INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

Herbs For Healing Polycystic Ovarian Syndrome (PCOS): A Comprehensive Approach

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ARTICLE INFO

Published: 16 Sept. 2025
Keywords:
Polycystic ovarian syndrome, Anovulation, Herbal therapy, Conventional therapy, Natural remedies
DOI:
10.5281/zenodo.17129177

ABSTRACT

Polycystic ovarian syndrome (PCOS) is a heterogenous endocrine disorder which involves combination of genetic and environmental factors affecting around 4-20% of women of reproductive age worldwide. It is characterized by anovulation, infertility, hormonal imbalance, hyperlipidemia, hirsutism, cardiovascular problems and irregular menstrual cycles. Various herbs have beneficial impact on diseased condition and can be used to treat these symptoms. Herbal therapy is more preferred over conventional medical management due to its safety and lesser side effects. Conventional therapy is contraindicated and inefficient in some conditions, so women with PCOS are in need for alternative therapy. This review includes herbs such as Tinospora cordifolia, Lepidium meyenii, Ginseng, Chaste berry, Tribulus terrestris, Gymnema sylvestre, Silymarin, Chamomile, Spearmint, Pergularia daemia, and more. The aim of this review is to explore benefits of natural herbs with direct effects on reproductive system in treating menstrual irregularities and PCOS.

INTRODUCTION

Polycystic ovarian syndrome is also known as Stein- Leventhal syndrome. It consists of enlarged ovaries containing many cysts in small undeveloped follicles [1]. It is a complex endocrinal disorder associated with hirsutism, amenorrhea, anovulation, hypertension, dyslipidemia, risk of diabetes, inflammation, hyperinsulinemia, insulin resistance, obesity, acne, cardiovascular disease, painful and irregular menstrual cycles [2]. Globally, PCOS is considered as root cause for infertility in female. Even though the genetic, environmental, dietary, and metabolic factors are underlying causes for PCOS, but also the etiology of PCOS remains unclear [3]. Elevated levels of luteinizing hormone serum concentration and ratio of

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

LH/FSH are neuroendocrine features of PCOS [4]. It is generally found in obese women and female with family history of PCOS. Diagnosis of PCOS is done by ultrasound scanning techniques, findings may include multiple ovarian cysts, hypothyroidism and raised levels of prolactin in blood [5]. There is no cure for PCOS till date. Treatment may include lifestyle changes, food intake management, physical activity, maintain good sleep cycle and follow nutrient rich diet [6]. Currently, standard treatment for PCOS include modification in women's lifestyle and several pharmacological therapies [7]. In modernization, treatment for PCOS include metformin, oral contraceptives, anti-androgens and clomiphene citrate. But long-term use of metformin have complications such as lactic acidosis, and oral contraceptives may lead to weight gain. So, it is necessary for safe and economical approach in management of PCOS[8]. Over the centuries, herbs are used in treating various health conditions due to their several beneficial effects. Contrarily, prescription drugs are necessary even though they have side effects and potential long-term effects [9]. This review analyzes several herbs naturally used to treat PCOS.

2. Review methodology:

This review uses a systematic approach to analyze the existing research on medicinal herbs for managing PCOS. It aims to summarize current findings, highlight gaps in knowledge and suggest directions for future studies.

2.1 Data sources:

A thorough literature search was done using PubMed, Scopus, Web of science, Google scholar and Embase to find studies on medicinal herbs used in PCOS. Other sources like government reports, dissertations and conference abstracts were also checked. The keywords such as PCOS, herbal therapy, conventional therapy, management and natural remedies were included. Filters were used to include only English studies from 2015 to 2025, with a focus on clinical trials and observational studies.

2.2 Study selection:

This review includes studies on herbs used in PCOS which is selected based on particular inclusion and exclusion criteria.

Inclusion criteria:

Inclusion criteria focus on the studies published from 2015-2025 in English which explored on medicinal herbs used in PCOS including clinical trials, observational studies and systematic reviews. The study investigated use of medicinal herbs emphasizing on their effect on insulin levels, hormone, menstrual cycle, ovulation and infertility.

Exclusion criteria:

Studies conducted in lab without human subjects or animals were excluded. Abstracts which were not in English and did not have full access were not included. Reviews and editorials lacking data were not taken. Researches only emphasized on conventional therapy rather than herbal drugs for PCOS were not considered. Investigations with unrelated methods and results were excluded.

2.3 Data extraction:

Data from multiple studies was gathered to underscore the importance of medicinal herbs in PCOS. Details such as author name, year of publication and country were included. It was noted that whether study is clinical trial, review or observational study. Information on herbs including their names and sources were included. Primary outcomes such as hormonal balances,

regular menstruation, ovulation, metabolism and fertility were considered. The key findings were defined along with advantages and disadvantages of herbs. The information collected was arranged in order to evaluate safety and efficacy of different herbs.

3. Signs and symptoms:

Signs and symptoms of PCOS includes the following:

1. Mood swings
2. Hair thinning
3. Heavy bleeding
4. Diabetes
5. Pelvic pain
6. Irregular menstrual cycle [10].

4. CAUSES:

Internal factors: Obesity, Inflammation, Insulin resistance, Hyperandrogenism

External factors: Alteration in genomes such as Calpain 10, Cytochrome p450, and insulin genes are considered as etiological factor for PCOS.

Environmental factors: Some of the endocrine disrupting chemicals including perchlorates, phthalates, triclosan, bisphenol A, and dioxins can affect endocrine system and lead to development of PCOS [11].

5. Rationale for using Natural Herbs:

The reason for using herbal medicines with scientific documentation is to describe endocrinological effects on PCOS. Herbal medicines are known to possess synergistic and antagonistic effects between compounds. It is also involved in interaction with various body systems and alters body function [12]. This review highlights the importance of particular herbs in PCOS and facilitates herbal drug selection.

6. Natural remedies in management of PCOS:

6.1 Tinospora cordifolia:

Tinospora cordifolia is a biological name for Guduchi which belongs to the family Menispermaceae. *Tinospora cordifolia* is one of the most popular Ayurvedic medicinal plant. It has less side effects and multiple beneficial effects involving treatment of irregular menstruation, arthritis, leprosy, fever, diabetes, stress and malaria [13]. The primary chemical constituents found are alkaloids, glycosides, steroids, terpenoids, essential oils and polysaccharides [14]. It is an anti-inflammatory herb which is considered to be effective against PCOS since insulin dysregulation and ovarian cysts have common root cause namely mild inflammation in the tissues. Guduchi helps to reduce the insulin resistance developed by women during PCOS. It also regulates the menstrual flow [15]. Figure [1] shows picture of Guduchi.

Fig 1: Tinospora Cordifolia

5.2 Lepidium meyenii:

Lepidium meyenii known as maca, is a medicinal plant belonging to family Brassicaceae. It is indigenous to high Andean regions of Peru and Bolivia. It is a traditional herbal medicine used in

relieving symptoms of menopause [16]. It is known to have phenols, isothiocinates, glucosinolates, macamides and macaenes. It has high anti-oxidant property [17]. It stimulates endocrine system and act as natural hormonal balancer with lesser side effects. It increases progesterone and estradiol levels in PCOS patients. It is regarded as a source which has benefits of lowering PCOS along with hypoglycemic and anti-obesity effects. It has main role in maintaining fertility [18]. Figure [2] depicts picture of maca.

Fig 2: Lepidium meyenii

5.3 Ginseng:

Panax ginseng is the scientific name of Ginseng belonging to genus Panax and family Araliaceae. It is highly fragrant and durable medicinal plant. It is known to have a high anti-oxidant property. The anti-oxidant property is stimulated by activity of anti-oxidant enzymes, glutathione and superoxide dismutase. Anti-oxidant plays a role in eliminating superoxide and prevent lipoidal peroxidation in cell membrane by inhibiting the activity of hydroxyl radicals and anions. This will remarkably decrease the plasma LH levels and effective in enhancing endocrine status in management of ovulation disorder in PCOS patients [19]. Figure [3] shows Ginseng.

Fig 3: Ginseng

5.4 Chaste berry:

Vitex agnus-castus is the botanical name of chaste berry belonging to family Lamiaceae. It is known to enhance fertility and address hormonal imbalance. It consists of casticin, casticin acetate, casticin glucoside, agnuside, agnuside glucoside and vitexin. It does not have effect on DHEA or estradiol levels but it increases progesterone and decrease testosterone levels. It also stimulates and stabilize activity of pituitary gland and responsible for release of luteinizing hormone which reduces estrogen and androgen levels by raising progesterone levels. So, it is the most extensively used drug in treatment of PCOS [20,21]. Figure [4] shows Chaste berry.

Fig 4: Chaste Berry

5.5 Tribulus terrestris:

Tribulus terrestris, typically known as bindii, belonging to Caltrop family. It is used in PCOS to

regulate ovulation and reduce ovarian cysts. Hydroalcoholic extract of bindii is found to have alkaloids, saponins, phenols, and flavonoids which normalizes hormonal alteration, menstrual irregularity, removes ovarian cyst and maintains normal ovarian activity in estradiol valerate induced PCOS rats. The anti-estrogenic property of *Tribulus terrestris* is responsible for regularizing hormonal imbalance and induction of ovulation in PCOS patients. Phytoestrogens of the plant binds with ERα and ERß, acts as estrogen antagonist by stimulating gonadotropin releasing hormone secretion. It also shows hypoglycemic effect and reduce cholesterol in human with type-2 diabetes milletus which has therapeutic efficiency in PCOS [22]. Figure [5] shows Bindii.

Fig 5: Tribulus terrestris

5.6 Gymnema sylvestre:

Gymnema sylvestre commonly known as Gurmar, belonging to family Apocynaceae, consists of Lupeol, ß-amyrin, ß-elemene and stigmasterol. The plant has been hsitorically valued for its medicinal properties, particularly in regulating blood sugar levels. More recently, it has gained attention for its potential in managing PCOS. This condition often involves insulin resistance, leading to hormonal imbalances and symptoms like irregular periods, excessive hair growth, and weight gain. The active constituent of *G. sylvestre* mainly gymnemic acids, are believed to enhance insulin sensitivity, helping to control blood sugar levels and reduce insulin resistance. Additionally, its anti-oxidant and anti-inflammatory properties may contribute to reduce oxidative stress, which further support hormonal balances [23,24,25]. Figure (6) depicts Gurmar.

Fig 6: Gymnema Sylvestre

5.7 Silymarin:

Silymarin is a flavonoid extracted from Milk thistle *(Silybum marianum L. Gaernt.)* belonging to family Asteraceae. It consists of silybin, isosilybin, silydianin, silychristin and flavonolignans [26]. It possess anti-angiogenesis property which decrease proliferation of follicular cells, and reduces the production of testosterone, and increase in corpus luteum because of increase in progesterone levels. It also acts as hepatoprotective and increase SHBG protein synthesis and inhibiting cyclooxygenase and has anti- inflammatory action which reduce cyst. It stimulates glucose 6- phosphate and inhibit gluconeogenesis thereby lowers blood glucose level and reduce symptoms of PCOS [27]. Figure [7] shows silymarin.

Fig 7: Silymarin

5.8 Chamomile:

Chamomilla matricaria, is the scientific name of chamomile belonging to family Asteraceae, is a perennial plant cultured in North Africa and Western Europe. The chemical constituents of chamomile include flavonoids, apigenin, patuletin, quercetin and anti-oxidants such as kamazelin, matricin, farnesene and gallic acid. It also consists of choline which is known for its anti-inflammatory property. It has anti-spasmodic effect which is used to relieve from menstrual cramps and reduce risk of preterm birth. It also stimulates menstruation [28,29]. Figure [8] depicts chamomile.

Fig 8: Chamomile

5.9 Spearmint:

Spearmint *(Mentha Spicata)* is a fragrant, rhizomatous perennial herb belonging to family Lamiaceae. Plants in this family are rich in polyphenols, giving them powerful antioxidant properties. A 30-days randomized controlled trial investigated spearmint tea is effective in reducing hirsutism in women with PCOS. Additionally, studies on PCOS induced rats showed that spearmint oil extracted from mentha spicata decreased body weight, testosterone levels, ovarian cyst and atretic follicles while increasing graffian follicles [1,29]. Figure [9] presents spearmint.

Fig 9: Spearmint

5.10 Pergularia daemia:

Pergualria daemia, commonly known as Trellis-vine or Uttamani, belonging to family Apocynaceae. It is a perennial twinning herb widespread in tropical and sub-tropical region. Phytoconstituents of *P. daemia* include tannins, flavonoids, steroids, glycosides, terpenoids and carbohydrates [12]. Traditionally, this plant has various medical applications due to its anti-inflammatory, anti-oxidant and anti-microbial properties [30]. It also plays significant role regulating menstrual irregularities and restoring the estrous cycle. This helps in reduction of formation in follicular cysts and balance altered levels of follicle stimulating hormone (FSH) and luteinizing hormone (LH) in PCOS. Studies on PCOS-induced rats have shown that fresh leaves extract of Pergularia daemia effectively restores

hormonal balance. Additionally, these plants exhibit potent hypoglycemic and hypolipidemic properties, making it beneficial in managing PCOS- related metabolic disturbance [31,32,33]. Figure [10] shows Trellis-vine.

Fig 10: Pergularia Daemia

5.11 Asparagus racemosus:

Asparagus racemosus is the scientific name of shatavari belonging to family Liliaceae. It is mostly found in tropical and subtropical regions of India. It consists of glycosides, alkaloids, steroidal saponins, polysaccharides and mucilage [34]. It contains phytoestrogen which regulates insulin level in the body. Phytoestrogens also maintains hormonal imbalances and regulates ovarian cycle in women. The herb will enhance follicle stimulating hormone and stimulate folliculogenesis. The major constituent saponin present in shatavari maintains uterine movement and relieves painful periods [35]. Shatavari is also used in abortion where it reduces the occurrence of miscarriages and regenerates the uterine muscles [36]. Figure [11] depicts shatavari.

Fig 11: Asparagus Racemosus

5.12 Pimpinella anisum:

Anise is the common name of *Pimpinella anisum* which belongs to family Umbelliferae. It is a aromatic plant found in middle east, Asia and India. It consists of fatty acids, proteins, essential oils, carbohydrates, phenolic acids and flavonoids [37]. The plant has anti-oxidant, anti-inflammatory, hepatoprotective and dysmenorrhea treating properties. It also increases ovarian follicles, reduce menstrual irregularities by altering levels of luteinizing hormones [38,39]. Figure [12] presents picture of anise.

Fig 12: Pimpinella Anisum

5.13 Moringa oleifera:

Moringa oleifera (moringa or drumstick), belonging to family Moringaceas. It is widely found at temperature 25-35^0 C in tropical regions of Indonesia. It is grown at a height of 700m above sea level. The phytochemical analysis of moringa is found to contain polyphenols such as

chlorogenic acid, quercetin glucoside and Kaempferol glycoside. It reduces lipid peroxidation by possessing anti-oxidant activity. As per the study, moringa decreases insulin levels and reduce levels of androgen. Thereby, it stimulates process of aromatization from androgen to estrogens and improve folliculogenesis in patients with PCOS [40,41]. Figure [13] presents moringa.

Fig 13: Moringa Oleifera

5.14 Cocos nucifera:

Cocos nucifera, known as coconut, is a part of family Aracaceae, consists of flavonoids, polyphenols and fatty acids. It is found in south east Asia and Island between India and Pacific Ocean [42,43]. Coconut products appear to support the structure and function of ovaries, potentially reducing size and number of ovarian cysts. This can contribute to better hormonal balance. Additionally, coconut-based infusion is valued for their anti-inflammatory and anti-oxidant properties. These properties can help counteract hormonal imbalances often associated with PCOS. The healthy fats in coconut play a role in hormone production, which may help manage irregular menstrual periods [44]. Figure [14] represents picture of coconut.

Fig 14: Cocos Nucifera

5.15 Flaxseeds:

Flaxseeds, derived from *Linum usitatissimum* of Linaceae family, has shown potential in managing PCOS by promoting hormonal balance and improving ovarian function. It consists of omega-3-fatty acids, proteins, dietary fibers, micronutrients and lignans [45]. Research on rat model demonstrate that the hydroalcoholic extract of flaxseeds effectively reduced testosterone levels while increasing progesterone, aiding in endocrine regulation. Additionally, flaxseeds treatment lead to positive histological changes in ovaries, including an increase in healthy follicles and corpus luteum, along with reduction in cystic follicles. These findings suggests that flaxseed may help to regulate menstrual cycles and alleviate PCOS symptoms, making it promising natural remedy for diseased condition [46]. Figure [15] shows flaxseed.

Fig 15: Flaxseed

6. Future directions:

PCOS is predominantly occurring in adolescent women. Even though there are more cases found in a community, the etiology of few cases remains unknown. It may be due to genetic factors, lifestyle factors such as stress, diet and environmental factors. There is no exact treatment for PCOS till date. It may include lifestyle modifications, stress management, dietary habits and nutrient supplements. The use of conventional drugs is associated with more side effects than herbal drugs. Further research is needed to optimize side effects of synthetic drugs and employ use of herbal medicines in treatment of PCOS [47].

Polycystic ovarian syndrome is a female endocrine disorder which causes infertility. Studies have shown that several herbal medicines play important role in regulation of PCOS with minimum side effects. Herbal drugs are known to enhance immunity and normalize irregular menstrual cycles with less side effects. Herbal medicines can be used individually or in combination to relieve symptoms of PCOS. Additionally, herbal treatment in combination with physical exercise and dietary habits may be effective in evaluating symptoms of PCOS. Though natural remedies are safe and effective, they should be consumed only under supervision of a healthcare professional.

7. CONCLUSION:

Table 1: List of active components and their role in PCOS

Plant	Scientific name	Family	Potent constituents	Effect in PCOS
Guduchi	Tinospora cordifolia	Menispermaciceae	Alkaloids	Helps to overcome insulin dysregulation during PCOS [14,15]
Maca	Lepidium meyenii	Brassicaceae	Phenols	Anti-oxidant property helps to maintain hormonal balance [17,18]
Ginseng	Panax ginseng	Araliaceae	Glutathione	Decreases plasma LH levels and improve endocrine status [19]
Chaste berry	Vitex agnus-castus	Lamiaceae	Agnuside, agnuside glucoside, casticin, casticin glucoside	Maintains estrogen and progesterone levels [20,21]
Bindii	Tribulus terrestris	Caltrop	Alkaloids, flavonoids, saponins, phenols	Regularize hormonal level and induce ovulation [2,22]
Gurmar	Gymnema sylvestre	Apocynaceae	Lupeol, ß-amyrin, ß-elemene, stigmasterol	Acts by lowering insulin resistance and obesity [23-25]
Silymarin	Silybum marianum L. Gaernt	Asteraceae	Silybin, isosilybin, silydianin, silychristin	Possess anti-angiogenesis property [26,27]
Chamomile	Chamomilla matricaria	Asteraceae	Flavonoids, Apigenin, patuletin, quercetin, anti-oxidants	Possess anti-inflammatory and anti-spasmodic effect, relieves menstrual cramps [20,28]
Spearmint	Mentha spicata	Mentha spicata	Polyphenols	Has anti-oxidant activity and reduce hirsutism in PCOS [1,29]

Trellis-vine	Pergularia daemia	Apocynaceae	Tannins, flavonoids, carbohydrates, steroids, terpenoids	Regulates menstrual irregularities and restores estrous cycle [12,30-33]
Shatavari	Asparagus racemosus	Liliaceae	Glycosides, alkaloids, steroidal saponins, mucilage	Enhance FSH and stimulate ovarian cycle [34,35,36]
Anise	Pimpinella anisum	Umbelliferae	Fatty acids, essential oils, proteins, flavonoids	Increase ovarian follicles and reduce menstrual irregularities [37-39]
Moringa	Moringa oleifera	Moringaceas	Chlorogenic acid, kaempferol glycoside, quercetin glucoside	Enhance aromatization and improve folliculogenesis [40,41]
Coconut	Cocos nucifera	Aracaceae	Polyphenols, fatty acids, flavonoids	Lowers inflammation and oxidative stress [42-44]
Flaxseeds	Linum usitatissimum	Linaceae	Lignans	Reduce testosterone [45,46]

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HOW TO CITE: Chaithra K.*, Sonali HB, Sourabh Choudhari A., Sushma V., Swathi S., Tejas Chittappa CT, Herbs for Healing Polycystic Ovarian Syndrome (PCOS): A Comprehensive Approach, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 9, 1699-1711 https://doi.org/10.5281/zenodo.17129177