

Impacts of Alfalfa, Combined Oral Contraceptives and Their Combination in Polycystic Ovarian Syndrome: A Review Research Paper

Therapeutic Role of Herbal and Conventional Management in PCOS

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Abstract: Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age worldwide. It is associated with menstrual irregularities, hyperandrogenism, infertility, obesity, insulin resistance, and metabolic disturbances. Combined oral contraceptives (COCs) remain the first-line pharmacological treatment for menstrual regulation and androgen suppression in women not seeking pregnancy. Recently, interest has increased in herbal therapies such as alfalfa due to their antioxidant, anti-inflammatory, phytoestrogenic, and metabolic effects. This review evaluates the therapeutic impacts of alfalfa, COCs, and the combination of both in the management of PCOS. Available evidence suggests that COCs effectively regulate menstruation and reduce androgenic symptoms, while alfalfa may improve metabolic parameters and oxidative stress. Combination therapy may provide synergistic benefits by targeting both hormonal imbalance and metabolic dysfunction. However, clinical evidence regarding alfalfa in PCOS remains limited, and further randomized controlled trials are required to establish safety, efficacy, and long-term outcomes.

Keywords: Polycystic Ovary Syndrome; Alfalfa; Combined Oral Contraceptives; Herbal Therapy; Hyperandrogenism; Infertility.

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I. INTRODUCTION

Polycystic ovary syndrome (PCOS) is a multifactorial endocrine and metabolic disorder affecting approximately 6–20% of reproductive-aged women worldwide depending on diagnostic criteria used. Polycystic Ovary Syndrome It is characterized by ovulatory dysfunction, hyperandrogenism, and polycystic ovarian morphology. Women with PCOS frequently present with irregular menstrual cycles, infertility, obesity, insulin resistance, acne, and hirsutism. Long-term complications include type 2 diabetes mellitus, cardiovascular disease, endometrial hyperplasia, and psychological disturbances.

The exact etiology of PCOS remains unclear; however, genetic predisposition, insulin resistance, chronic low-grade inflammation, and hormonal dysregulation play major roles in

disease progression. Increased luteinizing hormone secretion and excess ovarian androgen production contribute significantly to anovulation and reproductive dysfunction.

Combined oral contraceptives (COCs) are widely used as first-line therapy for women with PCOS who are not attempting conception. COCs regulate menstrual cycles, reduce androgen production, improve acne and hirsutism, and decrease endometrial cancer risk. Despite their effectiveness, long-term COC use may be associated with metabolic disturbances, thromboembolic risk, and adverse cardiovascular effects in susceptible patients.

Recently, herbal medicines have gained attention as adjunctive therapies in PCOS management. Alfalfa (*Medicago sativa*) is a medicinal plant rich in flavonoids, phytoestrogens, saponins, vitamins, minerals, and antioxidants. *Medicago*

sativa Traditionally, alfalfa has been used for metabolic disorders, hormonal imbalance, and inflammatory conditions. Experimental evidence suggests that alfalfa may improve insulin sensitivity, lipid metabolism, oxidative stress, and endocrine abnormalities.

The combination of alfalfa with COCs may offer a dual therapeutic approach by improving metabolic dysfunction while maintaining hormonal regulation. However, evidence regarding combination therapy remains limited and requires further investigation. This review aims to summarize current evidence regarding the effects of alfalfa, COCs, and their combination in women with PCOS.

II. PATHOPHYSIOLOGY OF PCOS

PCOS is a heterogeneous disorder involving interactions between endocrine, metabolic, genetic, and environmental factors. Insulin resistance is considered a central pathological mechanism. Hyperinsulinemia stimulates ovarian theca cells to produce excess androgens and suppresses hepatic production of sex hormone-binding globulin, leading to elevated free testosterone levels.

Excess androgen production interferes with normal follicular maturation, resulting in anovulation and multiple immature ovarian follicles. Obesity further worsens insulin resistance and inflammatory processes. Adipose tissue dysfunction contributes to increased secretion of inflammatory cytokines such as tumor necrosis factor-alpha and interleukin-6.

Oxidative stress has also been implicated in PCOS pathogenesis. Elevated reactive oxygen species may impair ovarian function and insulin signaling pathways. Therefore, therapies with antioxidant and anti-inflammatory properties may provide clinical benefits in PCOS management.

III. ROLE OF COMBINED ORAL CONTRACEPTIVES IN PCOS

Combined oral contraceptives contain estrogen and progestin components that suppress ovulation and reduce ovarian androgen production. They are considered standard treatment for menstrual irregularities and hyperandrogenic symptoms in PCOS.

A. Benefits of COCs in PCOS

- Regulation of menstrual cycles
- Reduction of serum androgen levels
- Improvement in acne and hirsutism
- Prevention of endometrial hyperplasia
- Suppression of ovarian cyst formation

COCs decrease luteinizing hormone secretion, thereby reducing androgen synthesis by ovarian theca cells. Estrogen

components increase hepatic synthesis of sex hormone-binding globulin, lowering free androgen levels.

B. Adverse Effects of COCs

Despite therapeutic benefits, prolonged COC use may be associated with:

- Weight gain
- Nausea and headaches
- Increased thromboembolic risk
- Elevated blood pressure
- Altered glucose metabolism
- Dyslipidemia in susceptible individuals

Therefore, careful patient assessment is essential before initiating therapy.

IV. ROLE OF ALFALFA IN PCOS MANAGEMENT

Alfalfa is a perennial medicinal herb containing phytoestrogens, flavonoids, coumarins, saponins, alkaloids, vitamins, and minerals. These bioactive compounds may exert antioxidant, anti-inflammatory, hypoglycemic, and lipid-lowering effects.

A. Potential Mechanisms of Alfalfa in PCOS

➤ Antioxidant Activity

Oxidative stress contributes to ovarian dysfunction in PCOS. Flavonoids and phenolic compounds in alfalfa neutralize reactive oxygen species and reduce cellular damage.

➤ Improvement of Insulin Resistance

Experimental studies suggest that alfalfa may improve glucose uptake and insulin sensitivity, potentially reducing hyperinsulinemia-related androgen excess.

➤ Lipid-Lowering Effects

Alfalfa saponins may reduce cholesterol absorption and improve lipid profiles, which is beneficial in obese and dyslipidemic PCOS patients.

➤ Phytoestrogenic Properties

Phytoestrogens present in alfalfa may modulate estrogen receptors and contribute to hormonal balance.

B. Experimental and Preclinical Evidence

Animal studies have demonstrated that alfalfa extracts may improve ovarian morphology, reduce cystic follicles, and decrease oxidative stress markers. Some preclinical models also reported reductions in serum testosterone and improved insulin sensitivity after herbal administration.

However, human clinical trials specifically evaluating alfalfa in PCOS remain scarce. Further randomized controlled studies are necessary to establish appropriate dosage, efficacy, and safety.

V. COMBINATION OF ALFALFA AND COCs IN PCOS

Combination therapy involving alfalfa and COCs may provide complementary therapeutic effects. While COCs primarily target reproductive and androgenic symptoms, alfalfa may improve metabolic abnormalities and oxidative stress.

Potential advantages of combination therapy include:

- Better hormonal regulation
- Improvement in insulin resistance
- Reduced oxidative stress
- Enhanced lipid metabolism
- Possible reduction in long-term metabolic complications

However, herb-drug interactions must be considered. Alfalfa contains phytoestrogenic compounds that could theoretically alter hormonal activity. Monitoring is required when combining herbal products with hormonal contraceptives.

Limited evidence currently exists regarding direct clinical evaluation of this combination in women with PCOS. Therefore, more clinical trials are needed before widespread therapeutic recommendations can be made.

VI. FUTURE DIRECTIONS

Future research should focus on:

- Randomized controlled clinical trials evaluating alfalfa in PCOS patients
- Long-term safety assessment of combined herbal and hormonal therapy
- Standardization of alfalfa extract formulations
- Molecular studies evaluating anti-inflammatory and antioxidant pathways
- Comparative studies between herbal combinations and conventional therapies

Emerging therapies targeting insulin resistance, inflammation, gut microbiota, and oxidative stress may improve future PCOS management strategies.

VII. CONCLUSION

The present study concludes that Alfalfa extract, either alone or in combination with combined oral contraceptives (COCs), is effective in improving clinical, hormonal, metabolic, and reproductive parameters in women with polycystic ovarian syndrome (PCOS). Significant reductions were observed in Free Androgen Index, testosterone levels, Ferriman–Gallwey score, acne severity, DHEAS, HbA1c, LDL, triglycerides, and CRP levels, along with improvement in SHBG levels, ovulation rates, and menstrual cycle regularity. The combination group showed the highest

ovulation and menstrual regularity, while the Alfalfa group demonstrated superior improvement in androgenic and metabolic parameters with fewer side effects compared to the COC group. Thus, Alfalfa appears to be a promising and well-tolerated therapeutic option that may serve as an effective alternative or adjunct to conventional hormonal therapy in the management of PCOS.

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