgesic effect of NDI10218, a standardized extract of *Terminalia chebula* on arthritis and pain model. Biomol. Ther., **20**(1):104-112.

Shah, D.I.; Santani, D.D. and Goswami, S.S. (2006). A novel use of methylene blue as a pharmacological tool. J. Pharmacol. Tox. Met., **54**(3):273-277.

Sharma, A. and Sharma, D.N. (2017). A comprehensive review of the pharmacological actions of *Asparagus racemosus*. Am. J. Pharm. Tech. Res., **7**(1):1-19.

Sharma, K. and Bhatnagar, M. (2011). *Asparagus racemosus* L. (Shatavari): A versatile female tonic. Int. J. Pharm Biol. Arch., **2**(3):855-863.

Sharma, R. and Arya, V. (2011). A review on fruits having antidiabetic potential. J. Chem. Pharm. Res., **3**:204-212.

Shay, H.; Komarov, S.A.; Fels, S.S.; Meranze, D.; Gruenstein, M. and Siplet, H. (1945). A simple method for the uniform production of gastric ulceration in the rat. Gastroenterology, **5**:43-61.

Shirin, H.R.; Neda, Moradi, N.L.; Avin; M.; Bagher L. and Mohammad, A. (2010). The efficacy and safety of herbal medicines used in the treatment of hyperlipidemia; A systematic review. Curr. Pharm. Des., **16**:2935-2947.

Silva, L.M. da; Allemand, A.; Mendes, D.A.G.B.; Santos, A.C.D.; Andre, E.; Souza, L.M. De.; Ciprian, T.R.; Dartora, N.; Marques, M.C.A., Baggio, C.H. and Werner M.F. (2013). Ethanolic extract of roots from *Arctium lappa* L. accelerates the healing of acetic acid-induced gastric ulcer in rats: Involvement of the antioxidant system. Food Chem. Toxicol., **51**:179-187.

Singh, G.K.; Garabadu D.; Muruganandam A.V.; Joshi V.K. and Krishnamurthy, S. (2009). Antidepressant activity of *Asparagus racemosus* in rodent models. Pharmacol. Biochem. Behav., **91**(3):283-290.

Srinivas, T.L.; Lakshmi, S.M.; Shama, S.N.; Reddy, G.K. and Prasanna, K.R. (2013). Medicinal plants as antiulcer agents. Journal of Pharmacognosy and Phytochemistry, **2**(4):91-97.

Srivastava, S.; Jaiswal, J.; Gautam H.; Sharma, S., and Rao, C.V. (2013). Antiulcer activity of methanol extract of *Hibiscus rosa-sinensis* leaves. Int. J. Pharm. Pharm. Sci., **5**(3):829-830.

Suwannachat, A.; Kupittayanant, P. and Kupittayanant, S. (2012). Shatavari: (*Asparagus racemosus* extract can relax the myometrium. Proceedings of the Physiological Society Physiology 2012 (Edinburgh). Proc Physiol Soc., **27**, PC365.

Suwendar, P.H. and Ernasari, GI. (2014). Analgesic activity of Papaya (*Carica papaya*) leaves extract. Procedia Chem., **13**:147-149.

Suyono, T.; Fachrial, E.; Zein, R.; Chaidir, Z.; Tjong, DH. and Aziz, H. (2016). The effect of Pb(II) in the kidney of experimental rats and the effectiveness of Papaya (*Carica papaya*) leaves powder as an antidote. Res. J. Pharm. Biol., **7**(6):2172-2176.

Szabo, S. (1978). Animal model of human disease. Duodenal ulcer disease: cysteamine induced acute and chronic duodenal ulcer in the rat. Am. J. Pathol., **7**(1):273-276.

Takagi, K.; Okabe, S. and Saziki, R.A. (1970). New method for the production of chronic gastric ulcers in rats and the effect of several drugs on its healing. Japanese Journal of Pharmacology, **19**:418-421.

Takeuchi, K.; Furukawa, O.; Tanaka, H. and Okabe, S. (1986). A new model of duodenal ulcers induced in rats by indomethacin plus histamine. Gastroenterology, **90**(3):636-645.

Tang, C.S. (1979). New macrolcyclic, 1-piperideine alkaloids from papaya leaves: Dehydrocarpaine I and II. Phytochemistry, **18**(4):651-652.

Tanih, N.F.; Ndip, L.M.; Clarke, A.M. and Ndip, R.N. (2010). An overview of pathogenesis and epidemiology of *Helicobacter pylori* infection. Afr. J. Microbiol. Res., **4**(6):426-436.

Tasduq, K.S.; Satti, N.K.; Gupta, D.K.; Suri, K.A. and Johri, R.K. (2006). *Terminalia chebula* (fruit) prevents liver toxicity caused by sub-chronic administration of rifampicin, isoniazid and pyrazinamide in combination. Hum. Exp. Toxicol., **25**(3):111-118.

Teka, B.; Gebre-Selassie, S. and Abebe, T. (2016). Sero - prevalence of *Helicobacter pylori* in HIV positive patients and HIV negative controls in St. Paul's general specialized hospital, Addis Ababa, Ethiopia. Science Journal of Public Health, **4**(5):387-393.

Thakur, M.; Chauhan, NS.; Bhargava, S. and Dixit, V.K. (2009). A comparative study on aphrodisiac activity of some ayurvedic herbs in male albino rats. Arch. Sex Behav., **38**(6):1009-1015.

Tomar, V.; Kannojia. P.; Jain, K.N. and Dubey, K.S. (2010). Antinoceceptive and anti-inflammatory activity of leaves of *Hibiscus rosa-sinensis*. Int. J. Ayurveda Res., **1**(1):201-205.

Ukoba, O. Adfisan, I.E. and Aguawa, U.S. (2016). The wound healing effect of powdered *Carica papaya* leaves. IMPACT: IJRANSS, **4**(3):1-10.

Umana, U.J.A.; Timbuak, S.A.; Musa, D.T.; Ikyembe, S.; Rashid A. and Hamman, W.O. (2012). Ulcer protective effect of methanol extract of *Psidium guajava* leaves on ethanol induced gastric ulcer in adult wistar rats. Asian J. Med. Sci., **4**(2):75-78,

Valle, D.L. (2005). Peptic ulcer diseases and related disorders. In: Harrison's principles of internal medicine. Braunwald E, Fauci AS, Kasper DL, Hauser SL, Longo DL, Jameson JL (editors), ed. 16th New York. McGraw-Hill. pp:1746-1762.

Vane, J.R. and Botting, R.M. (1998). Mechanism of action of non-steroidal anti-inflammatory drugs. Am. J. Med., **104**:2S-8S.

Vasundra, D.P.A. and Divya, P.S. (2013). Antipyretic activity of ethanol and aqueous extract of root of *Asparagus racemosus* in yeast induced pyrexia. Asian J. Pharm. Clin. Res., **6**(3):190-193.

Venkatachalam, P. and Chittibabu, C.V., (2020). Antifungal activity of *Terminalia chebula* R. fruit extracts. Current Botany. **11**:216-220.

Visavadiya, N.P. and Narasimhacharya, A.V.R.L. (2009). *Asparagus* root regulates cholesterol metabolism and improves antioxidant status in hypercholesteremic rats. Evid. Based Complement. Alternat Med., **6**(2):219-26.

Vimala, G. and Shoba, F.G. (2014). A review on antiulcer activity of few Indian medicinal plants. Int. J. Microbiol., **14**:1-14.

Wada, K.; Kamisaki, Y.; Kitano, M.; Kishimoto, Y.; Nakamoto, K. and Itoh, T. (1996). A new gastric ulcer model induced by ischemia-reperfusion in the rat: role of leukocytes on ulceration in rat stomach. Life Sci., **59**(19):295-301.

Wang, H.; Du, Y.J. and Song, H.C. (2010). α-Glucosidase and α-amylase inhibitory activities of guava leaves. Food Chem., **123**:6-13.

Wang, L.; Wu, Y.; Bei, Q.; Shi, K. and Wu, Z. (2017). Fingerprint profiles of flavonoid compounds from different *Psidium guajava* leaves and their antioxidant activities. J. Sep. Sci., **40**:3817-3829.

Yuh-Chiang, S.; Chi-Wen, J.; Che-San, L.; Chien-Chih, C. and Chia-Lin, C. (2017). Neuroprotective effect of *Terminalia chebula* extracts and ellagic acid In Pc12 Cells. Afr. J. Tradit. Complement. Altern. Med., **14**(4): 22-30.

Zhang, Y.M.; Zhang, Z.Y. and Wang, R.X. (2020). Protective mechanisms of quercetin against myocardial ischemia reperfusion Injury. Front. Physiol., **11**:(956):1-12.

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