



Phytotherapy in Gastrointestinal Disorders

Gastrointestinal Sistem Hastalıklarında Fitoterapi

Adem AKÇAKAYA¹, Fatma Betül AKÇAKAYA ÖZER²

¹Bezmialem Vakıf University Faculty of Medicine, Department of General Surgery, İstanbul, Türkiye

²Bezmialem Vakıf University Faculty of Medicine, Department of Public Health, İstanbul, Türkiye

ABSTRACT

Gastrointestinal disorders include various disorders affecting organs such as the stomach, intestines, and liver, and while they have an important place in human health, their treatment processes are also complex. These disorders constitute an increasing health problem today and pose a significant burden on both health services and individuals. In the treatment of these disorders, phytotherapy (herbal treatment) is considered an important alternative in addition to traditional medicine. The use of phytotherapy has become preferred because it offers more natural options for patients with fewer side effects. Phytotherapy provides positive effects on the digestive system with its many properties such as anti-inflammatory, antioxidant, and antimicrobial features. In this article, various phytotherapeutic agents (e.g., aloe vera, turmeric, bitter melon, pomegranate, St. John's wort, mint, black cumin, berberine, garlic, olive leaf, cinnamon, tea, ginger, carnation and nettle) used in gastrointestinal disorders such as gastroesophageal reflux, peptic ulcer, inflammatory bowel disease, irritable bowel syndrome, colon polyps, colorectal and stomach cancer are discussed and their effects on the digestive system and potential properties in managing symptoms are discussed.

Keywords: Gastrointestinal system, digestive system disorders, phytotherapy, herbal treatment

ÖZ

Gastrointestinal sistem hastalıkları; mide, barsaklar, karaciğer gibi organları etkileyen çeşitli rahatsızlıkları içermektedir ve insan sağlığında önemli bir yer tutmakla birlikte tedavi süreçleri de karmaşıktır. Bu hastalıklar günümüzde giderek artan bir sağlık sorununu teşkil etmekte ve hem sağlık hizmetleri hem de bireyler üzerinde önemli bir yük oluşturmaktadır. Bu hastalıkların tedavisinde geleneksel tıbbın yanı sıra fitoterapi (bitkisel tedavi), önemli bir alternatif olarak değerlendirilmektedir. Fitoterapinin kullanımı, hastalar için daha doğal ve yan etkileri daha az olan seçenekler sunması nedeniyle tercih edilir hale gelmiştir. Fitoterapi; anti-enflamatuvar, antioksidan ve antimikrobiyal gibi pek çok özelliği ile sindirim sistemi üzerinde olumlu etkiler sağlamaktadır. Bu yazıda, gastrointestinal sistem hastalıkları olan gastroözofageal reflü, peptik ülser, enflamatuvar barsak hastalığı, irritable barsak sendromu, kolon polipleri, kolorektal ve mide kanserinde kullanılan çeşitli fitoterapötik ajanlara (örn; aloe vera, zerdeçal, kudret narı, nar, sarı kantaron, nane, çörek otu, berberin, sarımsak, zeytin yaprağı, tarçın, çay, zencefil, karenfil ve ısırgan otu) yer verilmiş sindirim sistemi üzerindeki etkileri ve semptomları yönetmedeki potansiyel özellikleri ele alınmıştır.

Anahtar Sözcükler: Gastrointestinal sistem, sindirim sistemi hastalıkları, fitoterapi, bitkisel tedavi

Introduction

Phytotherapy in Gastrointestinal Disorders

Phytotherapy (the use of medicinal plants for therapeutic purposes) is one of the oldest treatment methods used worldwide. Herodotus documented the first herbal medicine reports dating back to 3000 BC, and physician and philosopher Paracelsus

recognized the healing power of plants and referred to the holistic approach for sustainable health by saying, "All meadows, all mountains and hills are pharmacies" (1). The concept of phytotherapy generally refers to the use of medicinal plants or herbal medicines to prevent, treat diseases or improve health conditions. Most phytotherapies have been developed from traditional medicinal plants. This concept summarizes an

Address for Correspondence: Adem Akçakaya, Bezmialem Vakıf University Faculty of Medicine, Department of General Surgery, İstanbul, Türkiye
E-mail: drakcakaya@yahoo.com **ORCID ID:** orcid.org/0000-0003-3116-7033

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evidence-based healing system that is widely practiced worldwide. Compared to nutritional therapy, phytotherapy is more complex due to the use of many products with diverse chemical structures and biological activities. Phytotherapy has an ancient history and is widely used worldwide. Some phytotherapy strategies are well known, having been extensively studied in the fields of chemistry and pharmacology and partially proven by clinical trials.

Epidemiological studies have shown that plant-based diets can have protective effects on diseases such as cardiovascular, gastrointestinal disorders and cancers, and can also be effective on broad health problems such as obesity and diabetes.

In this article, we will examine the plants used in the main gastrointestinal disorders and their methods of action in the light of the literature. The use of phytotherapy in these system diseases has become preferred because it offers more natural options for patients with fewer side effects. Phytotherapy provides positive effects on the digestive system with many properties such as anti-inflammatory, antioxidant, antimicrobial and anticancer features. The diseases discussed and the plants used are explained specifically for the disease.

Phytotherapy in Gastroesophageal Reflux Disease and Peptic Ulcer

Aloe vera is an effective plant used in the treatment of gastroesophageal reflux disease (GERD). GERD is a condition that occurs when stomach acid leaks back into the esophagus (2). Symptoms include heartburn, difficulty swallowing, irritation in the esophagus, a burning sensation in the throat and cough. Aloe vera is a jelly-like substance obtained from the leaves of a cactus-like plant. However, recent studies have shown that aloe vera may also have positive effects on digestive system disorders. The polysaccharides and antioxidants found in aloe vera have the potential to neutralize stomach acid. This feature helps relieve GERD symptoms. The anti-inflammatory properties of aloe vera help reduce irritation and inflammation that may occur in the esophagus. This feature may contribute to the improvement of symptoms such as difficulty swallowing that occur due to GERD. It is thought that aloe vera may have a regulatory effect on the digestive system. It can regulate bowel movements and improve digestive processes. This may be effective in reducing GERD symptoms caused by digestive problems (3). The effectiveness of aloe vera has been demonstrated in various pharmacological and clinical studies. Thus, the potential benefits of aloe vera on GERD and the points to be considered are emphasized. Peptic ulcer disease is a condition characterized by lesions on the inner surface of the stomach or duodenum. These wounds are usually affected by digestive juices such as stomach acid and pepsin, and symptoms can include heartburn, abdominal pain, indigestion, and even bleeding. Peptic ulcers are often associated with factors such as *Helicobacter pylori* infection, long-term use of non-steroidal anti-inflammatory drugs, or excessive alcohol consumption (4).

Turmeric (*Curcuma longa*) is a plant of which roots grow underground and is a spice widely used in Asian cuisine. The active ingredient of turmeric is curcumin, which has anti-

inflammatory, antioxidant, and antiseptic properties (5). These properties suggest that it may be potentially useful in the treatment of peptic ulcer disease. Turmeric can speed up the healing process of ulcers by reducing the inflammatory responses that play a role in the formation of peptic ulcers and the inflammation in the lining of the stomach and intestines. The antioxidants in it can prevent damage to stomach and intestinal cells by combating free radicals. This can slow down the formation and progression of peptic ulcers. Various studies on the potential benefits of turmeric in the treatment of peptic ulcer disease have attempted to prove this effectiveness (6,7).

Bitter melon is one of the herbal treatment methods that may be potentially useful in the treatment of peptic ulcer disease. Bitter melon has anti-inflammatory and antioxidant properties thanks to the various biologically active components it contains. Bitter melon has protective effects on the stomach and intestinal mucosa and can accelerate the healing process of ulcers thanks to these properties. Studies have shown that bitter melon can be effective in the treatment of peptic ulcers by neutralizing stomach acid and protecting the mucosa (8,9).

Inflammatory Bowel Disease

Inflammatory bowel disease (IBD) is a disorder that includes chronic IBD such as Crohn's disease and ulcerative colitis. These diseases are characterized by chronic inflammation and damage to the intestines. Symptoms may include abdominal pain, diarrhea, bloody stools, weight loss and fatigue (10,11). In addition to pharmaceutical drugs, natural and herbal supports are also being investigated in the treatment of patients with IBD.

Pomegranate (*Punica granatum L.*) is a fruit rich in antioxidants and phytochemicals. Pomegranate peel and seeds, in particular, contain compounds with many health benefits, such as polyphenols (e.g., ellagic acid), anthocyanins, flavonoids, and vitamin C. It is suggested that the anti-inflammatory, antioxidant, and immunomodulatory properties of these compounds may be beneficial in the management of IBD. Ellagic acid, which contains anti-inflammatory and antioxidant effects, can reduce the severity and frequency of IBD symptoms by reducing inflammation in the intestinal wall and can help protect intestinal cells against oxidative stress by fighting free radicals (12,13). Pomegranate, which is among the natural supports in the management of IBD, is considered a potential alternative or supportive treatment option thanks to its anti-inflammatory and antioxidant properties.

Irritable Bowel Syndrome

Irritable bowel syndrome (IBS) is a common digestive system disorder and its symptoms include abdominal pain, bloating, gas, diarrhea, and constipation. Although the exact cause of IBS is unknown, factors such as stress, eating habits, and changes in intestinal microbiota are thought to play a role (14). There is an increasing search for non-pharmaceutical, natural supports for managing IBS symptoms.

St. John's Wort (*Hypericum perforatum*) is a plant that has been used in the treatment of various health problems since ancient

times. It is known especially for treating mental health problems such as depression and anxiety, but in recent years its effects on digestive system disorders have also been investigated (15). The compounds in St. John's Wort help relieve muscle spasms and pain in the intestines, and it is thought that these properties will provide potential benefits in the management of IBS symptoms.

Peppermint oil (*Mentha piperita*) is another herbal treatment known to be effective in relieving IBS symptoms. The menthol in peppermint oil can reduce muscle spasms in the intestines and relieve symptoms such as abdominal pain, bloating, and gas. Studies have shown that peppermint oil is effective in managing IBS symptoms and improves the quality of life of patients (16).

Black seed oil (*Nigella sativa*) is another herbal oil that has anti-inflammatory and antispasmodic properties and can relieve IBS symptoms. The thymoquinone content of black seed oil may help manage IBS symptoms by reducing inflammation in the intestines and relieving spasms. Studies investigating the effects of black seed oil on IBS suggest that this oil may be beneficial in reducing symptoms and improving the quality of life of patients (17).

Colon Polyps and Colorectal Cancer

Colon polyps are small, abnormal tissue growths found in the large intestine, and in some cases, they can turn into cancer. Colorectal cancer is cancer of the large intestine or rectum and is a major health problem worldwide (18). The potential benefits of naturally derived compounds are being investigated in the treatment of both colon polyps and colorectal cancer.

Berberine (*Berberis Vulgaris*) is a natural alkaloid found in many plants. Curcumin is a compound obtained from the turmeric root that has anti-inflammatory, antioxidant, and anticancer properties. These two compounds have properties that may provide potential benefits for conditions such as colon polyps and colorectal cancer.

Berberine is noted for its ability to reduce intestinal inflammation, regulate cell turnover, and stop the growth of cancer cells. Berberine has been shown to have anticancer effects in several studies. Curcumin stands out as an effective tool in preventing colon polyps and cancer development by suppressing inflammation and promoting apoptosis (programmed cell death) processes (19,20).

Pomegranate peel extract may play an important role in preventing colon polyps and colorectal cancer through the high amount of antioxidant compounds it contains. Pomegranate peel contains various antioxidants such as polyphenols, flavonoids, and tannins. These compounds may reduce the risk of cancer by preventing cell damage caused by free radicals. The anti-inflammatory properties of pomegranate peel may also help reduce intestinal inflammation, which may contribute to preventing the development of polyps and cancer (21).

The antioxidant properties of pomegranate peel extract can prevent DNA damage by reducing oxidative stress in cells,

thus providing a protective effect against cancer. Studies have shown that pomegranate peel can prevent the growth of cancer cells and promote the apoptosis process. These properties make pomegranate peel extract a potential phytotherapeutic agent in preventing colon polyps and colorectal cancer (22).

Stomach Cancer and Phytotherapy

Stomach cancer is a major health problem worldwide and its treatment processes are complex. Stomach cancer is a type of cancer that occurs as a result of abnormal growth and proliferation in stomach cells. It usually starts in the lining of the stomach and can spread to other tissues over time. Stomach cancer symptoms are often not obvious in the early stages, so the disease is usually diagnosed in advanced stages. Risk factors include *Helicobacter pylori* infection, excessive consumption of salty or smoked foods, obesity, smoking, and family history. Early diagnosis and treatment are important because stomach cancer can be difficult to treat in advanced stages (23). However, research on the positive effects of natural foods and plants on health shows that some foods can reduce the risk of cancer or support treatment processes.

Garlic (*Allium sativum*) is a plant that has been used for medicinal purposes for thousands of years and is known to have various positive effects on health with the bioactive compounds it contains. Allicin, the main active ingredient of garlic, has antioxidant and antimicrobial properties. In addition, the sulfur compounds found in garlic can also have positive effects on health. Studies on stomach cancer show that garlic consumption can reduce the risk of cancer. Garlic can prevent cell damage and reduce the effects of carcinogenic substances in the body through the antioxidants it contains. In addition, some laboratory studies have shown that garlic can prevent the growth of cancer cells and trigger the apoptosis (programmed cell death) mechanism (24,25). However, more clinical research is needed on the exact effects of these effects on humans.

Resveratrol is a natural polyphenol found in grape skins, red wine, Japanese knotweed (*Polygonum cuspidatum*) and some other plants. It is known to have antioxidant, anti-inflammatory and anticancer properties. Studies on stomach cancer show that resveratrol can prevent the growth of cancer cells and trigger the apoptosis process. Resveratrol may reduce the risk of stomach cancer by preventing cell damage caused by free radicals and repairing DNA damage (26,27).

The protective and therapeutic effects of resveratrol on stomach cancer involve mechanisms at the cellular level. These mechanisms include suppression of inflammation, reduction of oxidative stress, and regulation of cellular signaling pathways. It has also been suggested that resveratrol may increase treatment efficacy and reduce drug resistance of cancer cells when used in conjunction with chemotherapy (28).

Fatty Liver and Phytotherapy

Fatty liver is a condition characterized by excessive fat accumulation in liver cells. This disease can negatively affect liver

function and, in advanced cases, can develop into liver cirrhosis or liver cancer. Phytotherapy contains natural ingredients that may be potentially beneficial in the treatment of fatty liver.

Olive leaf (*Olea europaea* L. Folium) extract has strong antioxidant properties and is effective in reducing fat accumulation in liver cells. Oleuropein contained in olive leaf extract has anti-inflammatory and hepatoprotective properties that support liver health (29).

Garcinia cambogia (*Garcinia gummi-gutta*) extract can reduce fat synthesis and prevent fatty liver through its hydroxycitric acid content. This plant has properties that support weight loss and regulate fat metabolism (30).

Cinnamon (*Cinnamomum verum*) is another herb recommended for use in the treatment of fatty liver. Cinnamon can support liver health with its anti-inflammatory and antioxidant properties and prevent fat accumulation by reducing insulin resistance (31).

Bitter melon extract has anti-inflammatory and antioxidant properties and may be effective in reducing fat accumulation in liver cells. The components contained in bitter melon may protect liver health and prevent the progression of steatosis (32).

Ellagic acid is a natural polyphenol found in various fruits and vegetables. Ellagic acid, which has antioxidant and anti-inflammatory properties, may support liver health by reducing fat accumulation in liver cells (33).

Curcumin is the active ingredient in turmeric and has strong antioxidant and anti-inflammatory properties. Curcumin may be potentially beneficial in the treatment of fatty liver and may improve liver function (34).

Diarrhea

Diarrhea is a condition characterized by increased bowel movements and increased water content of stool. Some of the plants used in phytotherapeutic treatments for diarrhea are:

Tea (*Camelia Sinensis*) is one of the plants commonly used in the treatment of diarrhea. The tannins in tea can relieve diarrhea by tightening the intestinal mucosa and reducing bowel movements. In addition, the antimicrobial properties of tea can help control intestinal infections (35).

Pomegranate peel is an effective herbal solution for diarrhea treatment through the tannins it contains. The antimicrobial and anti-inflammatory properties of pomegranate peel can help reduce intestinal infections and inflammation. Studies have shown that pomegranate peel extract is effective in the treatment of diarrhea (21).

Ginger (*Zingiber officinale*), as well as being widely used in the treatment of nausea and vomiting, can also be effective in the treatment of diarrhea. The antiemetic and antispasmodic properties of ginger can reduce the severity of diarrhea by regulating bowel movements (36).

Clove (*syzygium aromaticum*) is another effective herb in the treatment of diarrhea. The antimicrobial and anti-inflammatory

properties of clove relieve diarrhea by reducing intestinal infections and inflammation. In addition, the eugenol compound contained in cloves helps control diarrhea by reducing intestinal muscle spasms (37).

Constipation

Constipation is a condition characterized by decreased bowel movements and hardening of stools. Phytotherapy offers natural and effective solutions in the treatment of constipation.

Flaxseed oil is a natural product widely used in the treatment of constipation. Flaxseed oil can increase bowel movements and help soften stools through its high fiber content. In addition, the omega-3 fatty acids contained in flaxseed oil support intestinal health and reduce inflammation (38).

Senna (*Senna alexandrina*) is another plant used in the treatment of constipation. The leaves and fruits of senna contain anthraquinone glycosides that increase bowel movements. These compounds can relieve constipation by encouraging contraction of the intestinal muscles (39).

Nettle (*Urtica dioica*) has mild laxative properties and can be used in the treatment of constipation. Nettle can relieve constipation by increasing bowel movements and helping to soften stools (40).

Conclusion

Gastrointestinal tract disorders are considered complex conditions in which herbal medicines can be included alongside medical treatment and lifestyle changes. Phytotherapy involves the use of plant-derived compounds, and the effects of these compounds on gastrointestinal health are increasingly being investigated. The chemical composition and clinical studies discussed in my article have shown that some plants may be potentially useful in the management of digestive tract diseases. When the chemical compositions of plants are examined, it has been found that many plants have anti-inflammatory, antioxidant, antispasmodic or antimicrobial properties. For example, it has been found that the anti-inflammatory effects of curcumin, the active ingredient in turmeric, can relieve symptoms of conditions such as stomach ulcers and IBS. Similarly, ginger has been shown to help treat nausea and digestive problems with its antiemetic (anti-vomiting) effects on the digestive system.

The results of clinical studies also support the effectiveness of phytotherapy. However, more scientific research is needed on the effectiveness of phytotherapy, and the methodological quality of such studies and the use of standardized forms of plants are important. In addition, the interactions and side effects of phytotherapy with other treatment methods should also be taken into account.

In conclusion, phytotherapy can be a potentially effective complementary treatment option in the management of gastrointestinal disorders. However, patients and healthcare professionals need to be careful in this regard and create treatment plans that are appropriate for individual situations. Further research and clinical studies will help us understand more about

the effectiveness and safety of herbs, making phytotherapy a reliable option for patients.

Ethics

Authorship Contributions

Concept: A.A., F.B.A.Ö., Design: A.A., F.B.A.Ö., Data Collection or Processing: A.A., F.B.A.Ö., Analysis or Interpretation: A.A., F.B.A.Ö., Literature Search: A.A., F.B.A.Ö., Writing: A.A., F.B.A.Ö.

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References

- Traidl-Hoffmann C. Nature's pharmacy at risk: Unveiling the hidden molecular secrets of phytotherapy in the age of globalization. *Allergy*. 2024;79:1413-5.
- Maret-Ouda J, Markar SR, Lagergren J. Gastroesophageal Reflux Disease: A Review. *JAMA*. 2020;324:2536-47.
- Panahi Y, Khedmat H, Valizadegan G, Mohtashami R, Sahebkar A. Efficacy and safety of Aloe vera syrup for the treatment of gastroesophageal reflux disease: a pilot randomized positive-controlled trial. *J Tradit Chin Med*. 2015;35:632-6.
- Tuerk E, Doss S, Polesky K. Peptic Ulcer Disease. *Prim Care*. 2023;50:351-62.
- Abd El-Hack ME, El-Saadony MT, Swelum AA, Arif M, Abo Ghanima MM, Shukry M, et al. Curcumin, the active substance of turmeric: its effects on health and ways to improve its bioavailability. *J Sci Food Agric*. 2021;101:5747-62.
- Abbas SH, Abdulridha MK, Najeb AA. Potential benefit of curcumin adjuvant therapy to the standard *Helicobacter pylori* eradication therapy in patients with peptic ulcer disease. *Asian J Pharm Clin Res*. 2017;10:313-7.
- Mahattanadul S, Nakamura T, Panichayupakaranant P, Phdoongsombut N, Tungsinmunkong K, Bouking P. Comparative antiulcer effect of bisdemethoxycurcumin and curcumin in a gastric ulcer model system. *Phytomedicine*. 2009;16:342-51.
- Alam S, Asad M, Asdaq SM, Prasad VS. Antiulcer activity of methanolic extract of *Momordica charantia* L. in rats. *J Ethnopharmacol*. 2009;123:464-9.
- Abu Bakar N', Hakim Abdullah MN, Lim V, Yong YK. Gastroprotective Effect of Polypeptide-K Isolated from *Momordica charantia*'s Seeds on Multiple Experimental Gastric Ulcer Models in Rats. *Evid Based Complement Alternat Med*. 2022;2022:6098929.
- Bruner LP, White AM, Proksell S. Inflammatory Bowel Disease. *Prim Care*. 2023;50:411-27.
- Rubin DT, Ananthkrishnan AN, Siegel CA, Sauer BG, Long MD. ACG Clinical Guideline: Ulcerative Colitis in Adults. *Am J Gastroenterol*. 2019;114:384-413.
- Shah TA, Parikh M, Patel KV, Patel KG, Joshi CG, Gandhi TR. Evaluation of the effect of *Punica granatum* juice and punicalagin on NFκB modulation in inflammatory bowel disease. *Mol Cell Biochem*. 2016;419:65-74.
- Scaiola E, Belluzzi A, Ricciardiello L, Del Rio D, Rotondo E, Mena P, et al. Pomegranate juice to reduce fecal calprotectin levels in inflammatory bowel disease patients with a high risk of clinical relapse: Study protocol for a randomized controlled trial. *Trials*. 2019;20:327.
- Black CJ, Ford AC. Global burden of irritable bowel syndrome: trends, predictions and risk factors. *Nat Rev Gastroenterol Hepatol*. 2020;17:473-86.
- Nobakht SZ, Akaberi M, Mohammadpour AH, Tafazoli Moghadam A, Emami SA. *Hypericum perforatum*: Traditional uses, clinical trials, and drug interactions. *Iran J Basic Med Sci*. 2022;25:1045-58.
- Cash BD, Epstein MS, Shah SM. A Novel Delivery System of Peppermint Oil Is an Effective Therapy for Irritable Bowel Syndrome Symptoms. *Dig Dis Sci*. 2016;61:560-71.
- Hu X, Xu N, Yang X, Hu X, Zheng Y, Zhang Q. *Nigella A* ameliorates inflammation and intestinal flora imbalance in DSS induced colitis mice. *AMB Express*. 2020;10:179.
- Sullivan BA, Noujaim M, Roper J. Cause, Epidemiology, and Histology of Polyps and Pathways to Colorectal Cancer. *Gastrointest Endosc Clin N Am*. 2022;32:177-94.
- Chen H, Zhang F, Zhang J, Zhang X, Guo Y, Yao Q. A Holistic View of Berberine Inhibiting Intestinal Carcinogenesis in Conventional Mice Based on Microbiome-Metabolomics Analysis. *Front Immunol*. 2020;11:588079.
- Gong C, Hu X, Xu Y, Yang J, Zong L, Wang C, et al. Berberine inhibits proliferation and migration of colorectal cancer cells by downregulation of GRP78. *Anticancer Drugs*. 2020;31:141-9.
- Jurenka JS. Therapeutic applications of pomegranate (*Punica granatum* L.): a review. *Altern Med Rev*. 2008;13:128-44.
- Seeram NP, Adams LS, Henning SM, Niu Y, Zhang Y, Nair MG, et al. In vitro antiproliferative, apoptotic and antioxidant activities of punicalagin, ellagic acid and a total pomegranate tannin extract are enhanced in combination with other polyphenols as found in pomegranate juice. *J Nutr Biochem*. 2005;16:360-7.
- Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA Cancer J Clin*. 2021;71:209-49.
- Mansingh DP, Dalpati N, Sali Veeresh Kumar, Vasanthi AHR. Alliin the precursor of allicin in garlic extract mitigates proliferation of gastric adenocarcinoma cells by modulating apoptosis. *Pharmacog mag*. 2018;14:84-91.
- Hekmatdoost A, Ghobeh M, Shaker-Hosseini R, MirSattari D, Rastmanesh R, Rashidkhani B, et al. The effect of garlic consumption on *Helicobacter pylori* treatment using urea breath test: a randomized clinical trial. *J Nutr Sci & Diet*. 2015;1:21-7.
- Atten MJ, Godoy-Romero E, Attar BM, Milson T, Zopel M, Holian O. Resveratrol regulates cellular PKC alpha and delta to inhibit growth and induce apoptosis in gastric cancer cells. *Invest New Drugs*. 2005;23:111-9.

27. Zulueta A, Caretti A, Signorelli P, Ghidoni R. Resveratrol: A potential challenger against gastric cancer. *World J Gastroenterol.* 2015;21:10636-43.
28. Jang JY, Im E, Kim ND. Mechanism of Resveratrol-Induced Programmed Cell Death and New Drug Discovery against Cancer: A Review. *International Journal of Molecular Sciences.* 2022;23:13689.
29. Barbaro B, Toietta G, Maggio R, Arciello M, Tarocchi M, Galli A, et al. Effects of the olive-derived polyphenol oleuropein on human health. *Int J Mol Sci.* 2014;15:18508-24.
30. Chuah LO, Ho WY, Beh BK, Yeap SK. Updates on Antiobesity Effect of Garcinia Origin (-)-HCA. *Evid Based Complement Alternat Med.* 2013;2013:751658.
31. Qin B, Panickar KS, Anderson RA. Cinnamon: potential role in the prevention of insulin resistance, metabolic syndrome, and type 2 diabetes. *J Diabetes Sci Technol.* 2010;4:685-93.
32. Raman A, Lau C. Anti-diabetic properties and phytochemistry of *Momordica charantia* L. (Cucurbitaceae). *Phytomedicine.* 1996;2:349-62.
33. Talcott ST, Lee JH. Ellagic acid and flavonoid antioxidant content of muscadine wine and juice. *J Agric Food Chem.* 2002;50:3186-92.
34. Salama SM, Abdulla MA, AlRashdi AS, Ismail S, Alkiyumi SS, Golbabapour S. Hepatoprotective effect of ethanolic extract of *Curcuma longa* on thioacetamide induced liver cirrhosis in rats. *BMC Complement Altern Med.* 2013;13:56.
35. Besra SE, Gomes A, Ganguly DK, Vedasiromoni JR. Antidiarrhoeal activity of hot water extract of black tea (*Camellia sinensis*). *Phytother Res.* 2003;17:380-4.
36. Ali BH, Blunden G, Tanira MO, Nemmar A. Some phytochemical, pharmacological and toxicological properties of ginger (*Zingiber officinale* Roscoe): a review of recent research. *Food Chem Toxicol.* 2008;46:409-20.
37. Cortés-Rojas DE, de Souza CR, Oliveira WP. Clove (*Syzygium aromaticum*): a precious spice. *Asian Pac J Trop Biomed.* 2014;4:90-6.
38. Ramos CI, Andrade de Lima AF, Grilli DG, Cuppari L. The short-term effects of olive oil and flaxseed oil for the treatment of constipation in hemodialysis patients. *J Ren Nutr.* 2015;25:50-6.
39. Alshehri MM, Quispe C, Herrera-Bravo J, Sharifi-Rad J, Tutuncu S, Aydar EF, et al. A Review of Recent Studies on the Antioxidant and Anti-Infectious Properties of Senna Plants. *Oxid Med Cell Longev.* 2022;2022:6025900.
40. Joshi BC, Mukhija M, Kalia AN. Pharmacognostical review of *Urtica dioica* L. *International Journal of Green Pharmacy.* 2014;8:201-9.