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Flavonoid-Rich Herbal Plants: Promising Candidates for Peptic Ulcer Therapy - A Comprehensive Review"

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ABSTRACT

Peptic ulcer disease is a significant health concern worldwide, makes compulsion for the exploration of other therapeutic options. Herbal plants which is rich in flavonoids have gained attention for their potential in peptic ulcer therapy due to their antioxidant, anti-inflammatory, and gastroprotective activities. Even though the availability of conventional intrventions such as proton pump inhibitors (PPIs), H2 receptor antagonists, and antibiotic regimens, these treatments are often accompanied by side effects and the potential for having potential drug resistance. Therefore, there is a growing demand for safer and more efficacious treatment alternatives.This short review examines the therapeutic potential of various flavonoid-rich herbal plants in the treatment of peptic ulcers. Through scientific literature, this review highlighted the pharmacological actions, mechanisms of action, and clinical evidence supporting the effectiveness of these herbal remedies. Flavonoid-rich herbal plants have emerged as promising candidates for peptic ulcer therapy due to their diverse biological activities, including anti-inflammatory, antioxidant, and antimicrobial properties. Key flavonoid-rich plants, including Meadowsweet (Filipendulaulmaria), Ginger (Zingiberofficinale), and Chamomile Matricariachamomilla and other plants are discussed in detail. Also the review explores the safety profiles and potential side effects associated with the use of these herbal plants. Overall, this review article try to provide important and valuable insights into the role of flavonoid-rich herbal plants as promising candidates for peptic ulcer therapy, underscoring the need for further research and clinical trials to elucidate their full therapeutic potential and ensure safe and effective integration into clinical practice.

Keywords: Flavonoids, Herbal plants, Peptic ulcer disease, Antioxidant

Introduction

Peptic ulcer disease is one of the most common gastrointestinal problems. It can be defined as a defect that develops in the mucosa of the gastrointestinal tract, which is filled with acid and pepsin. It is a well-known form of gastric ulcer, which affects approximately 10% of the population worldwide . Gastroesophageal disorders and ulcer are of particular importance: they are diagnosed at more than 4 million cases in the United States every year, with a new case occurring in another 350,000. A peptic ulcer is thought to be caused by an imbalance between aggressive stomach factors and protective mucosal factors. All of these sy autoimmune uelocnt adrenal, ulcers are formed in either the esophagus, in the stomach or duodenum. The intricate nature of gastroduodenal ulcer development is explained by an increased pepsinogen secretory capacity and various protective mechanisms of mucosal production.

Herbal plants have been used in the ancient and traditional medicine systems because of their various medicinal and pharmacological effects. Several extracts such as methanolic and ethanolic extracts have been drawing attention due to their high therapeutic effects on the treatment of several diseases and conditions including peptic ulcer disease. Most of the extracts are rich in a large number of bioactive compounds which have ulcerogenic, antiulcerogenic effects and gastric secretion inhibition properties Thus, these extracts can be the alternative management of PUD among patients (Kumadoh et al., 2021).

This review try to provide a comprehensive and wide range analysis of herbal plants which is used in the treatment of peptic ulcers disease, focusing particularly on extracts obtained using methanol and ethanol solvents. By investigating the pharmacological value of these extracts, we aspire aand try to elucidate their potential as an alternative or adjunctive treatment for peptic ulcer disease.

During this review, we will explore and survey of the traditional uses of herbal plants in PUD treatment as well as previous scientific evidence supporting their therapeutic potential. Furthermore, we will discuss about the mechanisms of action of herbal plant considering the anti-ulcerogenic effects of methanolic and ethanolic extracts and their pharmacological activities. Through this analysis report, we try to contribute to the growing body of understanding surrounding herbal remedies for peptic ulcers and provide the way for future research in this field.

Pathophysiology of Peptic ulcer

The exact mechanisms underlying the development of peptic ulcers result from the development of an imbalance between increased acid and pepsin secretion and decreased mucosal defense mechanisms and are affected by the use of NSAIDs and steroids, smoking, emotional stress, and genetic predisposition. Precisely how these factors generate ulcers is unclear. NSAIDs could weaken mucosal defense, while emotional stress could lower acid secretion or defense. Genetic factors are also involved in the development of ulcers. Some human or animal studies have shown the presence of a variety of endogenous substances suspected to be involved in ulcer development: lipid metabolites, neuropeptides, biogenic amines, Helicobacter pylori, and reactive free radicals. The prevention mechanism is important for the development of therapeutic agents. Severe ulcers and erosion may lead to life-threatening gastrointestinal secondary events such as hemorrhage or perforation; hence, mucosal defense remains essential.

Drug-induced ulcers are more common in the stomach region with duodenal ulcers being predominant in the Western population, particularly among males. In the healing of ulcers, antisecretory medicines are known to play a beneficial role but it is not clearly understood their influence relative to prostaglandins and gastric mucosal blood flow. Treatment of ulcer is targetted towards minimizing aggressive factors while enhancing mucosal defense. This can be attainable through the use of H2 receptor antagonists, proton pump inhibitors, and mucosal protectants among other drugs (Soll, 1990).

1.3 Herbal plants for peptic ulcer

Glycyrrhiza glabra

Family: Fabaceae (Leguminosae)

Synonyms: Glycyrrhiza glabra is commonly known as licorice or liquorice. It may also be referred to by the following synonyms:

- Glycyrrhiza officinalis
- Glycyrrhizaglandulifera
- Glycyrrhizahirsuta
- Glycyrrhiza violacea
- Glycyrrhiza glabra var. typical

Chemical Constituents:

Flavonoids: Liquiritin, liquiritigenin, isoliquiritigenin, glabridin, and glabrene are some of the flavonoids found in licorice (Fukai et al., 2002).

Glycyrrhizin: A triterpene glycoside responsible for licorice's characteristic sweet taste.

Glycyrrhetinic acid: Formed from glycyrrhizin through hydrolysis, exhibiting various pharmacological activities.

Morphology:

Licorice is a perennial herbaceous plant belonging to the Fabaceae family.

It has pinnate leaves, small violet to pale blue flowers, and a thick, woody rhizome.

Pharmacological Activity:

Anti-inflammatory: Licorice extracts possess significant anti-inflammatory properties, which can help alleviate inflammation associated with peptic ulcers.

Antioxidant: Flavonoids in licorice exhibit antioxidant activity, protecting the gastric mucosa from oxidative damage.

Cytoprotective: Licorice extracts have been shown to enhance mucosal defense mechanisms, reducing the risk of ulcer formation.

Anti-Helicobacter pylori activity: Licorice compounds may inhibit the growth of Helicobacter pylori, a bacterium implicated in peptic ulcer disease.

Prostaglandin modulation: Glycyrrhetinic acid may enhance prostaglandin synthesis, promoting gastric mucosal integrity and ulcer healing (Asl & Hosseinzadeh, 2008).

Mechanism of Action:

Flavonoids: Flavonoids present in licorice exert anti-inflammatory and antioxidant effects by modulating various signaling pathways involved in inflammation and oxidative stress.

Glycyrrhizin/Glycyrrhetinic acid: These compounds inhibit 11β-hydroxysteroid dehydrogenase type 2 enzyme, thereby increasing cortisol levels, which can enhance gastric mucosal defense mechanisms. Glycyrrhetinic acid also inhibits the activity of cyclooxygenase, reducing prostaglandin synthesis and inflammation.

Hypericum perforatum

Family: Hypericaceae

Synonyms: Hypericum perforatum is commonly known as St. John's Wort. It might also be referred by the following synonyms:Hypericumofficinale

Hypericumcalycinum

Hypericum vulgare

Hypericumquadripetalum

Hypericumchamaecistos

Hypericumamoenum

These synonyms are based on the taxonomic revisions and regional differences in nomenclature.

Chemical Constituents: St. John's Wort consists of various chemical constituents, such as:

Flavonoids: Hypericin, hyperforin, rutin, quercetin and kaempferol.

Hypericins: Naphthodianthrones, including pseudohypericin and hypericin.

Hyperforin: It is a phloroglucinol derivative.

Hypericin and hyperforin both of them are particularly remarkable for their pharmacological activities .

Morphology: St. John's Wort is a evergreen herb with yellow flowers, stalkless leaves that are dotted with translucent glands containing hypericin. It has a woody stem which can grow up to one meter in height.

Pharmacological Activity:

Anti-inflammatory: This plant possesses anti-inflammatory properties that may help in reducing the inflammation associated with peptic ulcers.

Antioxidant: Flavonoids in this plant exhibit antioxidant activity, which are able to protect the gastric mucosa from various oxidative stress.

Antimicrobial: This plant extract have shown antimicrobial activity against various pathogens and microorganisms, including Helicobacter pylori which is associated with peptic ulcer disease (PUD).

Wound healing: This plant extract have been prove to promote wound healing, which can be beneficial in ulcer recovery (Schempp, Pelz, Wittmer, Schöpf, & Simon, 1999).

Mechanism of Action: The mechanism of action of St. John's Wort in curing peptic ulcer disease is not fully understood by the researchers. However, its pharmacological activities including anti-inflammatory, antioxidant, antimicrobial, and wound-healing properties together known to contribute to its therapeutic and effects (Yildirim, Yunusoğlu, & Berkoz, 2017).

Chamomile (Matricariachamomilla):

Family: Asteraceae (Compositae)

Synonyms:

Matricariarecutita,

Chamomilla recutita

Chemical Constituents: Chamomile herb contains various flavonoids such as apigenin, quercetin, and luteolin, as well as some other compounds like chamazulene and bisabolol.

Morphology: Chamomile is an perennial plant with daisy-like flowers and feathery leaves.

Pharmacological Activity: It exhibits properties like anti-inflammatory, antioxidant, and spasmolytic properties. It helps to improve wound healing and also has been used traditionally for gastrointestinal conditions (McKay & Blumberg, 2006).

Mechanism of Action: Chamomile's anti-inflammatory and spasmolytic effects may help alleviate symptoms of peptic ulcers by reducing inflammation and relaxing smooth muscles in the gastrointestinal tract (Srivastava, Shankar, & Gupta, 2010).

Ginger (Zingiber officinale):

Family: Zingiberaceae
Synonyms: None commonly used
Chemical Constituents: Ginger contains bioactive compounds such as gingerol, shogaol, and paradol, as well as flavonoids like quercetin and kaempferol.
Morphology: Ginger is a flowering plant with green-purple flowers and aromatic rhizomes.
Pharmacological Activity: Ginger possesses anti-inflammatory, antioxidant, and anti-ulcer properties. It also stimulates gastric mucus secretion and exhibits gastroprotective effects.
Mechanism of Action: Ginger's anti-inflammatory and antioxidative effects because it has the ability to increase gastric mucus secretion, may contribute to its efficacy in treating peptic ulcers (Ali, Blunden, Tanira, & Nemmar, 2008; Hu et al., 2011).

Aloe vera:

Aloe vera has been extensively used in various cultures for centuries. In traditional Indian medicine, it's employed for conditions like constipation, skin issues, and infections. Trinidad and Tobago and Mexican American cultures use it for hypertension and type 2 diabetes respectively. Chinese medicine often prescribes it for fungal diseases. In the Western world, it's widely utilized in cosmetics, pharmaceuticals, and food. While it's claimed to treat various ailments, clinical trials mainly focus on skin conditions, wound healing, constipation, diabetes, and gastrointestinal issues.
Family: Asphodelaceae (formerly Liliaceae)
Synonyms: Aloe barbadensis
Chemical Constituents: Aloe vera contains various bioactive compounds including polysaccharides, anthraquinones (such as aloin and aloe-emodin), and flavonoids (such as quercetin and kaempferol).
Morphology: Aloe vera is a succulent plant with thick, fleshy leaves that contain a gel-like substance.
Pharmacological Activity: Aloe vera exhibits anti-inflammatory, antioxidant, and wound-healing properties. It also promotes tissue repair and has been used traditionally for gastrointestinal conditions.
Mechanism of Action: Aloe vera's anti-inflammatory and wound-healing effects may contribute to its potential efficacy in treating peptic ulcers (Foster, Hunter, & Samman, 2011; Surjushe, Vasani, & Saple, 2008).

Turmeric (Curcuma longa):

Turmeric, a plant used for thousands of years in Southeast Asia, is not only a spice but also part of religious ceremonies. Modern medicine recognizes its significance, evident in over 3000 recent publications. This review covers its medicinal effects from lab studies to human trials, addressing safety and efficacy.
Family: Zingiberaceae
Chemical Constituents: Turmeric contains
Curcuminoids
Curcumin
Turmerone
Gingerol.
Morphology: Turmeric is an evergreen herb having aromatic rhizomes and trumpet-shaped yellow flowers.
Pharmacological Activity: Turmeric exhibits anti-inflammatory, antioxidant, and gastroprotective activities. It helps to promotes wound healing and has been used traditionally for gastrointestinal problems.
Mechanism of Action: In curcumin primary bioactive compound found is turmeric which exerts anti-inflammatory effects by inhibiting various inflammatory mediators and pathways. It also increase gastric mucosal defense mechanisms and may help in ulcer healing process (Hewlings & Kalman, 2017; Prasad & Aggarwal, 2011).

Cabbage

Cabbage, a vegetable widely consumed by many, has been known for its medicinal value because of the presence of flavonoids and anthocyanins, which contribute to its antioxidant and anti-inflammatory properties. This particular study focused on investigating how cabbage can alleviate inflammation in mice with contact dermatitis (CD). The results revealed that applying cabbage extract topically reduced swelling in the ears, redness, and the infiltration of immune cells. Additionally, it led to a decrease in levels of inflammatory cytokines without impacting the mice's body weight or spleen/body weight ratio. These findings hint at cabbage's potential as a remedy for skin inflammation by suppressing Th1 immune responses.

In the realm of ancient and widely grown vegetation, Brassica oleracea has a rich history of being used in culinary dishes and traditional medicine since time immemorial. It has gained prominence for its wide array of healing attributes such as alleviating constipation, countering mushroom poisoning, easing hangovers, relieving headaches, treating sunstroke, combating fevers, reducing swollen feet, and addressing childhood croup. The plant's anti-inflammatory properties have been acknowledged for a considerable period and are linked to various phytochemicals like glucosinolates, polyphenols, and vitamins. These components not only contribute to its anti-cancer and antioxidant characteristics but are also substantiated by scientific research and pharmaceutical trials.(Ștefan & Ona, 2020)

Family: Brassicaceae (formerly Cruciferae)
Synonyms: None commonly used
Chemical Constituents: Cabbage contains various phytochemicals including flavonoids (such as quercetin and kaempferol), glucosinolates, and vitamin C.
Morphology: Cabbage is a leafy vegetable with a dense head of leaves formed by layers.
Pharmacological Activity: Cabbage exhibits anti-inflammatory, antioxidant, and gastroprotective properties. It also contains vitamin U (S-methylmethionine), which has been studied for its potential role in ulcer healing.
Mechanism of Action: The exact mechanism of cabbage in treating peptic ulcers is not fully understood, but its anti-inflammatory and antioxidative properties may contribute to its potential therapeutic effects (Lee et al., 2018).

Fenugreek (Trigonellafoenum-graecum):-

Fenugreek, a herb commonly used in Asian cuisine and traditional medicine for diabetes, shows acute benefits in lowering postprandial glucose levels, but its long-term impact on glycemia is uncertain. We conducted a systematic review of clinical trials assessing fenugreek's effect on glucose homeostasis markers. Results from 10 trials revealed significant reductions in fasting blood glucose, 2-hour postload glucose, and HbA1c levels compared to control interventions. However, heterogeneity in results was observed, partly explained by diabetes status and dosage. Despite promising findings, further high-quality trials are needed for conclusive evidence on fenugreek's efficacy in glycemic control for individuals with diabetes (Neelakantan, Narayanan, de Souza, & van Dam, 2014).
Family: Fabaceae (Leguminosae)
Chemical Constituents: Fenugreek seeds contain flavonoids
Vitexin
Apigenin
Alkaloids, saponins, and fiberS.
Morphology: Fenugreek is an annual herb with trifoliate leaves and white flowers that develop into pods containing seeds.
Pharmacological Activity: Fenugreek exhibits anti-inflammatory, antioxidant, and gastroprotective properties. It also enhances gastric mucosal defense mechanisms and has been used traditionally for gastrointestinal disorders.
Mechanism of Action: Fenugreek's anti-inflammatory and antioxidative effects, along with its ability to enhance gastric mucosal defense mechanisms, may contribute to its potential efficacy in treating peptic ulcers (Hannan et al., 2007).

Marshmallow (Althaea officinalis):

The medicinal plant marshmallow, known for its cough-treating properties, forms a protective layer on inflamed mucosa, aiding faster regeneration and defense against environmental damage. This study explores marshmallow's effects on inflammatory and oxidative stress in defensive macrophages, crucial for mucosal defense. Results show that marshmallow extracts increase macrophage viability, protect against oxidative damage, and inhibit inflammation, akin to diclofenac. They also enhance macrophage migration. These findings suggest marshmallow's potential in treating inflamed mucosal membranes and cough (Bonaterra et al., 2020). The study by (Banaee, Soleimany, & Nematdoost Haghi, 2017) examined marshmallow extract's safety as a natural remedy for sick carp. Fish given varying doses of the extract showed changes in enzyme levels and other markers. Lower doses improved certain health indicators and protected fish from sickness caused by Aeromonashydrophila. The findings suggest that moderate doses of marshmallow extract could be beneficial for fish health.
Family: Malvaceae
Synonyms:
Althaea rosea,
Althaeahirsuta
Chemical Constituents: Marshmallow root contains mucilage, flavonoids (such as quercetin and kaempferol), and polysaccharides.
Morphology: Marshmallow is a perennial herb with pink flowers and velvety leaves.
Pharmacological Activity: Marshmallow exhibits demulcent, anti-inflammatory, and gastroprotective properties. It forms a protective layer over the gastric mucosa, soothing irritation and promoting healing.

Mechanism of Action: Marshmallow's mucilage content forms a soothing barrier over the gastric mucosa, protecting it from excess acidity and irritation. Its anti-inflammatory effects may also contribute to ulcer healing **(Blumenthal & Busse, 1999)**.

Meadowsweet (Filipendulaulmaria):

Family: Rosaceae
Synonyms: Spiraea ulmaria
Chemical Constituents: Meadowsweet contains salicylates (such as salicylic acid and its derivatives), flavonoids, and tannins.
Morphology: Meadowsweet is a perennial herb with creamy-white flowers and fern-like leaves.
Pharmacological Activity: Meadowsweet exhibits anti-inflammatory, analgesic, and gastroprotective properties. It contains salicylates, which are precursors to aspirin and have been used traditionally for pain relief and to alleviate gastrointestinal discomfort.
Mechanism of Action: Meadowsweet's salicylate content may contribute to its anti-inflammatory and analgesic effects, while its mucilage and flavonoids may help protect the gastric mucosa and promote ulcer healing
One study involved the medicinal properties of Meadowsweet (Filipendulaulmaria) and Dropwort (Filipendula vulgaris) as traditionally employed in folk medicine. This investigation firsly focused on assessing the antioxidant, anti-inflammatory, and gastroprotective effects. From experimentation, it was found that lyophilized flower infusions and isolated flavonoids from these herbal plants showed significant antioxidant and anti-inflammatory activities. Furthermore, in animal models, these compounds exhibited promising gastroprotective potential, hinting at their efficacy in treating gastric injury induced by ethanol. These results not onlyvalidate the traditional uses of Meadowsweet and Dropwort but also shed light on the role of flavonoid and tannin components in their pharmacological activities.(Samardžić et al., 2018).

1.3 Conclusion

In conclusion, this brief review shows the promising potential of flavonoid-rich herbal plants in the management and treatment of peptic ulcer disease. Through their antioxidant, anti-inflammatory, and gastroprotective properties and other herbal remedies offers a promising path for therapeutic involvement. Key plants such as Meadowsweet (Filipendulaulmaria), Ginger (Zingiber officinale), and Chamomile (Matricariachamomilla) have shown good efficacy in preclinical and clinical studies. However, further research and clinical trials are required to elucidate their full therapeutic potential, optimize dosage regimens for the herbal plant, and ensure their safety profile and efficacy in clinical practice. Overall, flavonoids rich herbal plants hold great promise as alternative therapies and treatment for peptic ulcer disease, offering a natural and holistic approach to improving patient disease outcomes.

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References

1. Ali, B. H., Blunden, G., Tanira, M. O., & Nemmar, A. (2008). Some phytochemical, pharmacological and toxicological properties of ginger (Zingiber officinale Roscoe): a review of recent research. *Food Chem Toxicol, 46*(2), 409-420. doi:10.1016/j.fct.2007.09.085
2. Asl, M. N., & Hosseinzadeh, H. (2008). Review of pharmacological effects of Glycyrrhiza sp. and its bioactive compounds. *Phytother Res, 22*(6), 709-724. doi:10.1002/ptr.2362
3. Banaee, M., Soleimany, V., & Nematdoost Haghi, B. (2017). Therapeutic effects of marshmallow (Althaea officinalis L.) extract on plasma biochemical parameters of common carp infected with Aeromonas hydrophila. *Vet Res Forum, 8*(2), 145-153.
4. Blumenthal, M., & Busse, W. R. (1999). The Complete German Commission E Monographs, therapeutic guide to herbal medicines. *(No Title)*.
5. Bonaterra, G. A., Bronischewski, K., Hunold, P., Schwarzbach, H., Heinrich, E.-U., Fink, C., . . . Kinscherf, R. (2020). Anti-inflammatory and Anti-oxidative Effects of Phytohustil® and Root Extract of Althaea officinalis L. on Macrophages in vitro. *Frontiers in pharmacology, 11*, 290.
6. Foster, M., Hunter, D., & Samman, S. (2011). Evaluation of the Nutritional and Metabolic Effects of Aloe vera. In I. F. F. Benzie & S. Wachtel-Galor (Eds.), *Herbal Medicine: Biomolecular and Clinical Aspects*. Boca Raton (FL): CRC Press/Taylor & Francis
7. Copyright © 2011 by Taylor and Francis Group, LLC.
8. Fukai, T., Marumo, A., Kaitou, K., Kanda, T., Terada, S., & Nomura, T. (2002). Antimicrobial activity of licorice flavonoids against methicillin-resistant Staphylococcus aureus. *Fitoterapia, 73*(6), 536-539. doi:10.1016/s0367-326x(02)00168-5
9. Hannan, J., Ali, L., Begum, R., Khaleque, J., Akhter, M., Flatt Dsc, P., & Abdel-Wahab, Y. (2007). Soluble dietary fibre fraction of

Trigonella foenum-graecum (fenugreek) seed improves glucose homeostasis in animal models of type 1 and type 2 diabetes by delaying carbohydrate digestion and absorption, and enhancing insulin action. *The British journal of nutrition, 97*, 514-521. doi:10.1017/S0007114507657869

10. Hewlings, S. J., & Kalman, D. S. (2017). Curcumin: A Review of Its Effects on Human Health. *Foods, 6*(10). doi:10.3390/foods6100092
11. Hu, M. L., Rayner, C. K., Wu, K. L., Chuah, S. K., Tai, W. C., Chou, Y. P., . . . Hu, T. H. (2011). Effect of ginger on gastric motility and symptoms of functional dyspepsia. *World J Gastroenterol, 17*(1), 105-110. doi:10.3748/wjg.v17.i1.105
12. Kumadoh, D., Archer, M. A., Yeboah, G. N., Kyene, M. O., Boakye-Yiadom, M., Adi-Dako, O., . . . Mintah, S. O. (2021). A review on anti-peptic ulcer activities of medicinal plants used in the formulation of Enterica, Dyspepsia and NPK 500 capsules. *Heliyon, 7*(12), e08465. doi:10.1016/j.heliyon.2021.e08465
13. Lee, Y., Kim, S., Yang, B., Lim, C., Kim, J. H., Kim, H., & Cho, S. (2018). Anti-inflammatory Effects of Brassica oleracea Var. capitata L. (Cabbage) Methanol Extract in Mice with Contact Dermatitis. *Pharmacogn Mag, 14*(54), 174-179. doi:10.4103/pm.pm_152_17
14. McKay, D. L., & Blumberg, J. B. (2006). A review of the bioactivity and potential health benefits of chamomile tea (Matricaria recutita L.). *Phytother Res, 20*(7), 519-530. doi:10.1002/ptr.1900
15. Neelakantan, N., Narayanan, M., de Souza, R. J., & van Dam, R. M. (2014). Effect of fenugreek (Trigonella foenum-graecum L.) intake on glycemia: a meta-analysis of clinical trials. *Nutr J, 13*, 7. doi:10.1186/1475-2891-13-7
16. Prasad, S., & Aggarwal, B. B. (2011). Turmeric, the Golden Spice: From Traditional Medicine to Modern Medicine. In I. F. F. Benzie & S. Wachtel-Galor (Eds.), *Herbal Medicine: Biomolecular and Clinical Aspects*. Boca Raton (FL): CRC Press/Taylor & Francis
17. Copyright © 2011 by Taylor and Francis Group, LLC.
18. Samardžić, S., Arsenijević, J., Božić, D., Milenković, M., Tešević, V., & Maksimović, Z. (2018). Antioxidant, anti-inflammatory and gastroprotective activity of Filipendula ulmaria (L.) Maxim. and Filipendula vulgaris Moench. *Journal of Ethnopharmacology, 213*, 132-137. doi:https://doi.org/10.1016/j.jep.2017.11.013
19. Schempp, C. M., Pelz, K., Wittmer, A., Schöpf, E., & Simon, J. C. (1999). Antibacterial activity of hyperforin from St John's wort, against multiresistant Staphylococcus aureus and gram-positive bacteria. *Lancet, 353*(9170), 2129. doi:10.1016/s0140-6736(99)00214-7
20. Soll, A. H. (1990). Pathogenesis of peptic ulcer and implications for therapy. *New England Journal of Medicine, 322*(13), 909-916.
21. Srivastava, J. K., Shankar, E., & Gupta, S. (2010). Chamomile: A herbal medicine of the past with bright future. *Mol Med Rep, 3*(6), 895-901. doi:10.3892/mmr.2010.377
22. Ștefan, I., & Ona, A. (2020). Cabbage (Brassica oleracea L.). Overview of the Health Benefits and Therapeutical Uses.
23. Surjushe, A., Vasani, R., & Saple, D. G. (2008). Aloe vera: a short review. *Indian J Dermatol, 53*(4), 163-166. doi:10.4103/0019-5154.44785
24. Yildirim, M., Yunusoğlu, O., & Berkoz, M. (2017). Investigation of the effect of hyperforin and hypericin on inflammatory response in RAW 264.7 macrophages. *Van Medical Journal, 25*. doi:10.5505/vtd.2018.07769