*Role of fenugreek (*Trigonella foenum-graecum*) seed extract in hormonal balance and management of menopausal symptoms: A narrative review*

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Abstract:

This review examines the effects of saponin rich fenugreek (Trigonella foenum-graecum) seed extract on hormonal balance and menopausal symptoms,evaluating its potential as a dietary intervention.[1] When women reach menopause,their estrogen levels drop. Suddenly, all sorts of symptoms show up hot flashes, night sweats, mood swings, shifts in metabolism, even weaker bones. It doesn't just sound tough. For many women, it makes daily life harder.[1]

Hormone replacement therapy helps a lot of people, but nevertheless some worry about the side effects, so they start searching for other options[2]. That's where fenugreek seed extract comes in. Fenugreek (Trigonella foenum-graecum) is rich in bioactive compounds, particularly, steroidal saponin like diosgenin.[3] These act kind of like plant-based estrogens, or phytoestrogens. On top of balancing hormones, fenugreek (Trigonella foenum-graecum) also fights inflammation and has antioxidant perks. So it's more than just a hormone booster it covers a bit of everything.[4]

Fenugreek's scientifically relevant it actually binds to estrogen receptors and helps balance the whole hypothalamic-pituitary-ovarian axis[5]. That's not just science talk; it supports metabolism, strengthens bones, and even affects your mood and sleep by acting on neurotransmitters[6]. Real clinical studies back this up. Women see fewer hot flashes and night sweats, their mood lifts, hormones settle down, and, in fact, life just feels better overall.[7]

Fenugreek looks safe and pretty promising, whether you use it on its own or with other treatments. However, limitations such as small sample sizes, short study durations, and inconsistent dosing in existing research necessitate further investigation.[8]We need bigger, longer studies and clearer guidelines before it goes mainstream. Right now, the research is encouraging, but still limited. So, better clinical trials are essential if we want to know for sure how well fenugreek (Trigonella foenum-graecum) works in the long run.[9]

Major findings:

Fenugreek's (Trigonella foenum-graecum) got a powerful punch of saponin, and its standout compound, diosgenin, works a lot like a phytoestrogens. So what does that actually mean? Well, it helps your hormones stay in check, which is a significant relief during menopause[10]. People who take fenugreek see some of those distressing symptoms hot flashes, night sweats, mood swings, and disrupted sleep patterns start to ease up.[11] It promotes hormonal equilibrium through estrogen regulation and keeping FSH levels lower, so your endocrine system can actually function the way it should.[11] And there's more fenugreek (Trigonella foenum-graecum) actually boosts your metabolism. It keeps blood sugar in check, helps with cholesterol, and even cuts down the risk of heart disease[12]. Plus, it's good for your bones because of its osteoprotective effects. The antioxidants and anti-inflammatory stuff? Those help ease symptoms and just make you feel better overall.[13] Compared to hormone replacement therapy, Fenugreek is considered to be safer and most people don't have annoying side effects.[14]

Keywords:

Fenugreek (Trigonella foenum-graecum); Saponin; Diosgenin; Menopause; Phytoestrogens; Hormonal balance; Menopausal symptoms; Nutraceutical; Estrogen receptor modulation; Bone

health; Metabolic health; Antioxidant activity; Anti-inflammatory effects; Hormone replacement therapy (HRT) alternative.[15]

Abbreviations:
HRT – Hormone Replacement Therapy, FSH – Follicle-Stimulating Hormone, LH – Luteinizing Hormone, GnRH – Gonadotropin-Releasing Hormone, ER – Estrogen Receptor, SERM – Selective Estrogen Receptor Modulator, RANKL – Receptor Activator of Nuclear Factor κB Ligand, OPG – Osteoprotegerin, BMD – Bone Mineral Density, RCT – Randomized Controlled Trial, LDL – Low-Density Lipoprotein, HDL – High-Density Lipoprotein.

1. Introduction:
Menopause usually hits between ages 45 and 55, and it's a major shift. One day your periods are regular, then suddenly they're gone[16]. Estrogen and progesterone levels plummet, and a wave of new symptoms rolls in hot flashes, night sweats, mood swings, anxiety, trouble sleeping, even vaginal dryness. And that's not all.[16]The risk of heart disease and osteoporosis climbs, too. Since women are living longer now, many spend years sometimes decades managing these symptoms. Finding safe, effective ways to handle all of this matters more than ever.[16] Hormone replacement therapy used to be the standard, but lately, more women are stepping back from it. The worry about side effects like breast cancer, blood clots, and heart issues has people looking for something safer[17]. That's where natural options and plant-based supplements get interesting. Take fenugreek, for example. It's been a big deal in Ayurveda for ages, and now scientists are starting to pay attention, especially in the context of menopause.[18] Fenugreek (Trigonella foenum-graecum) seeds are loaded with bioactive compounds. We're talking steroidal saponin like diosgenin along with flavonoids, alkaloids, and polyphenols. These aren't just names on a label; they actually do something[19]. They deliver phytoestrogenic, antioxidant, anti-inflammatory, and metabolism-boosting effects.[18]The phytoestrogens are the real headliners. They act kind of like natural estrogen, so they might help stabilize some of the systemic effects of menopause.[20]
Recent studies show that fenugreek seeds, packed with Saponin, can help women going through menopause. They work with your hormonal system, support your bones and metabolism, and even help with mood and sleep by influencing neurotransmitters.[11] Here's what's interesting unlike traditional hormone therapy, fenugreek doesn't spike your estrogen levels, so it's often seen as a safer choice.[21]
Fenugreek's (Trigonella foenum-graecum)been part of traditional medicine for ages, and early studies show some promise, but honestly, we still don't have the full picture.[22] There's a lot we don't know about what actually works, how it works, or what that means when it comes to real-life benefits[23]. This review takes a closer look at saponin-rich fenugreek seed extracts how they might help with hormone balance, managing menopause symptoms, and whether they're actually safe and effective as part of your diet.[24]

2. Materials and methods:

2.1. Sources of information:
Data were collected from Pub-Med-indexed journals, randomized controlled trials, and pharmacological studies pretty much any credible source focused on fenugreek. I leaned on standard clinical tests like the Menopause Rating Scale (MRS), Greene Climacteric Scale, and SF-36.[25]

2.2. Literature search:
"A literature search was conducted using the Pub-Med database for articles published in English. Clinical studies, randomized controlled trials, review articles, and pharmacological studies related to fenugreek (Trigonella foenum-graecum), menopause, phytoestrogens, hormonal balance, and menopausal symptom management were included. Relevant articles published on the topic were reviewed and analyzed for this narrative review."[26]

2.3. Literature selection:
Inclusion criteria were studies related to hormone levels/hormonal balance, menopause, phytoestrogens, metabolism, their safety profiles, and the effects of fenugreek on these conditions. Non-related studies or studies without sufficient information on any of these subjects were excluded.[27]

2.4 data extraction:

Relevant data were extracted using a structured format, including study characteristics (author, year, design, sample size), participant details (age, menopausal status), intervention specifics (type, dosage, duration of fenugreek extract), outcome measures (menopausal symptoms, hormonal levels, metabolic parameters), and key findings. Relevant safety data and adverse effects were also recorded[28].

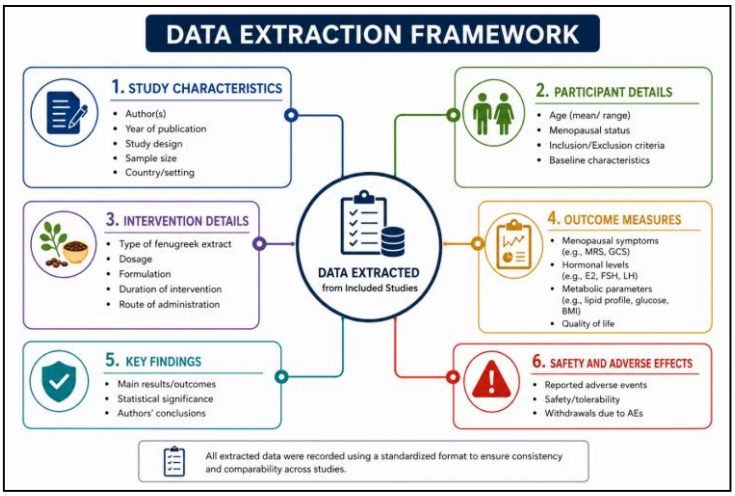


Figure. 1: Illustrates the structured framework used for data extraction and study evaluation in this narrative review

This figure illustrates the structured framework for extracting data in the review. It covers details about study characteristics, participant information, intervention specifics, outcome results, and safety findings from the chosen literature. The structure provided reliable and precise evaluation of how Trigonella foenum-graecum seed extract impacts menopausal symptoms and hormonal balance.[28]This study was conducted as a narrative review of the available literature

3. How fenugreek (Trigonella foenum-graecum) eases menopausal symptoms and helps hormonal profiles:

When estrogen and progesterone drop during menopause, a lot of women end up battling hot flashes, restless nights, mood swings, and changes in their metabolism.[29] Sure, HRT can help, but the risks push many women to search for something milder.[30] That's where fenugreek has gained attention. Packed with Saponin, phytoestrogens, and antioxidants, fenugreek helps level out those unstable hormones and actually brings some much-needed relief.[25]

3.1. Comparison with hormone replacement therapy (HRT):

Table. 1: Comparison between Fenugreek (Trigonella foenum-graecum) and Hormone Replacement Therapy (HRT) in the Management of Menopausal Symptoms

Parameter	Fenugreek (Trigonella foenum-graecum)	Hormone Replacement Therapy (HRT)
Nature of intervention	Herbal, plant-based remedy	Pharmacological therapy (estrogen ± progesterone)
Mechanism of action	Contains compounds with phytoestrogenic properties(e.g., steroidal Saponin) that have mild estrogen-like effects	Direct supplementation of endogenous estrogen, restoring hormonal levels
Overall effectiveness	Mild to moderate benefit reported; efficacy varies with formulation, dosage, and individual response	High; widely regarded as most effective evidence-based therapy for menopausal symptom management
Vasomotor symptoms	May reduce hot flashes and night sweats in some women	Significant reduction in frequency and severity of vasomotor symptoms
Psychological symptoms	Some studies report improvement in anxiety, irritability, and mood changes	Often improves mood and emotional stability
Sleep quality	Limited evidence suggests improvement in sleep quality and duration	Significant improvement in menopausal sleep disturbances
Sexual function	Limited evidence suggests possible improvement in libido and vaginal lubrication	Significant improvement in libido and vaginal atrophy

Urogenital health	Mild improvement in vaginal dryness and discomfort reported	Significant improvement in urogenital atrophy and related symptoms
Bone health	Limited and inconclusive evidence; possible supportive role	Proven benefit in preventing bone loss and reducing fracture risk
Cardiovascular effects	May improve lipid profile and glucose metabolism	Effects vary depending on timing, duration, and patient risk profile
Metabolic effects	Potential enhancement of insulin sensitivity and lipid metabolism	Variable effects on lipid and glucose metabolism
Onset of action	Gradual onset, typically over weeks to months	clinical improvement may be observed within weeks
Safety profile	Generally well tolerated with relatively few adverse effects reported	Associated with potential risks (e.g., thromboembolic, breast cancer, stroke)
Common side effects	Mild gastrointestinal discomfort, rare allergic reactions	Breast tenderness, nausea, bloating, increased risk of serious adverse events
Clinical suitability	May be considered for women seeking complementary or alternative approaches	Recommended for moderate to severe menopausal symptoms, to be used under medical supervision
Regulatory status	Commonly marketed as a dietary supplement and generally available without prescription	Prescription-based therapy requiring clinical supervision and monitoring

Tab. 1 compares fenugreek (Trigonella foenum-graecum) and Hormone Replacement Therapy (HRT) in the management of menopausal symptoms. Although HRT remains the most effective treatment for symptom relief, fenugreek shows potential as a natural alternative due to its phytoestrogenic properties and favorable safety profile. However, evidence supporting fenugreek is still limited compared with the well-established efficacy of HRT.[31, 30, 20]

3.2. What does saponin-rich fenugreek (Trigonella foenum-graecum)actually do:

Fenugreek addresses hot flashes and night sweats, lifts mood, reduces anxiety or depression, aids sleep, and even enhances sexual and urogenital functioning[32]. Clinical trials indicate that many women experience an effect within 4 to 8 weeks. In terms of hormones, fenugreek increases estrogen and progesterone slightly and reduces follicle-stimulating hormone (FSH). It can help stabilize the highs and lows of hormones without the undesirable effects of stronger drugs.[25]

The real standout is its Saponin, particularly diosgenin, which function like plant-derived estrogen by binding to estrogen receptors and offering the body additional support.[33]Fenugreek helps regulate hormones, supports mood and sleep by influencing serotonin and dopamine, and its anti-inflammatory and antioxidant properties assist in reducing stress and fatigue.[34]

It also helps improve insulin sensitivity, reduce LDL cholesterol, increase “good” HDL cholesterol, and assist in managing weight and blood sugar[34]. Fenugreek can replicate estrogen’s protective effect on bones, potentially helping to prevent osteoporosis in postmenopausal women.[33]

Thus, fenugreek (Trigonella foenum-graecum) rich in Saponin provides women a natural approach to managing menopause symptoms and hormonal fluctuations, delivering consistent support without the risks associated with synthetic hormone therapy.[35]

3.3. Mechanisms of action of fenugreek(trigonella foenum-graecum) in hormonal modulation and menopausal management[36] :

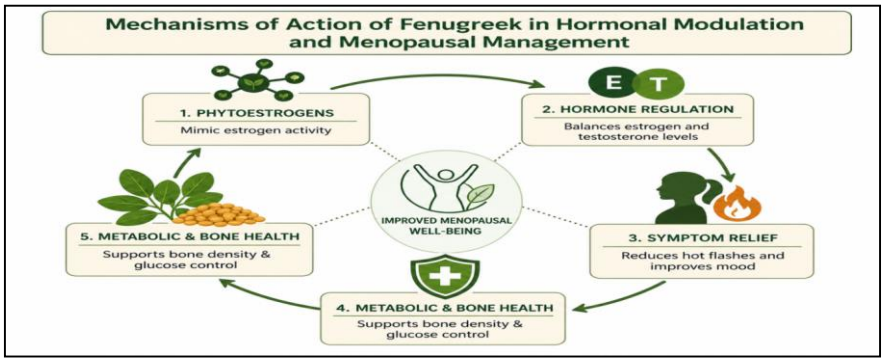


Figure. 2: *Proposed mechanisms of action of fenugreek (*Trigonella foenum-graecum*) in hormonal modulation and menopausal symptom management*

This figure summarizes how Trigonella foenum-graecum may offer positive relief for menopause. Here, the diagram shows how steroidal Saponin, including diosgenin, through estrogen receptor interactions for hormone balance, are active as antioxidants with anti-inflammatory and metabolic regulating effects that support bone health are all helpful in reducing symptoms of menopause.[36]

3.4. Mechanisms of action:

Fenugreek's saponin, such as diosgenin, function as plant-based estrogens, exerting selective effects similar to SERMs, depending on the tissue involved. But there's more: it's an antioxidant, helps combat inflammation, and supports metabolic balance.[35]That's why so many menopause symptoms occur simultaneously.[37]

4. Results and discussion:

The findings of the present review suggest that, Fenugreek (Trigonella foenum-graecum) seed extract, packed with Saponin, seems to have a lot going for it when it comes to handling menopause and hormonal ups and downs[25]. The research so far points to several helpful properties: it acts like a gentle phytoestrogens, fights off oxidative stress and inflammation, supports metabolism, and even helps protect bones. Together, these effects look promising for women navigating menopause.[34]

Digging into the details, studies keep coming back to one core compound diosgenin, a steroidal saponin.[34] It mimics estrogen just enough to interact with the body's estrogen receptors, without shooting up overall estrogen levels.[36] People taking fenugreek in clinical trials saw their follicle-stimulating hormone (FSH) drop while estradiol and progesterone nudged up an encouraging sign that the body's hormones were getting back into sync.[25]

Women who used fenugreek reported feeling better. Symptoms like hot flashes, night sweats, poor sleep, mood swings, fatigue, and anxiety all improved.[38]Their scores on menopause symptom scales and quality of life measures showed the same trend. The benefits likely come from a mix of tweaking hormone balance and gently affecting brain chemistry[25].

There's more. Fenugreek (Trigonella foenum-graecum) seems good for metabolism and the heart. Studies note better glucose control and insulin sensitivity, drops in "bad" LDL cholesterol and triglycerides, and a bump in "good" HDL cholesterol[39]. These changes matter they help shield against metabolic syndrome and heart issues, which often show up more after menopause[40].

The extract even looks like it can help bones stay strong by shifting how bone cells grow and break down bone. The plant's antioxidant and anti-inflammatory action may help with this, too.[32]But in reality, most of these bone findings come from lab and animal tests we still need real-world clinical data.[41]

Comparing fenugreek (Trigonella foenum-graecum) with hormone replacement therapy (HRT), their safety profiles differ considerably. Fenugreek's side effects are usually mild maybe some stomach upset or a brief change in body odor.[36] Unlike HRT, you don't see a big risk of serious issues like blood clots or hormone-linked cancers. That makes fenugreek a promising option for women looking for safer, long-term relief from bothersome menopausal symptoms.[39]

However, some gaps still remain in the available evidence. Many studies used small groups of people and didn't last long. Dosing wasn't always consistent, and the extracts varied. And we still don't know much about how safe fenugreek is after years of use.[38] Researchers need to run larger, more rigorous trials to figure out ideal doses, long-term benefits, and exactly how fenugreek works in the body.[34]

Overall, the reviewed evidence suggests that, saponin-rich fenugreek(Trigonella foenum-graecum) seed extract stands out as a promising plant-based option for managing hormones and easing menopause.[36] For women who want a gentle, natural alternative to standard hormone therapy, fenugreek offers real potential though more solid evidence will help define its place in menopausal care.[42]

5. Conclusion:

Menopause triggers a range of changes, including hormonal fluctuations, metabolic shifts, mood swings, and can also negatively affect bone health. All of this can significantly impact women's quality of life.[43]This review highlights fenugreek (Trigonella foenum-graecum), rich in Saponin, particularly diosgenin[36]. Beyond its hormonal effects, fenugreek serves as an antioxidant, combats inflammation, safeguards nerves, and aids in regulating metabolism.[34]

Both laboratory studies and real-world trials indicate that fenugreek can help women experiencing menopause. It can help reduce hot flashes, improve mood, aid sleep, support sexual and urinary health, and promote better metabolism and bone health.[25] In addition, fenugreek has a much milder history of side effects compared to hormone replacement therapy (HRT). That makes it a reliable option for women seeking a natural alternative or complement to HRT.[39]

Still, that's not the last word. Many studies involved small participant groups, lasted only briefly, or failed to maintain consistent dosing.[39]What's required are bigger, more extended studies with well-defined protocols that can truly clarify how fenugreek functions, the optimal way to administer it, and the reasons behind its effectiveness.[38]

In conclusion, fenugreek (Trigonella foenum-graecum) seed extract packed with saponin appears to be a compelling option for menopause support, helping women feel more balanced and alleviating challenging symptoms, particularly over time.[44]

6. Author contribution in this review article:

The author confirms sole responsibility for all aspects of the manuscript, including conception, literature review, analysis, writing, and final approval.

7. Funding:

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8. Data availability statement:

All data generated or analyzed during this study are included in this published article. Any additional information related to the study is available from the corresponding author upon reasonable request.

9. Conflicts of interest:

The authors declare that there are no conflicts of interest regarding the publication of this manuscript. The authors alone are responsible for the content and writing of the paper.

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11. References:

(1) Ko SH, Kim HS. Metabolic disorders in menopause. J Menopausal Med. 2015;21(2):83-90. doi:10.6118/jmm.2015.21.2.83

(2) Warren MP. A comparative review of the risks and benefits of hormone replacement therapy regimens. Am J Obstet Gynecol. 2004;190(4):1141-1167. doi:10.1016/j.ajog.2003.09.033

(3) Wang N, He F, Li W, Fang X, Li H. Purification of the total steroidal saponins from fenugreek seeds (Trigonella foenum-graecum L.) using aqueous two-phase system and determination of diosgenin content using micellar electrokinetic chromatography method. Nat Prod Res. 2019;33(3):453-456. doi:10.1080/14786419.2018.1455047

(4) Ulbricht C, Basch E, Burke D, et al. Fenugreek (Trigonella foenum-graecum L. Leguminosae): an evidence-based systematic review by the Natural Standard Research Collaboration. J Herb Pharmacother. 2007;7(3-4):143-177. doi:10.1080/J157v07n03_14

(5) Bhat MRK, Nagamma T, Konuri A. Medicinal value of phytoestrogens in Trigonella foenum-graecum L (Fenugreek): review. Bioinformation. 2020;16(11):832-837.

(6) Khanna A, Thomas J, John F, Maliakel B, Krishnakumar IM. Safety and influence of a novel extract of fenugreek on healthy young women: a randomized, double-blinded, placebo-controlled study. Clin Phytosci. 2021;7(1):63. doi:10.1186/s40816-021-00296-y

(7) Nedrow A, Miller J, Walker M, Nygren P, Huffman LH, Nelson HD. Complementary and alternative therapies for the management of menopause-related symptoms: a systematic evidence review. Arch Intern Med. 2006;166(14):1453-1465. doi:10.1001/archinte.166.14.1453

(8) Taylor WG, Zulyniak HJ, Richards KW, Acharya SN, Bittman S. Variation in diosgenin levels among 10 accessions of fenugreek seeds produced in western Canada. J Agric Food Chem. 2002;50(21):5994-5997. doi:10.1021/jf020293k

(9) Verma A, Gupta AK, Sana S, et al. Phytoestrogenic effect of fenugreek seed extract helps in ameliorating leg pain and vasomotor symptoms in postmenopausal women: a randomized, double-blinded, placebo-controlled study. PharmaNutrition. 2020;14:100209. doi:10.1016/j.phanu.2020.100209

(10) Geberemeskel GA, Debebe YG, Nguse NA. Antidiabetic effect of fenugreek seed powder solution (Trigonella foenum-graecum L.) on hyperlipidemia in diabetic patients. J Diabetes Res. 2019;2019:8507453. doi:10.1155/2019/8507453

(11) Srinivasan K. Fenugreek (Trigonella foenum-graecum): a review of health beneficial physiological effects. Food Rev Int. 2006;22(2):203-224. doi:10.1080/87559120600586315
(12) Cagnacci A, Venier M. The controversial history of hormone replacement therapy. Medicina (Kaunas). 2019;55(9):602. doi:10.3390/medicina55090602
(13) Basch E, Ulbricht C, Kuo G, Szapary P, Smith M. Therapeutic applications of fenugreek. Altern Med Rev. 2003;8(1):20-27.
(14) Monteleone P, Mascagni G, Giannini A, Genazzani AR, Simoncini T. Symptoms of menopause: global prevalence, physiology and implications. Nat Rev Endocrinol. 2018;14(4):199-215. doi:10.1038/nrendo.2017.180
(15) Rossouw JE, Anderson GL, Prentice RL, et al. Risks and benefits of estrogen plus progestin in healthy postmenopausal women: principal results from the Women's Health Initiative randomized controlled trial. JAMA. 2002;288(3):321-333. doi:10.1001/jama.288.3.321
(16) Mafi F, Bigdeli Shamloo MB, Kazemzadeh R, Pourmasumi S. The effect of fenugreek on menopausal symptoms: a systematic review. J Herb Med. 2021;28:100451.
(17) Meghwal M, Goswami TK. A review on the functional properties, nutritional content, medicinal utilization and potential application of fenugreek. J Food Process Technol. 2012;3(9):181. doi:10.4172/2157-7110.1000181
(18) Chen MN, Lin CC, Liu CF. Efficacy of phytoestrogens for menopausal symptoms: a meta-analysis and systematic review. Climacteric. 2015;18(2):260-269. doi:10.3109/13697137.2014.966241
(19) Bedell S, Nachtigall M, Naftolin F. The pros and cons of plant estrogens for menopause. J Steroid Biochem Mol Biol. 2014;139:225-236. doi:10.1016/j.jsbmb.2012.12.004
(20) Visuvanathan T, Than LTL, Stanslas J, Chew SY, Vellasamy S. Revisiting Trigonella foenum-graecum L.: pharmacology and therapeutic potentialities. Plants (Basel). 2022;11(11):1450. doi:10.3390/plants11111450
(21) Stuenkel CA, Davis SR, Gompel A, Lumsden MA, Murad MH, Pinkerton JV, Santen RJ. Treatment of symptoms of the menopause: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2015;100(11):3975-4011. doi:10.1210/jc.2015-2236
(22) Santoro N, Epperson CN, Mathews SB. Menopausal symptoms and their management. Endocrinol Metab Clin North Am. 2015;44(3):497-515. doi:10.1016/j.ecl.2015.05.001
(23) Khanna A, John F, Das S, Thomas J, Rao J, Maliakel B, et al. Efficacy of a novel extract of fenugreek seeds in alleviating vasomotor symptoms and depression in perimenopausal women: a randomized, double-blinded, placebo-controlled study. J Food Biochem. 2020;44(12):e13507. doi:10.1111/jfbc.13507
(24) International Committee of Medical Journal Editors. Recommendations for the conduct, reporting, editing, and publication of scholarly work in medical journals. Updated December 2023. Accessed May 29, 2026.
(25) Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, Welch VA, editors. Cochrane Handbook for Systematic Reviews of Interventions. 2nd ed. Chichester (UK): Wiley; 2019.
(26) Khorshidian N, Yousefi M, Khanniri E, Mortazavian AM. Potential application of fenugreek seeds as functional food and nutraceutical ingredients: a comprehensive review. Nutr Food Sci Res. 2016;3(1):5-16. doi:10.18869/acadpub.nfsr.3.1.5
(27) Baethge C, Goldbeck-Wood S, Mertens S. SANRA—a scale for the quality assessment of narrative review articles. Res Integr Peer Rev. 2019;4:5. doi:10.1186/s41073-019-0064-8
(28) Krebs EE, Ensrud KE, MacDonald R, Wilt TJ. Phytoestrogens for treatment of menopausal symptoms: a systematic review. Obstet Gynecol. 2004;104(4):824-836. doi:10.1097/01.AOG.0000140688.71638.d3
(29) Baber RJ, Panay N, Fenton A. 2016 IMS Recommendations on women's midlife health and menopause hormone therapy. Climacteric. 2016;19(2):109-150. doi:10.3109/13697137.2015.1129166
(30) Moalic S, Liagre B, Corbière C, Bianchi A, Dauca M, Bordji K, et al. A plant steroid, diosgenin, induces apoptosis, cell cycle arrest and COX activity inhibition in osteosarcoma cells. Eur J Pharmacol. 2001;428(3):321-330. doi:10.1016/S0014-2999(01)01283-7
(31) Yadav UC, Baquer NZ. Pharmacological effects of Trigonella foenum-graecum L. seeds: a review. Pharm Biol. 2014;52(1):1-13. doi:10.3109/13880209.2013.826247
(32) Kassaian N, Azadbakht L, Forghani B, Amini M. Effect of fenugreek seed powder on glycemic control and lipid profile in type 2 diabetic patients. Int J Vitam Nutr Res. 2009;79(1):34-39. doi:10.1024/0300-9831.79.1.34

(33) Wani SA, Kumar P. Pharmacological effects of Trigonella foenum-graecum L. seeds: a review. Phytother Res. 2018;32(2):255-275. doi:10.1002/ptr.5978
(34) Abedinzade M, Nasri S, Omodi MJ, Ghasemi E. Efficacy of Trigonella foenum-graecum seed extract in reducing metabolic and inflammatory alterations associated with menopause. Iran Red Crescent Med J. 2015;17(11):e26685. doi:10.5812/ircmj.26685
(35) Tham DM, Gardner CD, Haskell WL. Clinical review of the effects of phytoestrogens on menopausal symptoms. Am J Med. 1998;104(2):131-138. doi:10.1016/S0002-9343(97)00366-3
(36) Neelakantan N, Narayanan M, de Souza RJ, van Dam RM. Effect of fenugreek (Trigonella foenum-graecum L.) on glycemia: a systematic review and meta-analysis of clinical trials. Nutr J. 2014;13:7. doi:10.1186/1475-2891-13-7
(37) Muka T, Oliver-Williams C, Colpani V, et al. Association of menopausal characteristics with coronary heart disease and cardiovascular mortality: a systematic review and meta-analysis. J Am Coll Cardiol. 2016;68(17):1829-1843. doi:10.1016/j.jacc.2016.08.041
(38) Al-Harbi MM, Qureshi S, Raza M, Ahmed MM, Afzal M, Shah AH. Pharmacological effects of Trigonella foenum-graecum L. (fenugreek): a review of preclinical evidence. Phytother Res. 2019;33(10):2698-2710. doi:10.1002/ptr.6450
(39) Neelakantan N, Narayanan M, de Souza RJ, van Dam RM. Effect of fenugreek (Trigonella foenum-graecum L.) intake on glycemia: a meta-analysis of clinical trials. Nutr J. 2014;13:7. doi:10.1186/1475-2891-13-7
(40) Gurka MJ, Vishnu A, Santen RJ, DeBoer MD. Progression of metabolic syndrome severity during the menopausal transition. J Am Heart Assoc. 2016;5(8):e003609. doi:10.1161/JAHA.116.003609
(41) Shirwaikar A, Malini S, Kumari SC. Protective effect of fenugreek seeds against osteoporosis in ovariectomized rats. Phytother Res. 2003;17(6):660-664. doi:10.1002/ptr.1198
(42) Rahmati-Roodsari M, Bahmani M, Rafieian-Kopaei M. Fenugreek (Trigonella foenum-graecum L.) in women's health: a review of clinical evidence and traditional use. J Herb Med. 2024;43:100816. doi:10.1016/j.hermed.2023.100816
(43) Santoro N, Roeca C, Peters BA, Neal-Perry G. The menopause transition: signs, symptoms, and management options. J Clin Endocrinol Metab. 2021;106(1):1-15. doi:10.1210/clinem/dgaa764
(44) Hakimi F, Zarei S, Mohammad Alizadeh Charandabi S, et al. The effect of fenugreek seed extract on menopausal symptoms in postmenopausal women: a randomized controlled trial. Phytother Res. 2021;35(6):3047-3056. doi:10.1002/ptr.7025