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Role of Herbs in Treating Polycystic Ovarian Syndrome (PCOS)

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Abstract: A common, complex endocrine condition called polycystic ovarian syndrome (PCOS) causes polycystic ovaries, persistent anovulation, and hyperandrogenism, which manifest as irregular menstrual periods, hirsutism, acne, and infertility. Evidence-based medical management for PCOS emphasizes a multidisciplinary approach because standard pharmacological treatment only treats a single symptom, may not be appropriate, frequently has adverse effects, and is occasionally ineffective. Women with PCOS have moreover shown a significant interest for alternative therapies. This review investigates the impact of herbal medicine as an alternative treatment for PCOS on the reproductive and endocrine systems.

Keywords: Polycystic ovarian syndrome, Herbs, Roselle, Androgens, Estrogens, *Hibiscus*

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Introduction

A disproportionate balance of reproductive hormones causes the condition called Polycystic Ovarian Syndrome (PCOS), which results in cystic ovarian follicles (Dennett and Simon, 2015). The egg's fluid-filled sac, which is usually filled with water, becomes a functional cyst, impeding the release of the egg, a physiological process that increases the likelihood of fertilization. As a result, the disruption of the menstrual cycle caused by ovulation blocks results in amenorrhea (Chaudhuri, 2023). Multiple ovarian cysts are a hallmark of PCOS. In some clinical circumstances,

each cyst may be between 8 to 10 mm. Because the fertilization step is hampered, the restriction in egg release prevents any likelihood of pregnancy (Rausch *et al.*, 2009). Research suggests that 5% to 10% of females 18 to 44 years of age are affected by PCOS (Rausch *et al.*, 2009). Women with PCOS have higher rates of endometrial cancer, cardiovascular disease, dyslipidemia, and type-2 diabetes mellitus (McFarland, 2012).

Causes of PCOS:

The major factors that influence PCOS are as

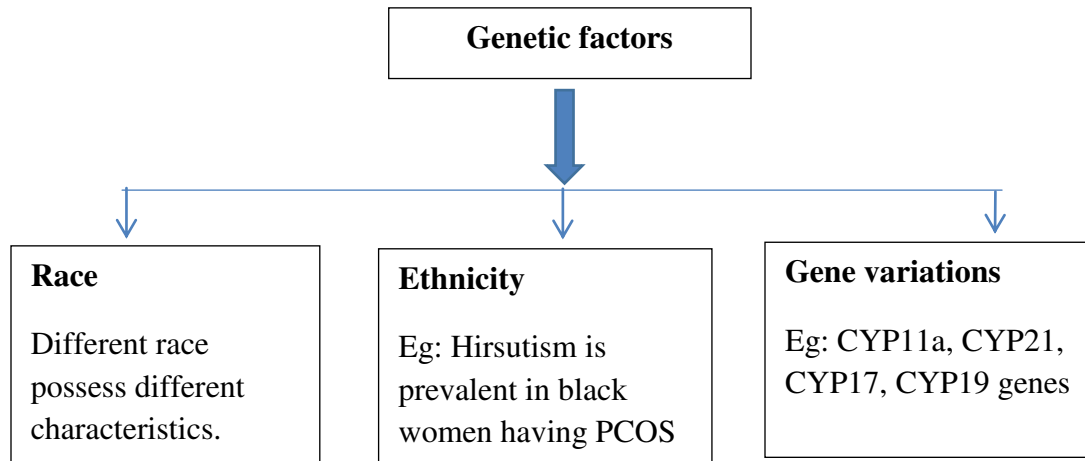


Fig. 1: Genetic factors associated with PCOS (Zeng *et al.*, 2022).

follows:

Environmental factors: According to studies, heavy metal poisoning, pesticides and endocrine disrupting-chemicals are the major environmental factors that affects reproduction (Kandaraki *et al.*, 2011). In addition to it, an unhealthy lifestyle and poor diet also contribute to prognosis of PCOS. Stress also influence anxiety, irritation, depression (Lydic and Juturu, 2008). A positive link has been observed in numerous studies between the incidence of PCOS, smoking, and exposure to cigarette smoke (Zhang *et al.*, 2020). The findings of a Taiwanese population-based study indicated a correlation between an increased risk of PCOS and increased exposure to fine air polluting particles and gases, including SO₂, NO, NO₂, NO_x etc. (Lin *et al.*, 2019).

Genetic factors: All genes and mutations that affect the ovaries either directly or indirectly are associated with PCOS. The genetic factors that cause PCOS are depicted in Figure 1. Based on these factors, PCOS is divided into 4 types viz. Insulin resistance PCOS, adrenal PCOS, inflammatory PCOS, post-pill PCOS (Khan *et al.*, 2019).

Role of Endocrine hormones: Extra- and intraovarian variables interact delicately to control ovarian folliculogenesis. Any disturbance of this balance may result in infertility. Changes in

the paracrine, endocrine and metabolism may result in low FSH secretion, high levels of LH, hyperandrogenemia and hyperinsulinemia (De Leo *et al.*, 2016). Patients with POCOS have also been shown to have a vitamin D deficiency (Thomson *et al.*, 2012). Vitamin D deficiency has been linked to the development of insulin resistance (IR) and decreased glucose tolerance in obese PCOS patients, as evidenced by the lower serum levels of 25-OH-D observed in these patients compared to non-obese women with PCOS (Yildizhan *et al.*, 2009).

Hormonal Imbalance: Some major hormones viz. Androgens, insulin and LH have a key role in the pathogenesis of PCOS.

Role of Androgens: The ovaries of PCOS adolescents produce high level of PCOS resulting in hyperandrogenism (Chang *et al.*, 1983), viz. testosterone that prevents the maturation of follicles. Thus, leads to anovulation. Thus, when a sperm meets a not fully matured ovum, results in conception problem (Kumar *et al.*, 2005) in a PCOS individual.

Role of Insulin: In PCOS patients, anovulation is caused by hyperinsulinemia and insulin resistance. Androgens also lead to insulin resistance (Chang *et al.*, 1983). A study revealed that antiandrogen and androgen suppression improved insulin sensitivity in obese and non-

obese PCOS (Dunaif *et al.*, 1989). Although the precise causes of metabolic abnormalities are yet unknown, aberrations in insulin secretion and signaling are thought to be the primary cause. This was shown in female rhesus monkeys, who were exposed to excess testosterone *in vitro* and showed impairments in insulin production and action (Zeng *et al.*, 2022).

Role of Luteinizing Hormones: Several studies revealed that insulin interacts with LH in causing anovulation in PCOS patients by inducing premature arrest of follicle development to augment steroidogenesis (Zeng *et al.*, 2022). LH hypersecretion has been shown to be present in up to 60% of PCOS patients (Laven *et al.*, 2002). Excess LH may prevent egg maturation and fertilization, which in turn may reduce the likelihood of pregnancy and increase the probability of miscarriages (Kumar *et al.*, 2011). No detrimental effects of exogenous LH treatment or higher endogenous LH were seen in ovulation induction cycles triggered with CC on the likelihood of ovulation or successful pregnancy (Imani *et al.*, 2000). More information is required to understand the clinical impact of LH elevation.

Complications associated with PCOS:

Individuals with PCOS are more likely to experience some more severe health issues such as Diabetes mellitus, Cardiovascular diseases, Insulin resistance, endometrial hyperplasia, metabolic abnormalities and obesity (Zeng *et al.*, 2022).

Management of PCOS:

Till date there is no complete cure for PCOS. The treatment usually involves in treating the symptoms of PCOS (Leena *et al.*, 2016). Allopathic therapy, herbal therapy and dietary and lifestyle modifications are currently used in treating PCOS (Zeng *et al.*, 2022). In this review, emphasis is given to herbal therapy.

Herbal therapy of treating PCOS:

Due to high cost and side effects associated with allopathic therapy, the demand for herbal

medicines are increasing in day-to-day life. Since plants are significant sources of medicine; throughout history, people have employed a wide range of plant-based remedies to treat and prevent disease, with differing degrees of effectiveness (Sharma *et al.*, 2017). Because they offer humans with food, clothes, shelter, and medicines, plants have played a significant role in human life. They served as the foundation for the traditional medical systems, such as Ayurvedic, Unani, and others, which have been practiced for many years and are still producing novel treatments for humanity. A sizable portion of the populace in underdeveloped nations gets their primary medical care from medicinal plants. The majority of people on the planet are starting to use traditional medicines because they are affordable, widely available, and have fewer negative health effects. In order to fully understand the enormous potential of medicinal plants employed in many traditional systems, there has been a global surge in concentration on plant study in recent years. One of the many medicinal plants that have been researched and found to have potential as strong phytochemical agents for treating a variety of illnesses is the *Hibiscus*, which is prized for both its medical qualities and its many health advantages (Ali *et al.*, 2005).

Over 5 million women suffer from the hormonal endocrine illness known as polycystic ovarian syndrome, or PCOS (ACOG, 2009). One of the main causes of female infertility is PCOS, which significantly raises the risk of miscarriage and newborn death during or soon after delivery. Additionally, PCOS can lead to serious health issues, including endometrial cancer, osteoporosis, heart disease, and diabetes.

***Hibiscus rosa-sinensis* (Malvaceae):** *Hibiscus* is frequently referred to as "Roselle." The stem, leaves, calyces, and seeds of hibiscus are traditionally grown for their industrial, medical, and other uses. The calyces are abundant in vitamins, minerals, protein, dietary fiber, carbohydrates, and bioactive substances. The roselle calyces present an intriguing reservoir of

possible bioactive compounds possessing anti-inflammatory, antibacterial, hypocholesterolemic, antihypertensive, antioxidant, and anticarcinogenic properties (Maciel *et al.*, 2018). Numerous scientific studies have demonstrated that *Hibiscus* calyces are rich in polyphenols and flavonoids, which contribute to the plant's nutritional value because these substances are linked to hibiscus' antioxidant properties. Based on current data, it appears that the *Hibiscus* calyces' polyphenols and anthocyanins have a variety of biological effects. Studies have shown that dried calyces may be a good source of bioactive compounds with strong anti-inflammatory, anti-tumor, anti-hyperlipidemic, anti-hypertensive, anti-inflammatory, diuretic, antiurolithic, antimicrobial, anti-cancer, hepatoprotective, renoprotective, and immunomodulatory effects (Rao *et al.*, 2014). The extract has demonstrated efficacy in managing hypertension, inflammation, hepatic diseases, diabetes mellitus, and metabolic syndrome. Extensive evidence regarding the various health benefits of *Hibiscus* and its assumed mode of action has been presented. Numerous traditional uses of this plant have been verified by phytochemical and pharmacological research. Studies on the phytochemical content of *Hibiscus* have shown that it contains bioactive substances that can effectively treat a variety of degenerative illnesses.

Herbs are important as there are few truly effective pharmaceutical options, said Jillian Stansbury, a Washington state-based naturopathic physician and author of The PCOS Health and Nutrition Guide. Herbs are a safe and nutritive option to support ovarian function, endocrine feedback loops, thyroid function, and blood sugar regulation and metabolism. The supplementation was continued two months, PCOS experimental group showed changes in the clinical symptoms after *Hibiscus* tea supplementation (Sreesha *et al.*, 2020). Also, a product from Zenherbs Labs is called FertiZen-RTM; it was created as a treatment and management tool for PCOS and is a blend of three phytochemicals from three different plants: *Foeniculum vulgare*, *Linum usitatissimum*,

Glycyrrhiza glabra, and *Hibiscus* extract (Gadani *et al.*, 2023).

***Glycyrrhiza glabra* L. (Fabaceae):** This natural herb is used to treat a variety of medical conditions, including osteoarthritis, infections, and as a demulcent and expectorant. However, it is also very effective at lowering the level of testosterone in the blood and preventing hirsutism in PCOS patients. For these reasons, it is used as an adjuvant in a number of different therapies (Yang *et al.*, 2018). A study revealed that treating nine healthy and young females with a formulation containing 7.6% glycyrrhizic acid for two cycles reduced the testosterone levels significantly (Khanage *et al.*, 2019).

***Cinnamomum zeylanicum* (Lauraceae):** It is a popular spice and flavoring that has a lengthy history of use as a medication. Supplementing with cinnamon has been shown in a randomized controlled clinical trial to enhance menstrual cyclicity and may be a useful treatment for certain PCOS-affected women (Kort and Lobo, 2014). Its improvement in insulin sensitivity may be due in part to the underlying mechanism of cinnamon's effects on PCOS. A study on mouse model of DHEA-induced PCOS, showed that cinnamon could restore ovarian morphology and estrous cyclicity, as well as down-regulate serum levels of insulin and testosterone. It could also lower IGF-1 levels while raising IGFBP-1 levels in both the plasma and the ovary. Regarding PCOS treatment, cinnamon might be a useful medicinal ingredient (Dou *et al.*, 2018).

***Linum usitatissimum* (Linaceae):** A study on supplementing with flax seed has been shown to significantly reduce the volume and number of follicles in polycystic ovaries, improve menstrual cycle frequency, and have no effect on blood sugar, body weight, or hirsutism. Flaxseeds could improve ovarian function and menstrual cycle (Farzana *et al.*, 2015). A case study on flaxseed supplementation in female patients for 4 months revealed a significant reduction in PCOS symptoms. Additionally, it also lowers

testosterone and hirsutism in PCOS patients (Nowak *et al.*, 2007). Thus, flaxseeds could be used as an potential therapeutics for treating PCOS.

***Mentha spicata* (Lamiaceae):** It has long been believed that spearmint, which is typically consumed as tea, lowers testosterone levels. As shown in a Turkish study by Akdogan and colleagues, its anti-androgenic qualities lower blood levels of free testosterone while maintaining total testosterone and DHEAS levels. The study involved 21 female suffered with hirsutism drank a cup of herbal tea steeped with spearmint twice, daily for five days during the follicular phases of their menstrual cycles. Following spearmint tea treatment, the patients luteinizing hormone, follicle-stimulating hormone, and estradiol increased while their levels of free testosterone significantly decreased (Akdogan *et al.*, 2007). Because of its anti-androgenic qualities, spearmint tea can also aid in the management of PCOS (Grant, 2010).

***Trigonella foenum-graecum* Linn (Fabaceae):** In addition to improving insulin resistance, fenugreek helps the body metabolize glucose. Consequently, this aids in hormone balance. Additionally, it might aid in weight loss, lower cholesterol, and support normal heart function (Harilakshmi, 2017).

***Aloe vera* (L.) Burm. f. (Asphodelaceae):** *Aloe vera* is a herbaceous plant that has hypoglycemic properties (Ma and Tan, 2017; Doaei *et al.*, 2018; Gholamalizadeh *et al.*, 2018). The high fiber content of *Aloe vera* promotes faster gastrointestinal transit, absorption, and hemostasis modulation (Radha *et al.*, 2014; Doaei *et al.*, 2018; Gholamalizadeh *et al.*, 2018). Many different compounds with varying potential biological activities can be found in *Aloe vera*. *Aloe vera* contains phytosterols that have the ability to change the steroidogenic response, express estrogen receptor protein, decrease androgens, increase estrogens, and eventually improve PCOS symptoms (Radha *et al.*, 2014; Moniruzzaman *et al.*, 2012; Doaei *et al.*, 2018).

A study was carried out to know the effect of *Aloe vera* gel on rats with PCOS (Radha *et al.* 2014). *Aloe vera* was given to rats in each group in this study at three different doses (5 mg/kg, 10 mg/kg, and 15 mg/kg) for 60 days. The results showed that *Aloe vera* can improve glucose tolerance in a manner that is dose-dependent. All groups showed a significant decrease in serum insulin levels and insulin resistance, and testosterone levels were significantly reduced by the doses of 10 and 15 mg (Radha *et al.* 2014). Thus this study revealed that *Aloe vera* could be used as a therapeutic in treating PCOS effectively.

Conclusion

According to this study, herbal remedies may be helpful for PCOS. Herbal medicine's constituents can influence blood sugar, insulin resistance, lipid profiles, hormone levels in the serum, and ovarian tissue. As a result, these plants may offer a novel method of treating or managing PCOS. However, more research is required in this area in the future due to the insufficiency of previous studies and inconsistent findings.

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