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A REVIEW OF THE EFFECTS OF FENUGREEK (TRIGONELLA FOENUM-GRAECUM L.) SUPPLEMENTATION ON ENDOCRINE FUNCTION, SEXUAL HEALTH, AND MUSCLE PERFORMANCE IN ADULTS

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ABSTRACT

Research objectives: The purpose of this review is to present scientific evidence on the effects of fenugreek seed extract on sex hormone concentrations, sexual function, functional and morphological parameters of skeletal muscle in adults, and to summarize data on the safety of its supplementation.

Methods: A literature review was conducted using PubMed and Google Scholar with a focus on papers from the last ten years. The research included keywords: *Trigonella foenum-graecum*, fenugreek, testosterone, safety, libido, skeletal muscles

Key findings and conclusions: Fenugreek (*Trigonella foenum-graecum* L.) is a plant from the Fabaceae family that has been used for centuries in traditional Indian medicine, particularly within Ayurveda. It is reported to have a range of health-promoting properties, including stimulating appetite and lactation, enhancing libido, and alleviating menopausal symptoms. Some studies also suggest that it may help regulate blood glucose levels in individuals with type 2 diabetes, lower cholesterol levels, and improve sexual function in men.

Fenugreek seeds are rich in bioactive compounds such as alkaloids, steroidal saponins, flavonoids, and 4-hydroxyisoleucine. Among these, saponins—especially diosgenin and yamogenin, which make up approximately 4.8% of the seed content—are considered particularly important due to their estrogenic and androgenic activity. While fenugreek supplementation may offer various health benefits, some sources also point to potential adverse effects, including possible toxicities resulting from improper or excessive use of fenugreek-based products.

KEYWORDS

Trigonella Foenum-Graecum, Fenugreek, Testosterone, Safety, Libido, Skeletal Muscles

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Introduction

Fenugreek (*Trigonella foenum-graecum* L.), a member of the Fabaceae family, is a drought-tolerant plant cultivated in many regions of the world, mainly the Indian subcontinent and North Africa. It is one of the oldest medicinal plants and is also used as a food additive (Gupta et al., 2021; Ouzir et al., 2016; Zandi et al., 2015). It serves as a spice (seeds), herb (dried or fresh leaves), vegetable (fresh leaves), as well as a flavoring agent and a precursor in the synthesis of steroids and other hormones (Ouzir et al., 2016). In traditional Ayurvedic medicine, it was used to treat conditions such as diabetes, hypercholesterolemia, and endocrine disorders; its uses included promoting lactation and improving sexual function (Gupta et al., 2021; Khanna et al., 2020). In Morocco, it was also used to increase women's appetite, which, in that cultural context, was perceived as a way to enhance physical attractiveness (Ouzir et al., 2016). Studies have shown that fenugreek supplementation can help lower blood glucose levels in people with type 1 diabetes and reduce myocardial oxidative stress (Haghani et al., 2016).

Fenugreek exhibits a complex phytochemical composition, including alkaloids, polyphenols, flavonoids, lipids, carbohydrates, amino acids, coumarins, vitamins, and steroidal saponins, which are particularly relevant due to their impact on the endocrine system (Nagulapalli Venkata et al., 2017; Ouzir et al., 2016). Steroidal saponins account for approximately 4.8% of the seed's composition, with diosgenin and yamogenin being the main representatives of this group (Ouzir et al., 2016). Diosgenin, a plant-derived steroid, has been investigated for its potential benefits on physical health and performance. The literature also describes potential androgenic and anabolic effects of saponin glycosides extracted from fenugreek in men (Isenmann et al., 2023). In recent years, there has been increasing interest in dietary supplement formulations containing fenugreek extract (e.g. Testofen®, Furosap®) aimed at supporting physical performance and overall well-being (Isenmann et al., 2023; A. J. Rao et al., 2020; Sankhwar et al., 2023).

One of the key areas of research on fenugreek is its potential impact on testosterone levels, particularly in relation to symptoms of testosterone deficiency in aging men. Low testosterone may present as psychological symptoms (e.g., depression), physical ones (such as fatigue), and most notably, issues related to sexual health, including erectile dysfunction and decreased libido (Corona et al., 2017). In women, the effects of fenugreek on hormonal balance have been explored, especially in connection with peri-menopausal symptoms (hot flashes, night sweats, depression, insomnia) (Khanna et al., 2020), as well as its influence on sexual function in healthy menstruating women experiencing reduced sexual desire (A. Rao et al., 2015).

The purpose of this review article is to analyze and summarize the available scientific evidence, with a focus on recent clinical trials, including randomized controlled trials (RCTs) and meta-analyses, on the effects of fenugreek extract supplementation on testosterone levels, libido and musculoskeletal-related parameters (strength, muscle mass) in adults. Both male data and available findings in women are included. The article aims to present the current state of knowledge in this area and discuss the potential benefits and safety issues of fenugreek-containing supplements.

Methodology

This article reviews the existing scientific literature on fenugreek (*Trigonella foenum-graecum* L.) extract supplementation in adults, especially in relation to its effects on testosterone levels, sexual health, and muscle performance. It also discusses the safety of its use. The paper aims to summarize key findings and insights from selected publications over the past 10 years, with an emphasis on recent randomized controlled trials (RCTs).

A search of the PubMed and Google Scholar electronic databases was conducted to gather relevant publications, covering literature published from 2015 to early 2025. A combination of keywords was used, such as “fenugreek,” “*Trigonella foenum-graecum*,” “testosterone,” “safety,” “libido,” and “skeletal muscles.” Additional sources were identified by screening the reference lists of selected articles.

The selection process was carried out in two stages. First, the titles and abstracts of the identified publications were screened for relevance. Then, the full texts of selected articles were reviewed to confirm their suitability for inclusion.

This paper aims to provide a broad overview of the available research, with a focus on key findings and areas of disagreement or uncertainty in the literature.

Results

The clinical trials included in this review involved a diverse range of participants, such as healthy young men (Albaker, 2023; Guo et al., 2018; A. J. Rao et al., 2020; Sankhwar et al., 2023; Smith et al., 2021; Wankhede et al., 2016), healthy aging men (A. Rao et al., 2016), men with symptoms of benign prostatic hyperplasia (BPH) (A. Rao & Grant, 2020), and men with hypogonadism or symptoms of low testosterone (Maheshwari et al., 2017), as well as perimenopausal women experiencing vasomotor symptoms and depression (Khanna et al., 2020; A. Rao et al., 2015), and healthy menstruating women reporting reduced libido (Khanna et al., 2021; A. Rao et al., 2015).

Effects on endocrine function

Recent systematic reviews and meta-analyses indicate that fenugreek seed extracts are among the herbs with the best documented positive effects on testosterone concentrations in men (Isenmann et al., 2023; Skrzypiec-Spring et al., 2024; Smith et al., 2021). A 2021 review of six fenugreek studies found that four of them resulted in increased testosterone concentrations in subjects (Smith et al., 2021). A 2023 meta-analysis including seven studies found little effect of fenugreek on total testosterone levels (Isenmann et al., 2023).

In a 2018 study, supplementation with Furosap® (250 mg/day) for 12 weeks in men aged 18–30 was associated with a significant increase in total testosterone compared to placebo (by 22.7%) (Skrzypiec-Spring et al., 2024; Smith et al., 2021). A 2016 study (Testofen® 600 mg/day for 12 weeks) in older men aged 43–70 also showed significant increases in total testosterone (12.2%) and free testosterone (9.5%) compared to placebo (A. Rao et al., 2016; Smith et al., 2021).

A 2017 study (Furosap®, 500 mg/day, 12 weeks) in men aged 35–65 showed a substantial increase (by 47%) in total testosterone concentrations, while free testosterone increased only slightly (8%) (Maheshwari et al., 2017). Other studies have also reported positive effects on free testosterone (Khanna et al., 2021; Smith et al., 2021; Wankhede et al., 2016).

In a 2024 study, an intervention with fenugreek extract (TrigozimR – 600, 1200, and 1800 mg/day for 12 weeks) in men aged 40–80 showed an increase in total plasma testosterone at each dose. However, a statistically significant increase compared to placebo was observed only at the highest dose. The study also measured salivary testosterone levels, which the authors considered to be representative of free testosterone. A significant increase in salivary testosterone was observed in the TrigozimR group compared to placebo (Lee-Ødegård et al., 2024).

In a study involving women, fenugreek seed extract (Libifem®) at a dose of 600 mg/day for two menstrual cycles in healthy menstruating women resulted in a significant increase in free testosterone and estradiol levels compared to placebo (A. Rao et al., 2015). A 2021 study (FHE, 250 mg twice daily for 42 days) in healthy young women also showed significant increases in estradiol, as well as total and free testosterone (Khanna et al., 2021). A 2016 study (FenuSMART®) conducted in postmenopausal women reported significant changes in estradiol, progesterone, and testosterone levels, moving toward hormonal rebalancing (Khanna et al., 2020, 2021; Thomas et al., 2020).

Based on the available literature, the effect of fenugreek on sex hormone-binding globulin (SHBG) appears to be minimal. Studies involving Testofen® and TrigozimR showed no significant differences in SHBG levels compared to placebo (Lee-Ødegård et al., 2024; A. Rao et al., 2016; Smith et al., 2021).

In vitro studies from 2025 conducted on mouse Leydig cells demonstrated that fenugreek microneedle extract at lower concentrations (up to 250 µg/mL) significantly stimulated progesterone and testosterone release after 24 and 48 hours of exposure. In contrast, higher doses led to an inhibition of hormone release. The authors suggest that this effect may be related to the presence of phytonutrients (e.g., glycosides and saponins), which exhibit androgenic and anabolic potential and may influence enzymes such as aromatase and 5-alpha-reductase (Jambor et al., 2025).

Effects on sexual health

A number of studies have reported positive effects of fenugreek supplementation on libido and sexual function, particularly in men (Maheshwari et al., 2017; A. Rao et al., 2015, 2016). A 2016 study (Testofen®) in older men demonstrated improvements in sexual function, including an increase in the number of morning erections and the frequency of sexual activity (A. Rao et al., 2016). A 2017 study (Furosap®) in men aged 35–65 showed significant improvements in cardiovascular health and libido (Maheshwari et al., 2017). Fenugreek has also been shown to improve sperm count, motility, and morphology in healthy male volunteers (Maheshwari et al., 2017; Sankhwar et al., 2023).

A 2024 study (TrigozimR) in men aged 40–80 found no significant differences in subjective measures of erection quality, vigor, sexual desire, or enjoyment of sex compared to placebo. However, the study was conducted on a relatively small cohort (Lee-Ødegård et al., 2024).

In women, both the 2015 (Libifem®) and 2021 (FHE) studies reported increased sexual desire and arousal, along with a reduction in sexual dysfunction symptoms compared to placebo (Khanna et al., 2021; A. Rao et al., 2015).

Effects on muscle performance and body composition

Several studies have examined the effects of fenugreek on muscle performance and body composition, primarily in resistance-trained men. A 2023 literature review summarized findings in this area, noting that four out of six included randomized controlled trials (RCTs) reported significant improvements in muscular strength and endurance (defined as the number of repetitions performed before fatigue), along with increases in lean body mass and reductions in fat mass (Albaker, 2023).

A 2020 study (Testofen®, 600 mg/day for 8 weeks) combined with calisthenic training reported greater gains in strength and muscle mass in men compared to placebo (A. J. Rao et al., 2020). Similarly, a 2016 study using a fenugreek glycoside fraction (Fenu-FG®, 300 mg twice daily for 8 weeks) found that supplementation significantly improved muscular endurance and showed anabolic and androgenic effects when combined with regular resistance training (Wankhede et al., 2016).

On the other hand, a 2023 meta-analysis reported a non-significant effect of fenugreek on total testosterone, free testosterone, and muscle performance in leg press exercise among physically active men, while still suggesting a potential anabolic or performance-enhancing effect (Isenmann et al., 2023).

A 2018 study (Furosap®, 250 mg/day for 12 weeks) in healthy athletes showed that supplementation significantly increased average lean body mass compared to placebo (Guo et al., 2018).

In women, a 2023 study (Libifem®, 600 mg or 300 mg/day for 8 weeks) showed that supplementation combined with exercise significantly increased lean body mass and decreased total fat mass, as well as improved muscle strength in the leg press exercise compared to placebo. The effect was more pronounced in women taking the higher dose of Libifem®. This result is comparable to previous findings observed in men (A. Rao et al., 2023).

Safety

Fenugreek supplementation in clinical trials has generally been evaluated as safe and well tolerated (Kandhare et al., 2019; Wankhede et al., 2016). The 2017 Furosap™ study demonstrated a broad safety profile based on blood chemistry analyses. No significant changes were observed in lipid profile, blood morphology, or markers indicating hepatotoxicity or nephrotoxicity (Maheshwari et al., 2017).

However, there are reports highlighting potential side effects and safety concerns related to fenugreek supplementation (Ouzir et al., 2016). Its use may be associated with gastrointestinal symptoms such as diarrhea, bloating, indigestion, and abdominal pain, as well as with episodes of hypoglycemia (Albaker, 2023; Ouzir et al., 2016). Caution is advised when consuming fenugreek preparations rich in amino acids with high nitrogen content, as excessive intake may lead to liver or kidney damage (Lee & Kim, 2019).

Clinical case reports from 2022 and 2017 described instances of pulmonary embolism potentially linked to testosterone-boosting supplements containing fenugreek. It has been suggested that this may be related to testosterone-induced polycythemia vera and increased platelet aggregation (Alakhras et al., 2022; Nguyen et al., 2017).

Concerns have also been raised based on animal studies regarding reproductive toxicity, teratogenicity, and hematological, biochemical, and histological changes in various organs. Some studies suggest that fenugreek may impair nervous system development (Ouzir et al., 2016).

The literature also describes the possibility of cross-allergy after fenugreek ingestion in individuals allergic to peanuts (Takei et al., 2024). It is also worth noting that herbal supplements, including those containing fenugreek, may be poorly regulated and contaminated with undeclared substances, posing health risks and potentially leading to positive doping test results (Albaker, 2023; Kandhare et al., 2019; Skrzypiec-Spring et al., 2024).

Discussion and conclusions

Analysis of recent clinical trials leads to increasingly consistent findings, although further rigorous studies involving larger participant groups are still needed. The main conclusions of this literature review are as follows:

Endocrine functions

Fenugreek extracts have shown promising effects in increasing testosterone levels in men, as confirmed by systematic reviews and meta-analyses (Isenmann et al., 2023; Smith et al., 2021). A 2024 study (TrigozimR) reported an increase in total plasma testosterone at the highest dose administered (1800 mg), along with a significant increase in salivary testosterone (Lee-Ødegård et al., 2024).

Additionally, a 2025 in vitro study on mouse Leydig cells suggests that low doses of fenugreek extract stimulate the release of progesterone and testosterone, while higher doses may exert an inhibitory effect (Jambor et al., 2025). In women, beneficial effects on hormonal balance have also been observed, including increases in free testosterone and estradiol levels (Khanna et al., 2020; A. Rao et al., 2015).

Sexual health

A number of studies have reported improvements in libido and sexual function in both men and women (Khanna et al., 2020; A. Rao et al., 2015, 2016). In men, fenugreek supplementation has also been associated with improved sperm motility and morphology, as well as increased sperm count (Maheshwari et al., 2017; Sankhwar et al., 2023). A 2024 in-silico study further suggests that bioactive compounds found in fenugreek, such as gitogenin and vitexin, may act as inhibitors of the PDE5 enzyme—a potential mechanism for promoting erectile function (Ray et al., n.d.).

Muscle performance and body composition

Fenugreek supplementation appears to have performance-enhancing and anabolic effects (Isenmann et al., 2023). These are reflected in increases in strength, muscular endurance (i.e., number of repetitions performed before fatigue), lean body mass, and reductions in body fat (Albaker, 2023; A. J. Rao et al., 2020; Wankhede et al., 2016). Similar benefits in body composition and muscle strength have been observed in women: supplementation with Libifem®, combined with exercise, significantly increased lean body mass, reduced body fat mass, and improved strength in the leg press exercise compared to placebo (A. Rao et al., 2023).

Safety

Reliable studies conducted in accordance with GLP, OECD, and ICH-GCP guidelines using clearly identified test materials suggest a wide safety margin for standardized fenugreek extracts (Kandhare et al., 2019). Nevertheless, gastrointestinal complaints such as diarrhea, bloating, and abdominal pain have been reported (Albaker, 2023; Ouzir et al., 2016).

There are also rare but serious clinical case reports (2022) linking fenugreek supplementation to pulmonary embolism. The authors suggest a possible association between supplementation and polycythemia vera, as well as increased platelet aggregation induced by elevated testosterone levels (Alakhras et al., 2022).

Animal studies have raised concerns about reproductive toxicity, teratogenicity, and possible effects on nervous system development (Gupta et al., 2021; Ouzir et al., 2016). In addition, fenugreek may trigger allergic reactions—including asthmatic symptoms—in individuals allergic to peanuts (Albaker, 2023; Gupta et al., 2021; Ouzir et al., 2016).

The lack of proper regulation in the herbal supplement market remains a significant issue, leading to potential contamination and ingredient variability, which may pose health risks and result in positive doping test outcomes (Albaker, 2023; Kioukia-Fougia et al., 2017).

In conclusion, fenugreek has demonstrated both established and promising effects in supporting endocrine function, sexual health, and muscular performance. Despite its generally favorable safety profile, further rigorous, long-term clinical trials involving large cohorts and using well-characterized, standardized formulations are needed. Such studies will help to better elucidate its mechanisms of action, optimize dosing strategies, and accurately assess long-term safety. Strengthening regulatory oversight of dietary supplements remains equally important.

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