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Research Article

Traditional Medicinal Plants and Irritable Bowel Syndrome diseases

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ABSTRACT

Irritable Bowel Syndrome (IBS) is a chronic digestive disorder characterized by abdominal pain, bloating, diarrhea, and constipation. The etiology is unknown. Based on the different mechanisms in the etiology, treatment focuses on controlling symptoms. Due to the long-term nature of the syndrome, inadequacy of current treatments, financial burden for patients, and pharmacological effects, several patients have turned to the use of complementary and alternative medicine (CAM). Complementary and alternative treatments for IBS include hypnosis, acupuncture, cognitive behavior therapy, yoga, and herbal medicine. Herbal medicines can have therapeutic effects and adverse events in IBS. This review article aimed to evaluate the efficacy of herbal drugs in controlling IBS. Herbal medicines play a significant role in the healthcare systems of many. Physicians need to understand some of the more common forms of CAM, as some herbs have side effects and others interact with conventional drugs. However, herbal medicines may have therapeutic effects in IBS, and further clinical research needed to assess their effectiveness and safety.

Keywords

Developing countries, Herbal medicine, Irritable Bowel Syndrome, Complementary medicine, Therapeutic effects.

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Introduction

Irritable bowel syndrome (IBS) is a functional gut disorder with high prevalence. Because of various factors involved in its pathophysiology and disappointing results from conventional IBS medications, the treatment of IBS is challenging, and the use of complementary and alternative medicines, especially herbal therapies, is increasing. Irritable bowel syndrome (IBS) is a functional gut disorder characterized by abdominal pain or discomfort, bloating, and bowel disturbances [1].

The etiology of IBS not fully understood. However, evidence suggests roles for genetic, psychosocial factors, an imbalance of gut microbiota, increased intestinal permeability, immune activation, and central nervous system dysfunction [2]. The primary management strategies for IBS include education, modified nutrition, dietary adjustments, pharmacotherapy, and a biopsychosocial approach [3]. Herbal medicine is a kind of therapy that utilizes medicinal plants to prevent or cure clinical conditions [4]. Herbal medicine frequently used as an alternative treatment modality worldwide. Herbal medicine is the most common CAM used in patients with IBS.

While the prevalence of gastrointestinal diseases in Arab nations is notably lower than in Western countries, there is an unfortunate upward trend in the incidence of these diseases in the Middle East and Africa [5]. Complementary and alternative treatments for IBS include hypnosis, acupuncture, cognitive behavioral therapy, yoga, and herbal medicine. Herbal medicine has both therapeutic effects and side effects in IBS [6]. Herbal products often used without

proper guidance or consultation with a doctor, and the correct dosage is not determined. A previous study found that the sources of information for patients taking herbal therapy included other patients with the same complaints, the media, the internet, friends and relatives, spice merchants, and herbalists [7].

Artichoke

The ancient Egyptians, Greeks, and Romans have known the therapeutic benefits of artichoke since ancient times, as evidenced by the use of artichoke as a medicinal treatment for liver and digestive disorders [8]. The high content of bioactive compounds, such as phenolic acids, flavonoids, anthocyanins, vitamins, inulin, and pectins, provides artichoke with beneficial effects against a variety of diseases. Numerous studies have found that artichoke presents an anti-inflammatory [9], antioxidant [10], antimicrobial [11], and anticarcinogenic [12] effect, as well as a hepatoprotective and cardioprotective action [13]. Moreover, new alternative uses for artichoke bio-wastes have proposed to avoid environmental problems [14]. Artichoke by-products in combination with novel ultrasound- and enzyme-assisted extraction techniques can be a valuable raw material for the manufacturing of value-added products such as food additives, biofuels, and agrochemicals [15].

The reason for this potent antimicrobial activity is likely due to the high content of phenolic compounds in the various parts of the artichoke. Polyphenols can lower the intracellular pH, chelate essential metals for microorganism survival, or alter the permeability of the bacterial cell membrane, thereby disrupting the transport of substrates [16]. Flavonoids present in artichoke leaves can also interfere with microbial enzyme activity [17], and different caffeoylquinic acid derivatives can disrupt bacterial cell walls [18].

Chamomilla recutita (L.)

Chamomilla recutita (L.) is one of the most prominent dark plants of chicory in traditional medicine and has used as a sedative in cases such as gastrointestinal disorders, colic, flatulence, and irritable bowel syndrome [19]. Flavonoids might could, did this effect on IBS. Both chamazulene and bisabolol of chamomile have antispasmodic and anti-inflammatory effects [20].

According to some studies, chamomile seems to be safe and may only cause minor allergic reactions in people who are allergic to the medicinal plants of the chamomile family [21]. The study of [22], showed that chamomile effect on gastrointestinal motility disorders [23], a study showed that chamomile decreased the symptoms of irritable bowel syndrome significantly [24], showed that chamomile oil can be considered as a complementary method to reduce colic symptoms in children. Chamomile is an effective anti-inflammatory and antispasmodic traditional medicine used for curing bowel disorders and menstrual discomfort [25].

The chamomile essential oil mostly used for its spasmolytic effect. The spasm induced by histamine and acetylcholine inhibited by the German chamomile alcoholic extracts. On the isolated jejunum of a rabbit, the myorelaxant effect of the alcoholic extract of chamomile assessed. Due to Ca + 2 channel blockade [26] and K+ channel activation, it causes the relaxation of isolated tissue [27].

Curcuma species

Eight-week treatment of IBS patients with Curcuma longa extract tablets decreased IBS prevalence and abdominal pain/discomfort score significantly between baseline and after treatment. There were significant improvements in the IBS quality of life (QOL) scales. Approximately two thirds of all subjects reported an improvement in symptoms after treatment, and there was a favorable shift in self-reported bowel pattern [28]. In a randomized, double blind, placebo-controlled trial, IBS patients randomly assigned to receive Curcuma xanthorriza or a placebo. IBS-related pain increased in the Curcuma group and decreased in the placebo group. IBS-related distension showed a greater reduction in the placebo group compared to the curcuma group. Additionally, the global assessment of changes in IBS symptoms and psychological stress due to IBS did not differ significantly between the two treatment groups. Thus, Curcuma xanthorriza did not show any therapeutic benefit over placebo in patients with IBS [29]. Thus, the species of Curcuma used is an important factor in determining its efficacy in IBS. The efficacy of Curcuma in IBS may be due to bactericidal [30], anti-inflammatory [31], and spasmolytic [32] activities. Hypericum perforatum L (HP), family Hyperiacea, commonly known as St. John's Wort, is most known for its proven.

Cynara scolymus

Cynara scolymus has demonstrated both preventive and curative roles in IBS. The leaf extract of Cynara scolymus evaluated in healthy volunteers suffering concomitant dyspepsia and showed a 26.4% fall in IBS incidence after treatment. A significant shift in self-reported usual bowel pattern away from alternating constipation/diarrhea toward normal observed. The Nepean Dyspepsia Index (NDI) total symptom score significantly decreased by 41% after treatment. Similarly, there was a 20% improvement in the NDI total QOL score in the subset after treatment [33]. When the leaf extract of Cynara scolymus administered to patients with IBS for 6 weeks, a significant reduction in the severity of symptoms observed. Ninety-six percent of patients rated this extract better than or at least equal to previous therapies administered for their symptoms. Furthermore, the tolerability of Cynara scolymus extract was excellent [34]. It reported that Cynara scolymus affects intestinal microbiota [35] and has antispasmodic activity [36].

It contains several alkaloids, among them: chlorogenic acid, caffeic acid, cinaropicrina, and cinarina, being the responsible for the sour flavor of the Artichoke, being able to stimulate the bile secretion and the diuretic action. It contains mucilage, essential oil, phytosterols, vitamins A, B1, B2, and C. It also contains potassium salts and magnesium salts. In addition, it contains flavonoids derived from the luteolin (cinarósidos, cinaratríosidos, escolimosidos); enzymes (catalase, oxidases, peroxidases, cinarasa, ascorbinasa, proteases), insulin, cianidol, tannins, among others [37], they added that there are 15 amino acids, of which nine considered essential: threonine, valine, isoleucine, leucine, lysine, phenylalanine, histidine, arginine, and methionine. It also has chlorogenic acid and cinarina, phenolics that derived from caffeic acid.

Hypericum perforatum

Hypericum perforatum is a popular herbal medicine for the treatment of depression and it may be beneficial in the management of IBS by modulating psychological stress and serotonin [38]. The efficacy of Hypericum perforatum (St John's wort) evaluated in IBS patients during a 12-wk randomized, double blind, and placebo-controlled trial. The overall bowel symptom score (BSS) from baseline was decreased both in the Hypericum and placebo groups, whereas the placebo arm showed significantly lower scores at the end of treatment. Individual BSS for diarrhea (D-BSS), constipation (C-BSS), pain or discomfort, and bloating, adequate relief (AR) of IBS of at least 50% during the last 4 weeks of therapy, and IBS quality-of-life score showed greater improvement in the placebo group when compared with the Hypericum group. Thus, Hypericum perforatum showed lower efficacy for the treatment of IBS than placebo [39]. Another study showed that Hypericum perforatum could improve the psychological symptoms and the ANS reactivity to stress and relieve intestinal symptoms in women with IBS. In patients with IBS, intestinal symptoms of IBS were also relieved significantly [40].

Lepidium sativum

Lepidium sativum Linn. belongs to the Cruciferae (Brassicaceae) family, commonly which known as Garden cress, Common cress, or Halim. This popular herb used in Saudi Arabia and is grown in many Saudi regions such as Hijaz, AL-Qaseem, and the Eastern province. In Saudi folk medicine, it commonly employed for the treatment of hyperactive gut disorders such as diarrhea [41]. In the Western world, the leaves of *L. sativum* used in salad, while in various African countries, its seeds thought to be an effective medicinal remedy to cure motility-related gut disorders, including diarrhea, in addition to multiple other medicinal uses [42].

The plant well studied phytochemically with multiple active constituents, such as alkaloids, riboflavin, α-tocopherol, β-carotenes, β-sitosterol, ascorbic, linoleic, oleic, palmitic, and stearic acids. It considered a good source of monounsaturated fatty acids and L-arabinose [43]. Moreover, cucurbitacins and cardenolides have also identified as plant constituents [44].

The plant has been shown to exhibit antidiarrheal and antispasmodic effects in rats, mediated through dual blockade of muscarinic receptors and Ca^{++} channels [45], in addition to other reported activities. It now recognized that the result obtained on one species might not necessarily depict the true picture of the pharmacological profile of the medicinal products [46] hence, it is imperative to test the plant on different species.

Mentha piperita

The evidence for the efficacy of the essential oil of Mentha piperita (peppermint oil) in IBS seems to be more than other herbal preparations [47]. In a prospective, randomized, double blind, placebo-controlled clinical study, the efficacy of an enteric-coated peppermint oil formulation evaluated in outpatients with IBS. Seventy-nine percent of patients on Mentha capsule experienced an alleviation of the severity of abdominal pain, 83% had less abdominal distension, 83% showed a reduced stool frequency, 73% had fewer borborygmi, and 79% less flatulence. Corresponding figures for the placebo group: 43% with reduced pain, 29% with reduced distension, 32% with reduced stool frequency, 31% with fewer borborygmi, and 22% with less flatulence. Symptom improvements after the Mentha capsule were significantly better than after the placebo. No significant side effects seen in the Mentha group, and peppermint oil well tolerated [48]. In another randomized, double-blind, placebo-controlled study conducted on outpatients with IBS, the number of subjects free from abdominal pain or discomfort changed from 0 at week 0 to 14 at week 8 in the peppermint oil group and from 0 to 6 in the placebo group. The severity of abdominal pain reduced significantly in the peppermint group as compared to the placebo group. Furthermore, peppermint oil capsules significantly improved the QOL. No significant adverse reaction reported from peppermint oil capsule [49]. In another study, the effectiveness of an enteric-coated peppermint oil capsule evaluated in patients with IBS, in whom small intestinal bacterial overgrowth, lactose intolerance, and celiac disease excluded. The symptoms evaluated abdominal bloating, abdominal pain or discomfort, diarrhea, constipation, feeling of incomplete evacuation, pain at defecation, passage of gas or mucus, and urgency at defecation. The number of patients who showed a reduction of the basal total IBS symptoms score in the peppermint oil group was greater than that in the placebo group [50]. In a randomized, double-blind controlled trial of children with IBS, 75% of those receiving peppermint oil showed a reduced severity of pain associated with IBS. At the end of the trial, the peppermint oil group reported a more significant improvement in the change of symptom scale than the placebo group. Symptoms such as changes in abdominal rumbling, abdominal distention, belching, gas, and heartburn exhibited no changes when peppermint oil compared with a placebo. The most predominant effect of peppermint oil was a reduction in the severity of abdominal pain. Either the investigator or patients reported no side effects during the 2-week study period [51]. Mentha has shown to have antimicrobial [52] and antispasmodic [53] activity, and to cause a reduction in gastric motility [54].

Plantago psyllium

Psyllium husk is the only fiber recommended by the American Society of Gastroenterology for the treatment of irritable bowel syndrome (IBS) [55]. Clinical evidence available in the literature confirms that psyllium extracted from *P. ovata* can reduce painful symptoms and normalize stool consistency in patients with IBS in both diarrhoeal and constipated forms [56,57], conducted a study in a group of 275 patients diagnosed with IBS and evaluated the effect of psyllium husk and bran consumption on the clinical course of the disease. For this purpose, the cited authors randomly assigned eligible patients to three groups. The first group consisted of patients (n = 85) receiving psyllium 10 g/day, 97 other patients consumed wheat bran 10 g/day, and the last group of 93 patients received a placebo. The duration of the study was 12 weeks. In the first month of the experiment, the percentage of patients who responded was statistically significantly higher in the group consuming psyllium than in the placebo group (57% vs. 35%). In

addition, in the second month of follow-up, a higher percentage of patients with clinical improvement were those in the psyllium-treated group (59% vs. 41%). In the third month of treatment, the observed difference between the number of patients reporting symptom relief in the psyllium group (46%) and the number in the placebo group (32%) was not statistically significant. The authors of the described experiment also noted that the dropout rate was highest (46%) in the group receiving wheat bran, and the most common reported reason for dropping out was exacerbation of IBS symptoms, probably caused by mechanical irritation of the intestinal mucosa by coarse wheat bran particles [58].

Many authors concluded that psyllium significantly improves overall well-being in patients with irritable bowel syndrome and in those with constipation, and favorably affects bowel habit and transit time [59].

References

1. Chang JY, Talley NJ. Current and emerging therapies in irritable bowel syndrome: from pathophysiology to treatment. Trends Pharmacol Sci. 2010; 31: 326-334.
2. *Hyams JS, Burke G, Davis PM, Rzepski B, Andrulonis PA. Abdominal pain and irritable bowel syndrome in adolescents: a community-based study. J Pediatr. 1996; 129: 220-226.*
3. *Rasquin A, Di Lorenzo C, Forbes D, Guiraldes E, Hyams JS, et al. Childhood functional gastrointestinal disorders: child/adolescent. Gastroenterology. 2006; 130: 1527-1537.*
4. *Bahrami HR, Noras M, Saeidi M. Acupuncture Use in Pediatric Disease: A Short Review. International Journal of Pediatrics. 2014; 2: 69-72.*
5. Al Fadda M, Peedikayil MC, Kagevi I, Al Kahtani K, Al Ben Mousa A, *et al.* Inflammatory bowel disease in Saudi Arabia: a hospital-based clinical study of 312 patients. Ann Saudi Med. 2012; 32: 276-282.
6. Bahrami HR, Hamedi S, Salari R, Noras M. Herbal medicines for the management of irritable bowel syndrome: a systematic review. Electron Phys. 2016; 8: 2719-2725.
7. Ekor M. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. Front Pharmacol. 2014; 10: 177.
8. Lattanzio V, Kroon PA, Linsalata V, Cardinali A. Globe Artichoke: A Functional Food and Source of Nutraceutical Ingredients. J Funct Foods. 2009; 1: 131-144.
9. Rotondo R, Cruz PS, Masin M, Bürgi M, Girardini J, et al. Artichoke Extracts with Potential Application in Chemoprevention and Inflammatory Processes. Braz J Pharm Sci. 2022; 58: 19238.
10. Salekzamani S, Ebrahimi MM, Rezazadeh K. The Antioxidant Activity of Artichoke Cynara scolymus: A Systematic Review and Meta-Analysis of Animal Studies. Phytother Res. 2019; 33: 55-71.
11. Shallan MA, Ali MA, Meshrf WA, Marrez DA. In Vitro Antimicrobial, Antioxidant and Anticancer Activities of Globe Artichoke (Cynara cardunculus Var. Scolymus L.) Bracts and Receptacles Ethanolic Extract. Biocatal Agric Biotechnol. 2020; 29: 101774.
12. Hassabou NF, Farag AF. Anticancer Effects Induced by Artichoke Extract in Oral Squamous Carcinoma Cell Lines. J Egypt Natl Canc Inst. 2020; 32: 17.
13. El Sayed AM, Hussein R, Motaal AA, Fouad MA, Aziz MA, et al. Artichoke Edible Parts Are Hepatoprotective as Commercial Leaf Preparation. Rev Bras Farmacogn. 2018; 28: 165-178.
14. Barracosa P, Barracosa M, Pires E. Cardoon as a Sustainable Crop for Biomass and Bioactive Compounds Production. Chem Biodivers. 2019; 16: 1900498.
15. Zayed A, Farag MA. Valorization, extraction optimization and technology advancements of artichoke biowastes: Food and non-food applications. LWT-Food Sci Technol. 2020; 132: 109883.
16. Papuc C, Goran GV, Predescu CN, Nicorescu V, Stefan G. Plant Polyphenols as Antioxidant and Antibacterial Agents for Shelf-Life Extension of Meat and Meat Products: Classification, Structures, Sources, and Action Mechanisms. Compr Rev Food Sci Food Saf. 2017; 16: 1243-1268.
17. Donadio G, Mensitieri F, Santoro V, Parisi V, Bellone ML, et al. Interactions with Microbial Proteins Driving the Antibacterial Activity of Flavonoids. Pharmaceutics. 2021; 13: 660.
18. Chojnacka K, Skrzypczak D, Izydorczyk G, Mikula K, Szopa D, et al. Antiviral Properties of Polyphenols from Plants. Foods. 2021; 10: 2277.
19. *Bahrani SS, Varkaneh ZK, Sabziani Z, Bagheri Z, Mohamadi MA, et al. A systematic review of the role of medicinal plants in the treatment of chemotherapy induced nausea and vomiting. Int J Psychosoc Rehabil. 2020; 24: 7888-7896.*
20. *Ghanavati M, Houshmand SL, Zainali H, Abrahimpour F. Chemical composition of the essential oils of Matricaria recutita L. belonging to central and south parts of Iran. J Med. Plants. 2010; 2: 102-108.*
21. *Chauhan ES, Jaya A. Chamomile an ancient aromatic plant-A review. J Ayurveda Med Sci. 2017; 2:* 251-255.
22. *Khadem E, Shirazi M, Janani L, Rahimi R, Amiri P, et al. Effect of topical chamomile oil on postoperative bowel activity after cesarean section: a randomized controlled trial. J Res Pharm Pract. 2018; 7: 128-135.*
23. *Agah S, Taleb A, Moeini R, Gorji N, Nikbakht H, et al. Chamomile efficacy in patients of the irritable bowel syndrome. Der Pharma Chem. 2015; 7: 237-241.*
24. *Ghorat F, Afzali B, Salehipoor H. The effectiveness of topical chamomile oil in the treatment of infantile colic symptoms: a case report. Asian J Clin Case Rep Trad Alt Med. 2017; 1: 27–32.*
25. Asadi SM, Rafieian KM, Azimi N. Gundelia: a systematic review of medicinal and molecular perspective. Pak J Biol Sci. 2013; 16: 1238-1247.
26. Gilani AH, Mehmood MH, Janbaz KH, Khan AU, Saeed

SA. Ethnopharmacological studies on antispasmodic and antiplatelet activities of Ficus carica. J Ethnopharmaco. 2008; 119: 1-5.

27. Godfraind T, Miller R, Wibo M. Calcium antagonism and calcium entry blockade. Pharmacol Rev. 1986; 38: 321-416.
28. Bundy R, Walker AF, Middleton RW, Booth J. Turmeric extract may improve irritable bowel syndrome symptomology in otherwise healthy adults: a pilot study. J Altern Complement Med. 2004; 10: 1015–1018.
29. Brinkhaus B, Hentschel C, Von Keudell C, Schindler G, Lindner M, et al. Herbal medicine with curcuma and fumitory in the treatment of irritable bowel syndrome: A randomized, placebo-controlled, double-blind clinical trial. Scand J Gastroenterol. 2005; 40: 936–943.
30. Zaidi SF, Yamada K, Kadowaki M, Usmanghani K, Sugiyama T. Bactericidal activity of medicinal plants, employed for the treatment of gastrointestinal ailments, against Helicobacter pylori. J Ethnopharmacol. 2009; 121: 286-291.
31. Ammon HP, Wahl MA. Pharmacology of Curcuma longa. Planta Med. 1991; 57: 1-7.
32. Gilani AH, Shah AJ, Ghayur MN, Majeed K. Pharmacological basis for the use of turmeric in gastrointestinal and respiratory disorders. Life Sci. 2005; 76: 3089-3105.
33. Bundy R, Walker AF, Middleton RW, Marakis G, Booth JC. Artichoke leaf extract reduces symptoms of irritable bowel syndrome and improves quality of life in otherwise healthy volunteers suffering from concomitant dyspepsia: a subset analysis. J Altern Complement Med. 2004; 10: 667-669.
34. Walker AF, Middleton RW, Petrowicz O. Artichoke leaf extract reduces symptoms of irritable bowel syndrome in a post-marketing surveillance study. Phytother Res. 2001; 15: 58-61.
35. Costabile A, Kolida S, Klinder A, Gietl E, Bäuerlein M, et al. A double-blind, placebo-controlled, cross-over study to establish the bifidogenic effect of a very-long-chain inulin extracted from globe artichoke (Cynara scolymus) in healthy human subjects. Br J Nutr. 2010; 104: 1007-1017.
36. Emendörfer F, Emendörfer F, Bellato F, Noldin VF, Cechinel FV, et al. Antispasmodic activity of fractions and cynaropicrin from Cynara scolymus on guinea-pig ileum. Biol Pharm Bull. 2005; 28: 902-904.
37. Orlosvkaya TV, Luneva IL, Chelombit´ko VA. Chemical composition of Cynara scolymus leaves. Chem Nat Comp. 2007; 43: 239-240.
38. Rahimi R, Nikfar S, Abdollahi M. Efficacy and tolerability of Hypericum perforatum in major depressive disorder in comparison with selective serotonin reuptake inhibitors: a meta-analysis. Prog Neuropsychopharmacol Biol Psychiatry. 2009; 33: 118-127.
39. Saito YA, Rey E, Almazar-Elder AE, Harmsen WS, Zinsmeister AR, et al. A randomized, double-blind, placebo-controlled trial of St John's wort for treating irritable bowel syndrome. Am J Gastroenterol. 2010; 105: 170-177.
40. Wan H, Chen Y. Effects of antidepressive treatment of Saint John's wort extract related to autonomic nervous function in women with irritable bowel syndrome. Int J Psychiatry Med. 2010; 40: 45–56.
41. Azaizeh H, Saad B, Khalil K, Said O. The state of the art of traditional Arab herbal medicine in the eastern region of the Mediterranean: a review. Evid Based Complement Alternat Med. 2006; 3: 229-235.
42. Usmanghani K, Saeed A, Alam MT. Indusyunic Medicine. University of Karachi Press: Karachi. 1997; 276-277.
43. Duke JA. Handbook of Phytochemical Constituents of GRAS Herbs and Other Economic Plants 2nd edn. CRC Press. 1992; 335.
44. Fleming T. PDR for Herbal Medicines 1st edn. Medical Economics 393. Company Inc: Montvale. 1998; 933-934.
45. Rahman MA, Mossa JS, Al- Said MS, Al-Yahya MA. Medicinal plant diversity in the flora of Saudi Arabia 1: A report on seven plant families. Fitoterapia. 2004; 75: 149-161.
46. Ghayur MN, Gilani AH. Species differences in the prokinetic effects of ginger. Int J Food Sci Nutr. 2006; 57: 65-73.
47. Pittler MH, Ernst E. Peppermint oil for irritable bowel syndrome: a critical review and metaanalysis. Am J Gastroenterol. 1998; 93: 1131-1135.
48. Liu JH, Chen GH, Yeh HZ, Huang CK, Poon SK. Enteric-coated peppermint-oil capsules in the treatment of irritable bowel syndrome: a prospective, randomized trial. J Gastroenterol. 1997; 32: 765-768.
49. Merat S, Khalili S, Mostajabi P, Ghorbani A, Ansari R, et al. The effect of enteric-coated, delayed-release peppermint oil on irritable bowel syndrome. Dig Dis Sci. 2010; 55: 1385-1390.
50. Cappello G, Spezzaferro M, Grossi L, Manzoli L, Marzio L. Peppermint oil (Mintoil) in the treatment of irritable bowel syndrome: a prospective double blind placebo-controlled randomized trial. Dig Liver Dis. 2007; 39: 530-536.
51. Kline RM, Kline JJ, Di Palma J, Barbero GJ. Enteric-coated, pH-dependent peppermint oil capsules for the treatment of irritable bowel syndrome in children. J Pediatr. 2001; 138: 125-128.
52. Logan AC, Beaulne TM. The treatment of small intestinal bacterial overgrowth with enteric-coated peppermint oil: a case report. Altern Med Rev. 2002; 7: 410-417.
53. Grigoleit HG, Grigoleit P. Pharmacology and preclinical pharmacokinetics of peppermint oil. Phytomedicine. 2005; 12: 612-616.
54. Hiki N. Peppermint oil reduces gastric motility during the upper gastrointestinal endoscopy. Nihon Rinsho. 2010; 68: 2126-2134.
55. *Ford AC, Moayyedi P, Chey WD, Lucinda AH, Brian EL, et al. American College of Gastroenterology monograph on management of irritable bowel syndrome. Am J Gastroenterol. 2018; 113: 1-18.*
56. *Moayyedi P, Quigley EM, Lacy BE, Anthony JL, Yuri AS, et al.*

The effect of fiber supplementation on irritable bowel syndrome: a systematic review and meta-analysis. Am J Gastroenterol. 2014; 109: 1367-1374.

57. *Bijkerk CJ, de Wit NJ, Muris JW, PWhorwell PJ, Knottnerus JA, et al. Soluble or insoluble fibre in irritable bowel syndrome in primary care. Randomised placebo controlled trial. BMJ. 2009; 27: 3154.*
58. *McRorie JW, Gibb RD, Kyle J, Nicola MM. Psyllium: the gel-forming nonfermented isolated fiber that delivers multiple fiber-related health benefits. Nutrition Today. 2021; 56: 169-82.*
59. Prior A, Whorwell PJ. Double blind study of ispaghula in irritable bowel syndrome. *Gut*. 1987; 28: 1510-1513.