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# Effectiveness of Fenugreek Seeds against Polycystic Ovarian Syndrome

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## ABSTRACT

Polycystic Ovarian Syndrome (PCOS) is one of the most common hormonal issues which predominantly affects women among reproductive years and can lead to irregular menstrual cycles, infertility, miscarriages, and excessive facial hairs. Infertility, obesity, lipid metabolism disorders, and insulin resistance are at the root of Polycystic Ovarian Syndrome. It is diagnosed with ultrasound and blood hormonal tests. Phytomedicines have been used in ancient times and recent research has approved potential benefits to advance disease treatment. Asia, Europe, and the Mediterranean region are home to fenugreek. Fenugreek may regulate estrogen and testosterone levels, which is effective against Polycystic Ovarian Syndrome. In women with polycystic ovary syndrome, fenugreek improved body weight, number of ovarian cysts, ovary size, irregular hair growth, and monthly regularity. Sonographic results and menstrual cycle are improved in polycystic Ovarian Syndrome women receiving adjuvant therapy to the fenugreek seed extract. The effectiveness of a standardized *Trigonella foenum- graecum* extract (Furocyst®) as a phytotherapeutic agent for the efficient management of Polycystic Ovarian Syndrome has been reported in literature [1]. Fenugreek seeds act as functional food that can give various health related benefits beyond basic nutrition. This review aimed to highlight the therapeutic effects of fenugreek seeds in the management of Polycystic Ovarian Syndrome.

## INTRODUCTION

Polycystic ovarian syndrome (PCOS), a frequent and complex endocrine condition, affecting roughly 7% women of reproductive age [2]. A thorough physical examination and a detailed medical history, including family history, are the first steps in evaluating a girl who exhibits symptoms and indicators of PCOS. Appropriate laboratory testing is then performed [3]. The latest recommendations state that this initial laboratory panel should include erythrocyte sedimentation rate, complete blood count, comprehensive metabolic profile, serum LH and FHS, and pregnancy test [4]. Prolactin, total testosterone, androstenedione, SHBG, thyroid function, dehydroepiandrosterone sulfate (DHEAS), and the concentration of 17-hydroxyprogesterone may also be included. Additionally, lipid values, fasting glucose, and glycated hemoglobin (HbA1c) are usually asked [5]. Additionally, prior research revealed that fenugreek had neuroprotective, antidepressant, and antianxiety qualities in addition to improving cognitive abilities and Parkinson's symptoms. According to a recent study, fenugreek and its extract have positive benefits on hormonally associated conditions such male impotence and galactagogue in nursing mothers. Along with other vital nutrients required for healthy growth and development, fenugreek is regarded as

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a rich source of dietary fiber. Research has also confirmed fenugreek's physiological and nutraceutical qualities, supporting its prospective use in the creation of various medicinal and functional food items [6]. Many traditional cuisines have made extensive use of fenugreek as a flavor enhancer. Furthermore, fenugreek is a valuable ingredient for the food and pharmaceutical industries due to its anticarcinogenic, antidiabetic, antioxidant, hypo cholesterolemic, anti-lithogenic, antibacterial, and immunological qualities [7].

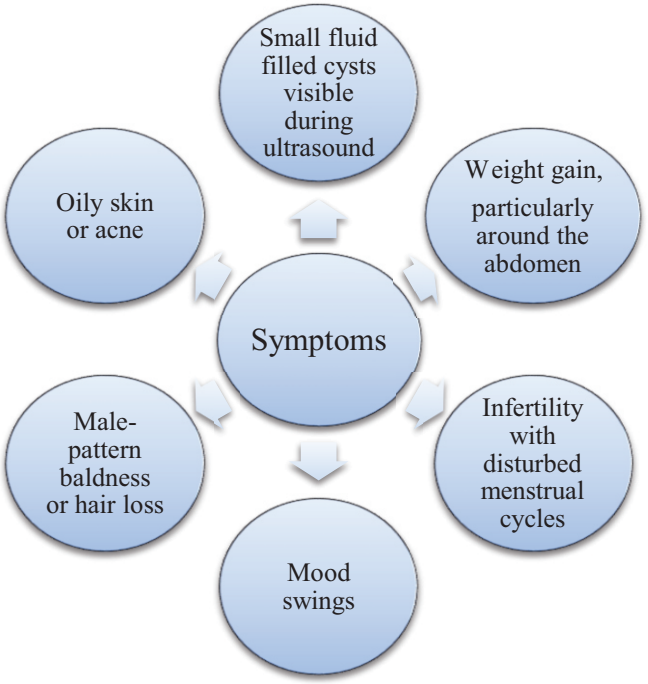


**Figure 1:** Symptoms of Polyovarian Cystic Syndrome

Natural plant components known as phytochemicals have a variety of medicinal uses. For ages, traditional remedies have made use of these chemicals' advantageous qualities, underscoring their potential as therapeutic candidates [8, 9]. A tiny, fragrant herb known as fenugreek (*Trigonella foenum-graecum*) belongs to the legume family (*Fabaceae*). Originating in the Eastern Mediterranean region and the Indian subcontinent, it is regarded as one of the first medicinal herbs and is now highly valued as food, spice, condiment, and traditional medicine (*Trigonella foenum-graecum, or fenugreek*) is a tiny, aromatic herb with seeds that belongs to the Fabaceae family of legumes. The Greek word trigonous is derived from the source of this plant's name. Because of the triangular shape of the leaflets, which implies a triangle, and is meant by the phrase *Foenum-graecum* is Greek hay or Greek grass. This versatile crop is now expanded globally on a commercial basis as a result of growing demand and specific uses in the value chains for food, wellness, and pharmaceuticals. For example, the market for fenugreek seed extract is anticipated to expand at a compound annual growth rate of 10% between 2024 and 2032 due to rising awareness of the extracts possible health advantages [10].

**Table 1:** Nutritional Composition of Fenugreek Seeds

| Nutrients | 100g of Fenugreek Seeds | References |
|---|---|---|
| Dietary Fiber | 24.6g | [10] |
| Carbohydrates | 58.4g | [10] |
| Protein | 23g | [10] |
| Fat | 6.4g | [10] |
| Ash | 3.4g | [10] |
| Moisture | 8.8g | [10] |
| Crude | 23g | [10] |

Tigogenin, Diosgenin, Trigonelline, the steroidal sapogenins B, C, D, E, and G, as well as apigenin, kaempferol, luteolin, atroside, and yamagenin Graecunin (Saponins of Spirostanol) Gitogenin, also known as dihydroxy-sapogenins Triterpenoids a complicated carbohydrate called galactomannan Isoleucine. The important amino acid 4-hydroxylaseAlkaloids: fenugreekine glycosides that hydrolyze to produce steroidal sapogenins (diosgenin, yamogenin, tigogenin, and neo tigogenin); sitosterol and cholesterol; vitamins A, B1, C, and nicotinic acid. Amino acids and protein: According to a study that was done, the amino acid profile of fenugreek seeds is made up of globulins, albumins, prolamins and glutelins. The substantial presence of amino acids in fenugreek seeds, including arginine, threonine, glutamic acid, aspartic acid, and leucine, led to this conclusion. This is because the seeds have relatively low levels of histidine and methionine, but high levels of lysine, an important amino acid. Fenugreek seeds have an average protein concentration of 23%, with a range of 13% to 39%. This is similar to the high protein values of other cultivated legumes, like the mung bean, cowpea, and field pea. It was discovered that it varied from 25% to 39% in five distinct NDM kinds, primarily depending on the fenugreek variety [11]. It lowers the blood cholesterol levels by preventing its absorption via intestines. Flavonoids which are excellent antioxidants are also present among fenugreek which plays the defensive role against free radical. Fenugreek seeds are antioxidant in nature which improves the immune system and helps to fight against chronic diseases. It is known that fenugreek seeds contain alkaloids, such as choline and trigonelline. Because it increases insulin sensitivity, Tripoline has been demonstrated to have antidiabetic effects in relation to blood sugar regulation. Bio active compounds of fenugreek seeds Galactomannan and volatile compounds: A primary polysaccharide in fenugreek, and a component of the cell wall. It has the ability to lower plasma glucose level and has a preventative impact on diabetes [12].

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**Table 2:** Bioactive Component of Fenugreek Seeds

| Classes | Bioactive Components | Role in PCOS | References |
|---|---|---|---|
| Saponins | Trigofoenosides A-G, graecunins, Neogitogenin | In women with PCOS, increased pregnancy, regular menstrual cycle and reduced size of cyst. | [13] |
| Flavanoids | Orientin, Calycosin, Luteolin, Vitexin, Isovitexin, Irilone, Tricine, and Apeginin. | Antioxidant qualities and anti-inflammation in rats with PCOS | [14] |
| Fatty Acids in Lipids | Oleic, palmitic, stearic, linoleic, and A-linolenic acids: Cycloartenol, campesterol, Bsitosterol, Glycerides of triacyls. | Anti-inflammatory actions improve hormonal and metabolic abnormalities by reducing chronic inflammation in PCOS. | [15] |
| Alkaloid | Carpaine, Gentienne, Choline, and Trigonelline | Enhance insulin sensitivity and glucose metabolism to help treat insulin resistance, a major problem in PCOS. | [16] |
| Fiber | Soluble and Insoluble | Promote satiety, enhance gut health, and stabilize blood sugar levels to help manage weight. can aid in lowering cholesterol levels, which are frequently raised in PCOS. | [17] |

It is also found to affect the feeding behaviour in human resulting in reduced fat consumption [18]. Some studies reported the role of fenugreek in stimulating hair growth [19]. Fenfuro, a fenugreek seed extract enriched with furostanolic saponins is found to play a vital role in the management of type 2 diabetes without causing any potential side effects [20]. Yamogenin controls the expression of genes linked to fatty liver tissue, hence reducing lipid accumulation in Hepatocytes' generation of acid. Subsequent research has shown that fenugreek's fiber content dramatically suppresses hunger, especially in obese experimental subjects. Research has demonstrated that fenugreek dietary supplements are effective at facilitating temporary weight loss. Fenugreek powder was given to a group of obese rats for 14 weeks, during which time significant changes in body composition, dimensions, and nutritional parameters was observed [21]. Effectiveness of fenugreek seeds against PCOS: The yearly fenugreek seeds (*Trigonella foenum-graecum L.*) is cultivated as a traditional spice crop in Asia, it plays a role in PCOS. There are ten to twenty aromatic golden seeds in its crust. Fenugreek seeds possesses anti-diabetic and anti-insulin resistance properties in women with PCOS. An open label, one arm, non-randomized post- marketing monitoring study with 50 premenopausal women (aged 18 to 45, BMI of 23.88 4.72 kg/m2, PCOS diagnosis) examined the effectiveness of fenugreek (*Trigonella foenum-graecum*) seeds extract increased in furostanolic saponins (*Furocyst*). Individuals showed a significant reduction in ovarian volume at trial's end compared to baseline measurements. Whereas the left ovary's volume dropped by 17.82%, the right ovary's reduced by 28.25% [22]. According to the study when rats with PCOS were treated with metformin and fenugreek seeds, their estrous cycles returned to normal. Ovarian morphological alterations include the emergence of polycystic ovaries with few corpora lutea in the group with PCOS vs the group without the condition [23]. A normal estrus cycle was shown by the decreased number of cysts and varying numbers of corporal lutea in the fenugreek-treated group. Rats with PCOS who received metformin treatment displayed a dense layer of granulosa cells in their corpus luteum and ovarian cortex. Numerous hormonal and metabolic abnormalities, including hyperglycemia, insulin resistance, and consequent hyperinsulinemia, are linked to PCOS. In animal models of PCOS produced by letrozole, numerous investigations have documented the induction of hyperglycemia Following points illustrate the effectiveness of fenugreek seeds against PCOS. 1. Increased Sensitivity to Insulin: The impact of fenugreek supplementation on insulin resistance in women with PCOS was examined in a 2023 randomized, double-blind, placebo-controlled study that was published in the Journal of the Science of Food and Agriculture. In comparison to the placebo group, the study revealed that fenugreek dramatically decreased insulin resistance and enhanced blood sugar management, indicating that it may be useful in treating the metabolic components of PCOS [24]. Controlling Menstrual Cycles: The use of fenugreek in conjunction with other herbal remedies to control menstrual periods in women with PCOS was investigated in a research published in Phytotherapy Research (2022). Significant improvements in menstrual cycle regularity and a decrease in symptoms such delayed ovulation was observed in the study. It is thought that fenugreek's capacity to affect hormone control is responsible for these benefits [25]. Effects that prevent Androgenesis: In 2021, a clinical study that was published in The Journal of Clinical Endocrinology & Metabolism examined how fenugreek supplementation affected the levels of androgen and hirsutism in women with PCOS. Fenugreek may help lessen hyperandrogenism in women with PCOS, according to the data, which revealed a significant decrease in both blood testosterone levels and the degree of hirsutism [26]. Antioxidant and Anti-Inflammatory Properties: Fenugreek's anti-inflammatory and antioxidant qualities, as well as its potential application in the treatment of metabolic diseases like PCOS, were examined in a 2020 study published in Molecules. According to the review's findings, fenugreek seeds may help lower inflammatory indicators, which could enhance PCOS-afflicted women's general metabolic health [27]. Managing Weight: The

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impact of fenugreek supplementation on body weight in overweight women with PCOS was investigated in a 2019 study published in The Journal of Nutrition. The findings showed a little decrease in body weight and body fat, most likely as a result of fenugreek's capacity to boost fullness and reduce caloric consumption [28].

## CONCLUSIONS

This review compares different studies to highlight the effectiveness of fenugreek seeds against PCOS. From all the various aspects it can be concluded that use of Fenugreek seeds can better manage hormonal imbalance and PCOS. However further studies should be conducted to prove clinical efficacy as it can offer an economical approach to treat PCOS with no or less adverse effects as compared to allopathic medicines. It can open new avenues for nutraceuticals especially for patients with unfavorable economic conditions.

## Authors Contribution

Conceptualization: UZ
Methodology: UAA, BG, UEH, RM, NS, TA, RA
Formal analysis: SM
Writing, review and editing: AF

All authors have read and agreed to the published version of the manuscript.

## Conflicts of Interest

All the authors declare no conflict of interest.

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