Vol. 5 No. 2 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387

Print ISSN 3007-2379

Herbal Medicine in Gut Health, Ulcerative Conditions, and Liver Disorders: An Integrative Review

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Key Words:
Lower Back Pain, Occupational Health, Operating Room Staff, Ergonomics, Musculoskeletal Disorders

Received on 13 July, 2024
Accepted on Aug 2025
Published on 11 Aug 2025

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Abstract

Gut health has emerged as a central determinant of overall well-being, influencing immunity, metabolism, and systemic disease risk. Parallel to this, liver health remains a critical concern, particularly in regions with high prevalence of metabolic disorders and infectious diseases. Herbal medicine, rooted in traditional systems such as Unani and Ayurveda, is increasingly supported by modern scientific evidence for its role in managing digestive and hepatic disorders. This review explores the mechanisms, clinical evidence, and practical applications of herbal interventions in gut health, ulcerative conditions, and liver diseases.

Keywords Gut Health, Herbal Medicine, Liver Health, Ulcerative Conditions, Microbiome, Unani Medicine, Integrative Health

INTRODUCTION

The global burden of gastrointestinal and hepatobiliary disorders continues to rise, encompassing a wide spectrum of conditions such as functional gut disorders, inflammatory bowel diseases, peptic ulcer disease, and chronic liver pathologies(Zheng et al., 2025). These conditions significantly impair quality of life and contribute to substantial healthcare costs worldwide. Despite advances in pharmacotherapy, the limitations of conventional treatmentsincluding adverse effects, antimicrobial resistance, recurrence, and incomplete symptom resolutionhave prompted growing interest in complementary and integrative approaches to disease management(AlaouiMdarhri et al., 2022).

Herbal medicine, rooted in traditional systems such as Unani, Ayurveda, and Traditional Chinese Medicine, has been used for centuries in the prevention and treatment of digestive and liver disorders(Ülger, 2025). In recent years, there has been a resurgence of scientific interest in plant-based therapies, driven by increasing evidence supporting their pharmacological properties, including anti-inflammatory, antioxidant, antimicrobial, hepatoprotective, and mucosal healing effects. Bioactive compounds such as flavonoids, alkaloids, tannins, terpenoids, and polyphenols are recognized for their therapeutic potential in modulating key pathological pathways involved in gut and liver diseases(Hu et al., 2023).

The human gastrointestinal system is intricately linked with the gut microbiota, immune responses, and metabolic processes(Jyoti&Dey, 2025). Dysbiosis, oxidative stress, and chronic inflammation are central mechanisms underlying many gastrointestinal disorders, including irritable bowel syndrome and inflammatory bowel diseases such as ulcerative colitis(Li et al., 2023). Herbal medicines have demonstrated the ability to restore microbial balance, enhance mucosal barrier function, and regulate immune responses. For example, several plant extracts have shown prebiotic-like effects, promoting beneficial microbial populations while inhibiting pathogenic organisms(M. Wang et al., 2024).

Ulcerative conditions, particularly peptic ulcers and ulcerative colitis, represent a significant clinical challenge due to their chronic and relapsing nature(Gros& Kaplan, 2023). Conventional therapies, including proton pump inhibitors, corticosteroids, and immunosuppressants, are effective but often associated with long-term adverse effects(Maideen, 2023). Herbal remedies offer a promising adjunct or alternative by exerting gastroprotective effects through mechanisms such as increased mucus production, inhibition of gastric acid secretion, enhancement of epithelial regeneration, and suppression of inflammatory mediators(Singh et al., 2024).

The liver's central role in metabolism and detoxification makes it particularly susceptible to oxidative damage and inflammation(Díaz et al., 2023). A variety of medicinal plants have demonstrated hepatoprotective properties by enhancing antioxidant defenses, stabilizing hepatocyte membranes, modulating lipid metabolism, and promoting liver regeneration(Gonfa et al., 2025; Thilagavathi et al., 2023).

An integrative approach that combines conventional medical therapies with evidence-based herbal medicine may offer a more holistic and patient-centered model of care. Such an approach aligns with the growing emphasis on personalized medicine, preventive healthcare, and the use of natural, accessible remedies(Desideri et al., 2024). However, despite promising evidence, challenges remain regarding standardization,

quality control, safety, herb–drug interactions, and the need for robust clinical trials to validate efficacy and establish clinical guidelines(Kruizinga et al., 2020).

This review aims to critically examine the current evidence on the role of herbal medicine in gut health, ulcerative conditions, and liver disorders. It explores the pharmacological mechanisms, clinical efficacy, and safety profiles of commonly used medicinal plants, while highlighting gaps in research and future directions for integrative therapeutic strategies. By bridging traditional knowledge with modern scientific evidence, this paper seeks to contribute to the development of safe, effective, and sustainable approaches to managing gastrointestinal and hepatic diseases.

2. Mechanisms of Herbal Action in Gut and Liver Health

Herbal medicines exert therapeutic effects through a complex interplay of biochemical and molecular pathways. Unlike single-target pharmaceutical agents, phytochemicals often act synergistically, influencing multiple physiological systems simultaneously. These mechanisms are particularly relevant in gastrointestinal and hepatic disorders, where inflammation, oxidative stress, microbial imbalance, and impaired barrier function play central roles(Cai et al., 2024).

2.1. Modulation of Gut Microbiota

The gut microbiota is a key regulator of digestive health, immune function, and metabolic homeostasis. Phytochemicalsparticularly polyphenols, flavonoids, and dietary fibers exhibit prebiotic-like properties by selectively promoting the growth of beneficial microorganisms such as *Lactobacillus* and *Bifidobacterium* species, while inhibiting pathogenic bacteria. These compounds are often metabolized by gut microbes into bioactive metabolites, such as short-chain fatty acids (SCFAs), which contribute to colonic health, reduce inflammation, and enhance epithelial integrity. This bidirectional interaction between herbal compounds and microbiota highlights their role in restoring microbial balance (eubiosis) in conditions such as irritable bowel syndrome and inflammatory bowel disease(Cronin et al., 2021; Simpson et al., 2023; J. Xu et al., 2017; L.-R. Zhu et al., 2023).

2.2. Anti-inflammatory Effects

Chronic inflammation is a hallmark of many gastrointestinal and liver disorders. Herbal medicines contain a wide array of bioactive compounds, including curcuminoids, catechins, and terpenoids, which modulate inflammatory pathways at the molecular level. These compounds inhibit the production of pro-inflammatory cytokines such as tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), and interleukin-1β (IL-1β), primarily through the downregulation of key signaling pathways such as nuclear factor kappa B (NF-κB) and mitogen-activated protein kinases (MAPKs). By attenuating these

pathways, herbal agents help reduce mucosal inflammation and tissue damage in disorders such as ulcerative colitis and hepatitis(Hongzhi et al., 2022).

2.3. Enhancement of Gut Barrier Function

The integrity of the intestinal barrier is critical for preventing the translocation of toxins, pathogens, and antigens into systemic circulation. Disruption of tight junction proteinssuch as occludin, claudins, and zonula occludens-1 (ZO-1)leads to increased intestinal permeability, commonly referred to as "leaky gut." Certain herbal compounds have been shown to enhance the expression and function of these tight junction proteins, thereby strengthening epithelial barrier integrity. Additionally, mucilaginous herbs may promote mucus production, providing an additional protective layer over the intestinal lining. This mechanism is particularly beneficial in inflammatory bowel diseases and other conditions associated with barrier dysfunction(Yang et al., 2021; Zhou et al., 2024).

2.4. Regulation of Digestive Function

Herbal medicines play a significant role in optimizing digestive processes. Bitter herbs, for instance, stimulate the secretion of saliva, gastric acid, bile, and digestive enzymes, thereby enhancing nutrient breakdown and absorption. Carminative and antispasmodic herbs help regulate gastrointestinal motility and alleviate symptoms such as bloating, flatulence, and abdominal cramps. These effects are mediated through interactions with enteric nervous system receptors, smooth muscle modulation, and regulation of gastrointestinal hormones. As a result, herbal therapies are widely used in functional gastrointestinal disorders, including dyspepsia and irritable bowel syndrome(B et al., 2023; Kmail, 2024).

2.5.Hepatoprotective Activity

The liver is highly susceptible to oxidative stress and toxic insults due to its central role in metabolism and detoxification. Herbal medicines exhibit hepatoprotective effects through multiple mechanisms, including antioxidant activity, anti-inflammatory effects, and enhancement of detoxification pathways. Phytochemicals such as flavonoids and silymarin-like compounds scavenge free radicals, reduce lipid peroxidation, and upregulate endogenous antioxidant systems, including glutathione, superoxide dismutase, and catalase. Additionally, certain herbs promote bile secretion (choleretic effect), support hepatocyte regeneration, and modulate lipid metabolism, making them beneficial in conditions such as non-alcoholic fatty liver disease, hepatitis, and drug-induced liver injury(Asadi-Samani et al., 2015).

3. Herbal Medicine in General Gut Health

Herbal medicines play a vital role in maintaining and restoring gastrointestinal health by improving digestion, regulating motility, reducing gas formation, and supporting microbial balance. Many commonly used culinary herbs possess well-documented pharmacological properties that contribute to overall gut function. Their multifaceted actions make them valuable in both preventive and therapeutic contexts, particularly for functional gastrointestinal disorders(Tan et al., 2020).

3.1. Ginger (*Zingiberofficinale*)

Zingiberofficinale is one of the most extensively studied medicinal plants for gastrointestinal health. Its bioactive constituents, including gingerols and shogaols, have been shown to enhance gastric emptying and improve gastrointestinal motility. Ginger exerts antiemetic effects through modulation of serotonin (5-HT_3) receptors in the gut and central nervous system, making it effective in managing nausea and vomiting. Additionally, it stimulates digestive enzyme activity and exhibits anti-inflammatory and antioxidant properties, which contribute to reduced bloating and improved digestive efficiency(Crichton, Marshall, Marx, Isenring, & Lohning, 2023; Crichton, Marshall, Marx, Isenring, Vázquez-Campos, et al., 2023; Đurić Jarić et al., 2025; Haniadka et al., 2013; Lai et al., 2022).

3.2. Fennel (*Foeniculumvulgare*)

Foeniculumvulgare is widely recognized for its carminative and antispasmodic effects. The essential oils, particularly anethole, help relax gastrointestinal smooth muscles, thereby alleviating intestinal spasms, bloating, and flatulence. Fennel also supports digestive processes by promoting gastric secretions and improving intestinal transit. Its mild antimicrobial activity further contributes to maintaining a balanced gut microbiota(İpçak et al., 2024; Rafieian et al., 2024; Saidani et al., 2026).

3.3. Cumin (*Cuminumcyminum*)

Cuminumcyminum is traditionally used to enhance digestive function and appetite. It stimulates the secretion of pancreatic enzymes, facilitating the breakdown of carbohydrates, proteins, and fats. Additionally, cumin promotes bile flow, which is essential for lipid digestion and absorption. Its antioxidant properties help mitigate oxidative stress within the gastrointestinal tract, while its carminative effects reduce symptoms such as abdominal discomfort and gas formation(Ahmed, 2024; Deng et al., 2023).

3.4. Cardamom (*Elettariacardamomum*)

Elettariacardamomum possesses a combination of carminative, antispasmodic, and gastroprotective properties. It aids in relieving bloating, indigestion, and abdominal discomfort by relaxing gastrointestinal smooth muscles and enhancing digestive

secretions. Cardamom has also been shown to exhibit antioxidant and anti-inflammatory activities, which may contribute to the protection of gastric mucosa against irritants and ulcerogenic factors. Its role in modulating gastric acid secretion further supports its use in functional dyspepsia(Alam et al., 2021; Sreedharan et al., 2023).

3.5. Psyllium Husk (*Plantago ovata*)

Plantago ovata, commonly known as psyllium husk, is a well-established bulk-forming laxative widely used for improving bowel regularity. It is rich in soluble fiber, which absorbs water to form a gel-like substance, facilitating stool passage and alleviating both constipation and mild diarrhea. Psyllium also exhibits prebiotic effects by promoting the growth of beneficial gut bacteria and increasing the production of short-chain fatty acids. These actions contribute to improved gut microbiota composition and overall colonic health(Kumar et al., 2026; Przybyszewska et al., 2024).

4. Herbal Medicine in Ulcerative Conditions

Ulcerative conditions of the gastrointestinal tract, including peptic ulcers and inflammatory bowel diseases such as ulcerative colitis, are characterized by mucosal inflammation, epithelial damage, and impaired healing. While conventional therapies remain the mainstay of treatment, herbal medicines have gained attention as supportive or adjunctive options due to their mucosal protective, anti-inflammatory, and regenerative properties. These agents act through multiple mechanisms, including enhancement of mucus production, inhibition of inflammatory mediators, antioxidant activity, and promotion of tissue repair(Iyengar et al., 2024).

4.1. Licorice (*Glycyrrhizaglabra*)

Glycyrrhizaglabra is widely recognized for its gastroprotective effects. Its active constituents, including glycyrrhizin and flavonoids, promote the secretion of protective mucus and enhance the integrity of the gastric mucosal barrier. Licorice also exhibits anti-inflammatory and antioxidant activities, contributing to the reduction of mucosal injury and acceleration of ulcer healing. Deglycyrrhizinated licorice (DGL) is commonly used in clinical practice to minimize the risk of adverse effects such as hypertension and hypokalemia associated with glycyrrhizin, while retaining its therapeutic benefits(ZaeifKhorasani et al., 2025).

4.2. Aloe Vera (*Aloe barbadensis Miller*)

Aloe vera has demonstrated significant anti-inflammatory and wound-healing properties, making it beneficial in the management of gastritis and mild ulcerative conditions. Its bioactive components, including polysaccharides and glycoproteins, help reduce mucosal inflammation, promote epithelial regeneration, and enhance collagen synthesis.

Additionally, aloe vera exhibits soothing effects on the gastrointestinal lining and may contribute to symptom relief in conditions such as acid reflux and ulcerative colitis. Its antioxidant activity further supports tissue repair by mitigating oxidative stress(Kaur &Bains, 2024; Mohamed et al., 2024).

4.3. Turmeric (*Curcuma longa*)

Curcuma longa, particularly its active compound curcumin, has been extensively studied for its potent anti-inflammatory and antioxidant properties. Curcumin modulates key inflammatory pathways, including nuclear factor kappa B (NF-κB), and reduces the production of pro-inflammatory cytokines such as TNF-α and interleukins. Clinical studies have shown that curcumin, when used as an adjunct to standard therapy, may improve remission rates and reduce relapse in patients with ulcerative colitis. Furthermore, it enhances mucosal healing and protects against oxidative damage in the gastrointestinal tract(Cunha Neto et al., 2019; Harsha et al., 2016; Prucksunand et al., n.d.; Rajagopal et al., 2018).

4.4. Chamomile (*Matricariachamomilla*)

Matricariachamomilla is known for its mild anti-inflammatory, antispasmodic, and anxiolytic properties. Its bioactive constituents, such as apigenin and bisabolol, contribute to the reduction of gastrointestinal inflammation and promote relaxation of smooth muscles. Chamomile is particularly useful in stress-related digestive disturbances, where psychological factors exacerbate gastrointestinal symptoms. Additionally, its soothing effects on the mucosa and ability to reduce oxidative stress support its role in managing mild ulcerative conditions and functional gastrointestinal disorders(Akram et al., 2024; El Joumaa & Borjac, 2022).

5. Herbal Medicine in Liver Health

Liver disorders, including non-alcoholic fatty liver disease (NAFLD)(Nie et al., 2025; X. Xu et al., 2025), hepatitis(X. Zhu et al., 2026), and toxin-induced liver injury(P. Wang et al., n.d., n.d.), represent a significant global health burden(Y. Xu et al., 2026). The liver's central role in metabolism, detoxification, and bile production makes it particularly vulnerable to oxidative stress, inflammation, and metabolic dysregulation. Herbal medicines have gained considerable attention for their hepatoprotective potential, owing to their antioxidant, anti-inflammatory, choleretic, and regenerative properties. These agents act through diverse mechanisms, including free radical scavenging, modulation of inflammatory pathways, enhancement of bile secretion, and support of hepatocyte repair and regeneration(Kumari et al., 2026).

5.1. Milk Thistle (*Silybummarianum*)

Silybummarianum, commonly known as milk thistle, is one of the most extensively studied herbs for liver protection. Its primary active complex, silymarin, comprises flavonolignans such as silybin, silydianin, and silychristin. Silymarin exerts potent antioxidant effects by scavenging free radicals and enhancing endogenous antioxidant defenses, including glutathione. It stabilizes hepatocyte membranes, thereby preventing toxin entry, and promotes protein synthesis, facilitating liver cell regeneration. Clinical studies have demonstrated its potential benefits in conditions such as NAFLD, alcoholic liver disease, and drug-induced hepatotoxicity(Adan Amjad et al., 2026).

5.2. Turmeric (*Curcuma longa*)

Curcuma longa plays a significant role in liver health primarily through its active compound, curcumin. Curcumin exhibits strong anti-inflammatory and antioxidant properties by modulating signaling pathways such as NF-κB and reducing pro-inflammatory cytokine production. It also enhances bile secretion (choleretic effect), aiding in fat digestion and detoxification processes. Furthermore, curcumin has been shown to improve lipid metabolism and reduce hepatic fat accumulation, making it particularly relevant in the management of NAFLD(Gao et al., 2024; Gull et al., 2023).

5.3. Dandelion (*Taraxacumofficinale*)

Taraxacumofficinale is traditionally used as a liver tonic due to its choleretic and diuretic properties. It stimulates bile production and flow, which facilitates the excretion of metabolic waste and toxins. Dandelion also contains phenolic compounds with antioxidant activity, helping to reduce oxidative stress within hepatic tissues. Additionally, it may support liver function by improving lipid metabolism and reducing inflammation, although further clinical evidence is needed to confirm its efficacy in specific liver disorders(Abdul Rasool, 2025; Herrera Vielma et al., 2025).

5.4. Artichoke (*Cynarascolymus*)

Cynarascolymus has demonstrated hepatoprotective and lipid-lowering effects, largely attributed to its active compounds such as cynarin and flavonoids. Artichoke extract enhances bile production and improves bile flow, supporting digestion and detoxification. It has also been shown to reduce liver enzyme levels (e.g., ALT and AST) and improve lipid profiles in patients with metabolic liver conditions. Its antioxidant properties further contribute to the protection of hepatocytes from oxidative damage(Kam et al., 2025; Nasef et al., 2023).

5.5. Cumin (*Cuminumcyminum*) and Fennel (*Foeniculumvulgare*)

Cuminumcyminum and *Foeniculumvulgare* indirectly support liver health by enhancing digestive efficiency and reducing gastrointestinal burden. By stimulating digestive

enzyme secretion and improving bile flow, these herbs facilitate proper nutrient metabolism and decrease the accumulation of metabolic toxins. Their carminative and antioxidant properties also help reduce oxidative stress and inflammation, which can otherwise contribute to hepatic dysfunction. Although their direct hepatoprotective effects are less pronounced compared to other herbs, their supportive role in maintaining overall digestive and metabolic health is significant(Deng et al., 2023; Rafieian et al., 2024).

6. The Gut–Liver Axis

The gut–liver axis represents a bidirectional communication system between the gastrointestinal tract and the liver, primarily mediated through the portal circulation, biliary tract, and systemic immune signaling. This close anatomical and functional relationship allows substances absorbed in the intestineincluding nutrients, microbial metabolites, and toxins to be transported directly to the liver via the portal vein.

A key feature in the pathophysiology of many gastrointestinal and hepatic disorders is increased intestinal permeability, often referred to as "leaky gut." Disruption of intestinal tight junctions permits the translocation of bacterial endotoxins, particularly lipopolysaccharides (LPS), into the portal circulation. This triggers activation of hepatic immune cells, including Kupffer cells, leading to the release of pro-inflammatory cytokines and the initiation of hepatic inflammation. Persistent exposure to such endotoxins contributes to the progression of liver diseases, including non-alcoholic fatty liver disease (NAFLD), steatohepatitis, and fibrosis(Song & Zhang, 2022).

The gut microbiota plays a central role in maintaining the integrity of the gut–liver axis. Dysbiosisan imbalance in microbial compositioncan exacerbate intestinal permeability, alter bile acid metabolism, and increase the production of harmful metabolites. These changes not only impair gut health but also place additional metabolic and inflammatory stress on the liver(Hu et al., 2023).

Herbal medicines offer a promising approach to modulating the gut–liver axis through multiple mechanisms. Certain phytochemicals enhance intestinal barrier integrity by upregulating tight junction proteins and promoting mucus production. Others exhibit prebiotic effects, fostering the growth of beneficial microbiota and restoring microbial balance. Additionally, many herbs possess anti-inflammatory and antioxidant properties that can reduce both intestinal and hepatic inflammation. By targeting these interconnected pathways, herbal interventions may simultaneously improve gut health and mitigate liver injury.

Understanding the gut–liver axis provides a valuable framework for integrative therapeutic strategies. Interventions aimed at restoring gut barrier function and

microbial balance can have downstream benefits for liver health, highlighting the importance of a holistic approach in the management of gastrointestinal and hepatic disorders(Ming et al., 2024).

7. Practical Herbal Formulations

7.1. Anti-bloating Herbal Tea

A combination of cardamom, fennel, and cumin can reduce gas and improve digestion.

7.2. Gut Soothing Drink

Aloe vera with turmeric and cardamom may support mucosal healing.

7.3. Liver Support Water

Cumin, fennel, and turmeric infused water supports digestion and liver function.

8. Safety and Limitations

Despite promising evidence, herbal medicine has limitations:

- Variability in quality and dosage
- Limited large-scale clinical trials
- Potential interactions with conventional drugs

Proper guidance and standardization are essential for safe use.

9. Conclusion

Herbal medicine offers significant potential in improving gut health, managing ulcerative conditions, and supporting liver function. Scientific evidence supports many traditional uses, although further research is needed to standardize and validate these therapies. An integrative approach combining diet, lifestyle, and herbal interventions can provide optimal health outcomes.

References

Abdul Rasool, E. M. (2025). Antioxidant Effects of Taraxacum officinale L. (Dandelion) Root Extract on Acute Liver and Kidney Injuries Induced by D-Galactosamine in Male Rats | Journal of Natural Science, Biology and Medicine. https://jnsbm.org/menuscript/index.php/submissions/article/view/412

Adan Amjad, Abida Liaquat, Rimsha Tariq, Azka Momina Irfan, Moazma Noor, Kiran Aslam, Rameesa Shahbaz, & Aiza. (2026). Antioxidant Properties and Hepatoprotective Potential of Milk Thistle (Silymarin marianum) in Chronic Hepatitis C Patients with Elevated Liver Enzymes. Journal of Health, Wellness and Community Research, e1246. https://doi.org/10.61919/v69k5v06

Ahmed, S. H. (2024). Cumin (Cuminum cyminum): Traditional Uses and Modern Scientific Aspects - A Review. South Asian Research Journal of Biology and Applied Biosciences, 6(06), 262–264. https://doi.org/10.36346/sarjbab.2024.v06i06.010

Akram, W., Ahmed, S., Rihan, M., Arora, S., Khalid, M., Ahmad, S., Ahmad, F., Haque, S., & Vashishth, R. (2024). An updated comprehensive review of the therapeutic properties of Chamomile (Matricaria chamomilla L.). International Journal of Food Properties, 27(1), 133–164. https://doi.org/10.1080/10942912.2023.2293661

Alam, A., Rehman, N. U., Ansari, M. N., & Palla, A. H. (2021). Effects of Essential Oils of Elettaria cardamomum Grown in India and Guatemala on Gram-Negative Bacteria and Gastrointestinal Disorders. Molecules, 26(9), 2546. https://doi.org/10.3390/molecules26092546

Alaoui Mdarhri, H., Benmessaoud, R., Yacoubi, H., Seffar, L., GuennouniAssimi, H., Hamam, M., Boussettine, R., Filali-Ansari, N., Lahlou, F. A., Diawara, I., Ennaji, M. M., & Kettani-Halabi, M. (2022). Alternatives Therapeutic Approaches to Conventional Antibiotics: Advantages, Limitations and Potential Application in Medicine. Antibiotics, 11(12), 1826. https://doi.org/10.3390/antibiotics11121826

Asadi-Samani, M., Kafash-Farkhad, N., Azimi, N., Fasihi, A., Alinia-Ahandani, E., &Rafieian-Kopaei, M. (2015). Medicinal plants with hepatoprotective activity in Iranian folk medicine. Asian Pacific Journal of Tropical Biomedicine, 5(2), 146–157. https://doi.org/10.1016/S2221-1691(15)30159-3

B, K., Babu, A. K., Pillay, S. M., Siang, T. C., Menon, B. V. V., Paneerselvam, G. S., Ming, L. C., Al-Worafi, Y. M., & Chooi, W. H. (2023). A Review of Herbal Treatment for Functional Gastrointestinal Disorders and Infection. Progress In Microbes & Molecular Biology, 6(1). https://doi.org/10.36877/pmmb.a0000346

Cai, T., Song, X., Xu, X., Dong, L., Liang, S., Xin, M., Huang, Y., Zhu, L., Li, T., Wang, X., Fang, Y., Xu, Z., Wang, C., Wang, M., Li, J., Zheng, Y., Sun, W., & Li, L. (2024). Effects of plant natural products on metabolic-associated fatty liver disease and the underlying mechanisms: A narrative review with a focus on the modulation of the gut microbiota. Frontiers in Cellular and Infection Microbiology, 14, 1323261. https://doi.org/10.3389/fcimb.2024.1323261

Crichton, M., Marshall, S., Marx, W., Isenring, E., &Lohning, A. (2023). Therapeutic health effects of ginger (Zingiberofficinale): Updated narrative review exploring the mechanisms of action. Nutrition Reviews, 81(9), 1213–1224. https://doi.org/10.1093/nutrit/nuac115

Crichton, M., Marshall, S., Marx, W., Isenring, E., Vázquez-Campos, X., Dawson, S. L., &Lohning, A. (2023). Effect of Ginger Root Powder on Gastrointestinal Bacteria Composition, Gastrointestinal Symptoms, Mental Health, Fatigue, and Quality of Life: A Double-Blind Placebo-Controlled Trial. The Journal of Nutrition, 153(11), 3193–3206. https://doi.org/10.1016/j.tjnut.2023.09.002

Cronin, P., Joyce, S. A., O'Toole, P. W., & O'Connor, E. M. (2021). Dietary Fibre Modulates the Gut Microbiota. Nutrients, 13(5), 1655. https://doi.org/10.3390/nu13051655

Cunha Neto, F., Marton, L. T., De Marqui, S. V., Lima, T. A., & Barbalho, S. M. (2019). Curcuminoids from Curcuma Longa: New adjuvants for the treatment of crohn's disease and ulcerative colitis? Critical Reviews in Food Science and Nutrition, 59(13), 2136–2143. https://doi.org/10.1080/10408398.2018.1456403

Deng, H., Tian, Z., Zhou, H., Zhang, Y., Chen, X., Cui, Y., Aifeire, A., Zhang, X., Wei, Z., Shen, P., Suo, F., & Huang, L. (2023). Elucidating the effects of cumin (Cuminum cyminum) fruit and stem as feed additives on growth, antioxidant capacity, liver and intestinal health, and gut microbiome of Nile tilapia (Oreochromis niloticus). Aquaculture Reports, 31, 101687. https://doi.org/10.1016/j.aqrep.2023.101687

Desideri, G., Montano, N., & Sesti, G. (2024). Patient centered care: A multidisciplinary and holistic approach. European Journal of Internal Medicine, 122, 119–120. https://doi.org/10.1016/j.ejim.2024.02.018

Díaz, L. A., Arab, J. P., Louvet, A., Bataller, R., & Arrese, M. (2023). The intersection between alcohol-related liver disease and nonalcoholic fatty liver disease. Nature Reviews Gastroenterology & Hepatology, 20(12), 764–783. https://doi.org/10.1038/s41575-023-00822-y

Đurić Jarić, M., Gottstein, Ž., Vince, S., Žura Žaja, I., Brus, M., Đuričić, D., Samardžija, M., &Valpotić, H. (2025). Effect of Standardized Ginger (Zingiber officinale Roscoe) Extract on Gut Morphology, Microbiota Composition, and Growth Performance in Broiler Chickens. Agriculture, 15(13), 1448. https://doi.org/10.3390/agriculture15131448

El Joumaa, M. M., &Borjac, J. M. (2022). Matricaria chamomilla: A valuable insight into recent advances in medicinal uses and pharmacological activities. Phytochemistry Reviews, 21(6), 1913–1940. https://doi.org/10.1007/s11101-022-09817-0

Gao, T., Wang, S., Zhu, Z., Lin, L., Luo, Y., Lu, M., & Liao, W. (2024). Components from Curcuma longa (Turmeric) Against Hepatobiliary Diseases Based on Gut–Liver Axis: Pharmacotherapeutic Properties and Potential Clinical Applications. The American Journal of Chinese Medicine, 52(02), 387–415. https://doi.org/10.1142/S0192415X24500162

Gonfa, Y. H., Bachheti, A., Semwal, P., Rai, N., Singab, A. N., &Bachheti, R. K. (2025). Hepatoprotective activity of medicinal plants, their phytochemistry, and safety concerns: A systematic review. Zeitschrift Für Naturforschung C, 80(3–4), 61–73. https://doi.org/10.1515/znc-2024-0116

Gros, B., & Kaplan, G. G. (2023). Ulcerative Colitis in Adults: A Review. JAMA, 330(10), 951. https://doi.org/10.1001/jama.2023.15389

Gull, N., Arshad, F., Naikoo, G. A., Hassan, I. U., Pedram, M. Z., Ahmad, A., Aljabali, A. A. A., Mishra, V., Satija, S., Charbe, N., Negi, P., Goyal, R., Serrano-Aroca, Á., Al Zoubi, M. S., El-Tanani, M., &Tambuwala, M. M. (2023). Recent Advances in Anticancer Activity of Novel Plant Extracts and Compounds from Curcuma longa in Hepatocellular Carcinoma. Journal of Gastrointestinal Cancer, 54(2), 368–390. https://doi.org/10.1007/s12029-022-00809-z

Haniadka, R., Saldanha, E., Sunita, V., Palatty, P. L., Fayad, R., & Baliga, M. S. (2013). A review of the gastroprotective effects of ginger (Zingiber officinale Roscoe). Food & Function, 4(6), 845. https://doi.org/10.1039/c3fo30337c

Harsha, M. R., Chandra Prakash, S. V., & Dharmesh, S. M. (2016). Modified pectic polysaccharide from turmeric (Curcumalonga): A potent dietary component against gastric ulcer. Carbohydrate Polymers, 138, 143–155. https://doi.org/10.1016/j.carbpol.2015.11.043

Herrera Vielma, F., Quiñones San Martin, M., Muñoz-Carrasco, N., Berrocal-Navarrete, F., González, D. R., & Zúñiga-Hernández, J. (2025). The Role of Dandelion (Taraxacum officinale) in Liver Health and Hepatoprotective Properties. Pharmaceuticals, 18(7), 990. https://doi.org/10.3390/ph18070990

Hongzhi, D., Xiaoying, H., Yujie, G., Le, C., Yuhuan, M., Dahui, L., &Luqi, H. (2022). Classic mechanisms and experimental models for the anti-inflammatory effect of traditional Chinese medicine. Animal Models and Experimental Medicine, 5(2), 108–119. https://doi.org/10.1002/ame2.12224

Hu, Q., Liao, W., Zhang, Z., Shi, S., Hou, S., Ji, N., Zhang, X., Zhang, Q., Liao, Y., Li, L., Zhu, Z., Chen, Y., Chen, J., Yu, F., Yang, Q., Xiao, H., Fu, C., Du, H., Wang, Q., … Li, R. (2023). The hepatoprotective effects of plant-based foods based on the "gut–liver axis": A prospective review. Critical Reviews in Food Science and Nutrition, 63(28), 9136–9162. https://doi.org/10.1080/10408398.2022.2064423

İpçak, H. H., Alçiçek, A., &Denli, M. (2024). Dietary encapsulated fennel seed (Foeniculum vulgare Mill.) essential oil supplementation improves performance, modifies the intestinal microflora, morphology, and transcriptome profile of broiler chickens. Journal of Animal Science, 102, skae035. https://doi.org/10.1093/jas/skae035

Iyengar, P., Godoy-Brewer, G., Maniyar, I., White, J., Maas, L., Parian, A. M., &Limketkai, B. (2024). Herbal Medicines for the Treatment of Active Ulcerative Colitis: A Systematic Review and Meta-Analysis. Nutrients, 16(7), 934. https://doi.org/10.3390/nu16070934

Jyoti, & Dey, P. (2025). Mechanisms and implications of the gut microbial modulation of intestinal metabolic processes. Npj Metabolic Health and Disease, 3(1), 24. https://doi.org/10.1038/s44324-025-00066-1

Kam, Ö., Bebitoğlu, B. T., Şener, G., Oğuz, E., Erdoğan, N. F., Kılıçkap, A., Ertaş, B., Şen, A., Şenkardeş, İ., Abas, B. İ., Çevik, Ö., Ercan, F., Ünlü, H., &Hatiboğlu, N. (2025). Protective effect of artichoke (Cynara scolymus L.) leaf and receptaculum extracts against hepatic encephalopathy in bile duct ligated rats. Metabolic Brain Disease, 40(7), 282. https://doi.org/10.1007/s11011-025-01701-y

Kaur, S., & Bains, K. (2024). Aloe Barbadensis Miller (Aloe Vera): Pharmacological activities and clinical evidence for disease prevention. International Journal for Vitamin and Nutrition Research, 94(3–4), 308–321. https://doi.org/10.1024/0300-9831/a000797

Kmail, A. (2024). Mitigating digestive disorders: Action mechanisms of Mediterranean herbal active compounds. Open Life Sciences, 19(1). https://doi.org/10.1515/biol-2022-0857

Kruizinga, M. D., Stuurman, F. E., Exadaktylos, V., Doll, R. J., Stephenson, D. T., Groeneveld, G. J., Driessen, G. J. A., & Cohen, A. F. (2020). Development of Novel, Value-Based, Digital Endpoints for Clinical Trials: A Structured Approach Toward Fit-for-Purpose Validation. Pharmacological Reviews, 72(4), 899–909. https://doi.org/10.1124/pr.120.000028

Kumar, A., Patel, R., Yadav, S., Prajapati, B., Sharma, S., Batta, K., Kaushik, R., Kumar, S., Dudhat, K., & Rustagi, S. (2026). Psyllium Husk: A Comprehensive Review of its Functional Properties, Health Benefits, Mechanisms of Action, and Potential Adverse Effects. Current Nutrition Reports, 15(1), 13. https://doi.org/10.1007/s13668-025-00727-z

Kumari, A., Chandila, N., Bhutani, R., & Yadav, I. (2026). Hepatoprotective Potential of Indian Medicinal Plants. Combinatorial Chemistry & High Throughput Screening, 29(3), 387–400. https://doi.org/10.2174/0113862073346295250107070310

Lai, W., Yang, S., Lin, X., Zhang, X., Huang, Y., Zhou, J., Fu, C., Li, R., & Zhang, Z. (2022). Zingiber officinale: A Systematic Review of Botany, Phytochemistry and Pharmacology of Gut Microbiota-Related Gastrointestinal Benefits. The American Journal of Chinese Medicine, 50(04), 1007–1042. https://doi.org/10.1142/S0192415X22500410

Li, L., Peng, P., Ding, N., Jia, W., Huang, C., & Tang, Y. (2023). Oxidative Stress, Inflammation, Gut Dysbiosis: What Can Polyphenols Do in Inflammatory Bowel Disease? Antioxidants, 12(4), 967. https://doi.org/10.3390/antiox12040967

Maideen, N. M. P. (2023). Adverse Effects Associated with Long-Term Use of Proton Pump Inhibitors. Chonnam Medical Journal, 59(2), 115. https://doi.org/10.4068/cmj.2023.59.2.115

Ming, Z., Ruishi, X., Linyi, X., Yonggang, Y., Haoming, L., &Xintian, L. (2024). The gut-liver axis in fatty liver disease: Role played by natural products. Frontiers in Pharmacology, 15, 1365294. https://doi.org/10.3389/fphar.2024.1365294

Mohamed, A. O., Abd-Elghaffar, S. Kh., Mousa, R. A., & Kamel, A. A. (2024). Aloe vera gel confers therapeutic effect by reducing pyroptosis in ethanol-induced gastric ulcer rat

model: Role of NLRP3/GSDMD signaling pathway. Molecular Biology Reports, 51(1), 401. https://doi.org/10.1007/s11033-024-09329-4

Nasef, M. A., Yousef, M. I., Ghareeb, D. A., Augustyniak, M., Aboul-Soud, M. A. M., & El Wakil, A. (2023). Hepatoprotective effects of a chemically-characterized extract from artichoke (Cynara scolymus L.) against AFB_1 -induced toxicity in rats. Drug and Chemical Toxicology, 46(6), 1070–1082. https://doi.org/10.1080/01480545.2022.2129672

Nie, W.-Y., Ye, Y., Tong, H.-X., & Hu, J.-Q. (2025). Herbal medicine as a potential treatment for non-alcoholic fatty liver disease. World Journal of Gastroenterology, 31(9), 100273. https://doi.org/10.3748/wjg.v31.i9.100273

Prucksunand, C., Indrasukhsri, B., Leethochawalit, M., &Hungspreugs, K. (n.d.). PHASE II CLINICAL TRIAL ON EFFECT OF THE LONG TURMERIC (CURCUMA LONGA LINN) ON HEALING OF PEPTIC ULCER. SOUTHEAST ASIAN J TROP MED PUBLIC HEALTH.

Przybyszewska, J., Kuźmiński, A., Przybyszewski, M., & Popławski, C. (2024). The role and therapeutic effectiveness of Plantago ovata seed husk (psyllium husk) in the prevention and non-pharmacological treatment of gastrointestinal diseases. Part 1. Clinical use of psyllium husk in the treatment of irritable bowel syndrome, ulcerative colitis, and colorectal cancer. Gastroenterology Review, 19(2), 121–126. https://doi.org/10.5114/pg.2024.139209

Rafieian, F., Amani, R., Rezaei, A., Karaça, A. C., & Jafari, S. M. (2024). Exploring fennel (Foeniculumvulgare): Composition, functional properties, potential health benefits, and safety. Critical Reviews in Food Science and Nutrition, 64(20), 6924–6941. https://doi.org/10.1080/10408398.2023.2176817

Rajagopal, H. M., Manjegowda, S. B., Serkad, C., & Dharmesh, S. M. (2018). A modified pectic polysaccharide from turmeric (Curcuma longa) with antiulcer effects via anti–secretary, mucoprotective and IL–10 mediated anti–inflammatory mechanisms. International Journal of Biological Macromolecules, 118, 864–880. https://doi.org/10.1016/j.ijbiomac.2018.06.053

Saidani, M., Kalleli, F., M'Hamdi, N., Arbi, T., Amraoui, M., & Larbi, M. B. (2026). Impact of dietary supplementation with fennel seed (Foeniculum vulgare var. Dulce) on growth Performance, carcass characteristics, meat quality, intestinal measurements, and cecal microbiota in broiler chickens. Tropical Animal Health and Production, 58(2), 97. https://doi.org/10.1007/s11250-026-04891-4

Simpson, R. C., Shanahan, E. R., Scolyer, R. A., & Long, G. V. (2023). Towards modulating the gut microbiota to enhance the efficacy of immune-checkpoint inhibitors. Nature Reviews Clinical Oncology, 20(10), 697–715. https://doi.org/10.1038/s41571-023-00803-9

Singh, N., Sharma, U., Mishra, B., Kandalkar, A. M., & Jain, S. K. (2024). Herbs and Herbal Formulations for the Management and Prevention of Gastrointestinal Diseases. In S. C. Izah, M. C. Ogwu, & M. Akram (Eds.), Herbal Medicine Phytochemistry (pp. 657–691). Springer International Publishing. https://doi.org/10.1007/978-3-031-43199-9_24

Song, Q., & Zhang, X. (2022). The Role of Gut–Liver Axis in Gut Microbiome Dysbiosis Associated NAFLD and NAFLD-HCC. Biomedicines, 10(3), 524. https://doi.org/10.3390/biomedicines10030524

Sreedharan, S., Nair, V., & Cisneros-Zevallos, L. (2023). Protective Role of Phenolic Compounds from Whole Cardamom (Elettaria cardamomum (L.) Maton) against LPS-Induced Inflammation in Colon and Macrophage Cells. Nutrients, 15(13), 2965. https://doi.org/10.3390/nu15132965

Tan, N., Gwee, K. A., Tack, J., Zhang, M., Li, Y., Chen, M., & Xiao, Y. (2020). Herbal medicine in the treatment of functional gastrointestinal disorders: A systematic review with meta-analysis. Journal of Gastroenterology and Hepatology, 35(4), 544–556. https://doi.org/10.1111/jgh.14905

Thilagavathi, R., Begum, S. S., Varatharaj, S. D., Balasubramaniam, A. K., George, J. S., & Selvam, C. (2023). Recent insights into the hepatoprotective potential of medicinal plants and plant-derived compounds. Phytotherapy Research, 37(5), 2102–2118. https://doi.org/10.1002/ptr.7821

Ülger, T. G. (2025). Historical and Current Scenario of Ayurvedic, Unani, and Chinese Medical Systems. In U. A. Dar, Mohd. Shahnawaz, & N. Singh (Eds.), Secondary Metabolites and Drug Discovery (1st ed., pp. 111–135). Wiley. https://doi.org/10.1002/9781394204595.ch4

Wang, M., Fu, R., Xu, D., Chen, Y., Yue, S., Zhang, S., & Tang, Y. (2024). Traditional Chinese Medicine: A promising strategy to regulate the imbalance of bacterial flora, impaired intestinal barrier and immune function attributed to ulcerative colitis through intestinal microecology. Journal of Ethnopharmacology, 318, 116879. https://doi.org/10.1016/j.jep.2023.116879

Wang, P., Liang, X., Cheng, G., Fan, Q., Li, Q., Dai, F., Liu, Y., Jiang, Z., Luo, T., Hu, J., & Dun, W. (n.d.). Analysis of risk factors for herb-induced liver injury: A retrospective study from China. Frontiers in Pharmacology, 17, 1766238. https://doi.org/10.3389/fphar.2026.1766238

Xu, J., Chen, H., & Li, S. (2017). Understanding the Molecular Mechanisms of the Interplay Between Herbal Medicines and Gut Microbiota. Medicinal Research Reviews, 37(5), 1140–1185. https://doi.org/10.1002/med.21431

Xu, X., Sun, W., Yin, S., Long, X., Zhao, H., Yang, H., & Zhang, Y. (2025). Improvement effects and mechanism of compound Chinese herbal medicine on fatty liver in largemouth bass Micropterus salmoides. Aquaculture, 598, 742075. https://doi.org/10.1016/j.aquaculture.2024.742075

Xu, Y., Yi, Y., Zhang, X., Jia, B., Huang, Y., Cui, R., Sun, H., Wang, M., Wan, J.-Y., Yao, H., & Yuan, C.-S. (2026). Global burden of MASLD-IBD comorbidity from 1990 to 2021 and trend prediction to 2050. International Journal of Surgery, 112(1), 1528–1542. https://doi.org/10.1097/JS9.0000000000003383

Yang, X.-F., Lu, M., You, L., Gen, H., Yuan, L., Tian, T., Li, C.-Y., Xu, K., Hou, J., & Lei, M. (2021). Herbal therapy for ameliorating nonalcoholic fatty liver disease via rebuilding the intestinal microecology. Chinese Medicine, 16(1), 62. https://doi.org/10.1186/s13020-021-00470-x

Zaeif Khorasani, E., Amirian, T., Nasiri Formi, E., Mahjoub, F., & Sadeghi, M. (2025). Efficacy of Glycyrrhiza glabra on peptic ulcer disease: A systematic review and meta-analysis. Advances in Integrative Medicine, 12(4), 100485. https://doi.org/10.1016/j.aimed.2025.100485

Zheng, Y., Duan, Y., He, X., Luo, H., & Zheng, X. (2025). Global, regional, and national burden of gallbladder and biliary tract diseases: A systematic analysis of prevalence, incidence, deaths, and disability-adjusted life years with projections to 2050. Annals of Hepato-Biliary-Pancreatic Surgery, 29(4), 424–440. https://doi.org/10.14701/ahbps.25-142

Zhou, Y., Zhang, D., Cheng, H., Wu, J., Liu, J., Feng, W., & Peng, C. (2024). Repairing gut barrier by traditional Chinese medicine: Roles of gut microbiota. Frontiers in Cellular and Infection Microbiology, 14, 1389925. https://doi.org/10.3389/fcimb.2024.1389925

Zhu, L.-R., Li, S.-S., Zheng, W.-Q., Ni, W.-J., Cai, M., & Liu, H.-P. (2023). Targeted modulation of gut microbiota by traditional Chinese medicine and natural products for liver disease therapy. Frontiers in Immunology, 14, 1086078. https://doi.org/10.3389/fimmu.2023.1086078

Zhu, X., Zhang, J., Su, C., Zhou, P., & Meng, X. (2026). Efficacy and Safety of Chinese Herbal Medicine Combined with Western Medicine in the Treatment of Icteric Hepatitis: A Systematic Review andMeta-Analysis. Combinatorial Chemistry & High Throughput Screening, 29. https://doi.org/10.2174/0113862073421260251113045022