



A Comprehensive Review on Tailoring an Herbal Approach for Treatment of Poly Cystic Ovarian Syndrome

Arpana Purohit^{1*}, Sameeksha Jain¹, Prakhar Nema¹, Deepak Kumar Jain², Harshna Vishwakarma¹, Prateek Kumar Jain¹

¹Adina College of Pharmacy, ADINA Campus Rd, Lahdara, Sagar, MP, 470001

²Sun Institute of Pharmaceutical Education & Research (SIPER), Bhatpura Road, Lahar, Bhand, MP, 477445

Article Info:

Article History:

Received 13 Jan 2022

Reviewed 26 Feb 2022

Accepted 07 March 2022

Published 15 March 2022

Cite this article as:

Purohit A, Jain S, Nema P, Jain DK, Vishwakarma H, Jain PK, A Comprehensive Review on Tailoring an Herbal Approach for Treatment of Poly Cystic Ovarian Syndrome, Asian Journal of Dental and Health Sciences. 2022; 2(1):27-32

DOI: <http://dx.doi.org/10.22270/ajdhs.v2i1.13>

*Address for Correspondence:

Arpana Purohit, Adina College of Pharmacy, ADINA Campus Rd, Lahdara, Sagar, MP, 470001

Email: tanuprht@gmail.com

Abstract

The review gives a brief about poly cystic ovarian syndrome (PCOS) and the symptoms related to the disease. Around 2.2 to 26% of cases of PCOS are present globally. The disorder generally occurs in the reproductive age group of women. The review has a mention of few herbs which can be used to correct the diseased condition. The various herbs have a positive effect on the diseased condition and can be used to cure symptoms like hypothyroidism, hyperplasia, obesity, diabetes, Menorrhagia, sleep disturbances, cardiovascular problems, hyperlipidemia, hirsutism, infertility, irregular menstrual cycle, etc. The herbs included in the review include Bauhinia variegata useful in hormone imbalance, Phyllanthus emblica, Terminalia bellirica, Terminalia chebula, and Commiphora wightii are used to regulate the hormones, Cinnamon cassia acts as an anti-oxidant, Tribulus terrestris improves reproductive dysfunction, Hypericum perforatum regulates depression, Commiphora myrrha prevents menorrhagia, Nigella sativa controls cholesterol, Saraca asoca has estrogenic action, Asparagus racemosus promotes folliculogenesis, Tinospora cordifolia regulates menstrual flow, Ocimum sanctum as an anti-oxidant. The plants taken had a positive effect on women with PCOS without causing any side effects. The natural herbs used for the treatment of PCOS did not have any side effects and treated the diseased condition naturally. This review aims to understand the natural plants available for the treatment of the disease naturally. The herbs can be used individually or can be used in combination.

Keywords: Poly cystic ovarian syndrome, Herbal medicine, Herbs, Natural plants

Introduction

One of the most prevalent disorders that affect both the metabolic and reproductive systems is polycystic ovary syndrome (PCOS). The main symptoms of PCOS are hyperandrogenism, persistent an ovulation and irregular menstrual periods^{1, 2}. There is no one effective treatment for this illness since its pathophysiology is still unclear, despite the fact that it likely has epigenetic roots^{3, 4}. For PCOS, various pharmaceutical therapies have been suggested. Although they have drawbacks including side effects, low patient compliance with long-term pharmaceutical therapies, low efficacy, and occasionally contraindications, complementary treatments can be a good substitute¹⁻⁵. A complex but frequent condition known as polycystic ovarian syndrome typically affects females in the reproductive age group. Nearly 70% of women who struggle with ovulation due to this condition develop sub fertility. The polycystic ovarian syndrome hinders the ovaries from functioning normally because the ovaries have cysts on them. Obesity or increased weight, high blood pressure, diabetes, dysfunctional lipid profiles, dandruff on the scalp or oily skin, dark patches on the neck and underarms, chronic pelvic pain, acne, increased levels of male hormones causing hair thinning and baldness in the male pattern, excessive hair growth on the body and face, and, in the case of women, menstruation are some of the underlying symptoms of this disorder⁹. Improper metabolism of estrogen, androgen, and

the generation of regulated amounts of androgen are the main underlying causes of PCOS in females¹⁰. Women have been reported to have low-grade inflammation and insulin resistance. PCOS is negatively impacted by some circumstances, including dietary modifications, lifestyle adjustments, and exposure to some environmental contaminants. It may cause major health concerns if left untreated. Additionally, it directly affects fertility¹¹. The most popular PCOS treatment options available today are oral contraceptives. They work by lowering blood levels of free androgens and preventing the release of gonadotropins¹². Letrozole, an aromatase inhibitor, and clomiphene citrate, a non-steroidal selective estrogen receptor modulator (SERM), are frequently used to induce ovulation. Although there is accumulating evidence that Letrozole has superior efficacy and safety for the mother and fetus^{13, 14}, clomiphene citrate is still the first-line medication. Insulin resistance, a crucial component of the Rotterdam criteria, is treated with metformin in PCOS patients. Overall, treating insulin resistance and hyperandrogenism enhances metabolic, reproductive, and hormonal processes¹⁴. In recent years, the usage of complementary therapies has grown, and currently, 40% of individuals benefit from them^{15, 16}. A neuroendocrine characteristic of PCOS includes increased luteinizing hormone secretion frequency, luteinizing hormone serum concentration rise, luteinizing hormone amplitude increase, and ratio of LH/FSH increase¹⁷. The development of PCOS is also brought

on by the interaction of numerous environmental and genetic variables. It is typically found in obese, less active or exercise-challenged women with a family history of PCOS. Ovarian cysts are among the symptoms that are employed in the therapy of the disorder, along with the absence of ovulation and excessive testosterone levels. The presence of any cysts can be determined using ultrasound techniques. The diagnosis of the illness can also be made using a number of additional factors, such as hypothyroidism, hyperplasia, and increased blood prolactin levels¹⁸. According to recent studies, there is currently little to no cure for PCOS. The only way to address the condition is to slightly alter your lifestyle, such as through exercise and weight loss. The regularity of the menstrual cycle can be maintained with the use of birth control pills, as can skin issues like acne and excessive hair growth. Additionally, a variety of methods can be employed to cure acne and remove body hair¹⁹. Lifestyle modification is the current treatment for PCOS corresponding to pharmacological interventions. To overcome this condition, modifications are to be made in the lifestyle such as proper exercise, diet, and also loss of weight. Agents that lower insulin, certain anti-androgens, and progestin-estrogen in combination comes under the category of pharmacological intervention. This category of treatment causes various problems and side-effects as they are expensive. The side effects can be gain of weight, irregular menstrual cycle, gastrointestinal problems, and also insulin resistance²⁰. Therefore, at present, lifestyle modification and diet alterations are the major concern for the above-mentioned gynecological diseases. Also, more and more patients are opting for herbal treatment. This review defines the few natural herbs used for the treatment and their role in the treatment of complications related to PCOS as described in Table 1.

Table 1 Herbs used in the treatment of associated PCOS complications

Herb used for Treatment	Symptom/Complication associated with PCOS
Tribulus terrestris	Reproductive dysfunction
Cinnamon cassia Ocimum sanctum	Anti-oxidant
Bauhinia variegata	Hormonal imbalance
Phyllanthus emblica, Terminalia bellirica, Terminalia chebula, and Commiphora wightii	Regulation of hormones
Hypericum perforatum	Depression & Mood swings
Commiphora myrrha	Menorrhagia
Nigella sativa	Cholesterol
Saraca asoca	Estrogenic action
Tinospora cordifolia	Regulation of menstrual flow
Asparagus racemosus	Folliculogenesis

Herbs in the treatment of PCOS

Hypericum Perforatum

The plant known as St. John's wort, *Hypericum perforatum*, is a member of the Hypericaceae family. Many nations employ St. John's wort as a medicinal plant. Tipton weed, Goat weed, and

Enola weed are some of the other names for St. John's wort. The herb was advised by Greek physicians to cure menstruation disturbances²¹. There are various situations in which the patient's psychological discomfort or psychology could influence the course of treatment or reduce the likelihood of successful outcomes²². Any factor that contributes to negative stress or sadness has no beneficial effects on ovarian function or treatment. Patients today have more faith in and desire in using natural herbs for therapy and the safe, effective, and natural method of healing. In order to achieve a synergistic impact or to assist the treatment for better results, patients with ovarian dysfunctions and PCOS are now utilizing alternative medicine²³. In general, women who are of reproductive age utilize St. John's wort extracts, which are widely recognized as synthetic medications that modulate serotonin^{24, 25}. Mild depression and mood fluctuations are frequent side effects of PCOS; such mild to moderate depression is treated with St. John's wort²⁶.

Commiphora Wightii

A therapeutic flowering plant known by many common names, including Guggulu, Guggul, and Gugal, *Commiphora wightii* is a member of the Burseraceae family. Although it can also be found in Central Asia, guggul is most frequently found in Northern India. Guggul extract, also known as guggulipid, is a frequent ingredient in Ayurvedic and herbal remedies. Guggul contains a variety of therapeutic essential oils, gum extracts, and resinous compounds²⁷. The study demonstrated that Guggul reduces the DHEA-induced PCOS in the ovarian follicles, which is a key factor in minimizing morphological abnormalities. As a result, the hormonal fluctuations return to normal. The study also shown that the DHEA-induced PCOS profile, which includes the hormones FSH, LH, progesterone, estrogen and testosterone, experienced a sharp rise in hormone levels. Elevated glucose levels were also observed²⁸. For the purpose of raising awareness, promoting the use of guggul as a nutritional/dietary supplement, and determining the safety of use in humans, the National Institute of Health Environmental Sciences nominated the Gum Guggul to extract for examination of the Toxicological parameters and characterization. Gum Guggul has been shown to provide advantages for female reproductive organs and hormonal balance²⁹.

Tribulus Terrestris

The medicinal plant is a member of the Zygophyllaceae family and belongs to the genus *Tribulus*; there are about 20 species in this family. *Tribulus terrestris*, *Tribulus cistoides*, and *Tribulus alatus* are the three principal species found in India³⁰. The medicinal herb utilized in both Ayurveda and Western medicine is gokhru, one of the three species³¹. Gokhru is utilized industrially for the creation of feed-based additives and medicinal formulations due to its saponin concentration³².

The herb contains a variety of compounds, including glycosides, flavonoids, alkaloids, etc.; these compounds are rich in biological significance when taken as a dry extract of the therapeutic plant. According to recent study investigations, the medicinal herb is thought to have an impact and enhance female sexual dysfunction and reproduction. Gokhru is seen as a potential alternative therapy for polycystic ovarian disease. Using a strong Gokhru extract, ovarian activity can be restarted after cysts in the ovaries have been eliminated. It is thought that the medicinal extract affects PCOS-affected women's folliculogenesis. The mechanism, however, is still not understood³³. Herbal medicines are used more frequently than synthetic ones since they have fewer side effects, are more affordable, and are beneficial to the health. They can also be taken for a longer period of time. Gokhru is thought to be an ovarian stimulant and a fertility

tonic with an impact on women with PCOS. As a result, it is a preferred herb for PCOS³⁴.

Asparagus Racemosus

In conventional Ayurvedic medicine, shatavari is a herb used for medicinal purposes that is a member of the Asparagaceae family. Women utilize the remedy plant for infertility, menstrual cycle control, ovarian follicle formation, and healthy functioning. The plant is thought to contain phytoestrogen, a type of natural plant-based estrogen that helps women's reproductive systems recover. In cases of hyperinsulinemia, it also aids in the body's regulation of insulin³⁵. There was a shatavari effect in young women with PCOS. According to a study, the plant is thought to boost the hormone that stimulates the formation of new follicles, increasing folliculogenesis. According to numerous studies³⁶, the weight of the ovaries may also grow. It is also regarded as the herb of choice for issues related to menstruation. Shatavari has a number of ingredients that aid in the treatment of issues associated to menstruation, such as menorrhagia, or painful menstrual bleeding, irregular flow, etc. The principal component of shatavari, saponin, aids in maintaining uterine mobility and is hence helpful in reducing unpleasant premenopausal bleeding³⁷. Infertility is one of the issues that women deal with. Because it promotes folliculogenesis, the herb is useful in the treatment of infertility issues. It gets the womb ready and lowers the likelihood of miscarriages. The roots of shatavari are frequently utilized during abortions to assist the uterine muscles grow stronger³⁸.

Nigella Sativa

A plant of significant therapeutic value that can be found all throughout the nation is *Nigella sativa*, also known as Kalaunji or black cumin and belonging to the Ranunculaceae family. All traditional medical systems, such as Ayurveda, Unani, Siddha, etc., use herbs. The Kalaunji plant plays a significant part in the oil and seed portion and is utilized in practically all types of medicine. Many illnesses and medical disorders are treated with kalaunji. According to Islamic Literature³⁹, it is well known to be a curative drug. According to numerous researches, black cumin is thought to be actively employed in the treatment and management of polycystic ovarian syndrome in female patients. Women with PCOS are thought to have a higher risk of developing cholesterol. Kalaunji was therefore seen to have impacted nearly all the metrics, according to the investigations. However, high-density lipoprotein and cholesterol were the main effects. While raising the body's LDL levels, black cumin modulates cholesterol and HDL levels. It has a favorable impact on the lipid profile because of choleric activity, as was seen in the case of Kalaunji. Additionally, it's thought that Kalaunji's decrease of appetite results in a hypolipidemic profile⁴⁰.

Cinnamon Cassia

The bark of the Dalchini tree has been used all over the world as both traditional and modern medicine with a variety of uses in addition to as a spice for cooking. Cinnamon trees may be found all over the world, and the Dalchini has at least 250 species that have been documented to date^{41,42}. Insulin resistance and signs of hyperinsulinemia have been identified in women with PCOS. Women were shown to have greater levels of insulin resistance than controls. Hyperandrogenism and insulin resistance are the main causes of irregular menstruation and anovulation in women. Synthetic medications like metformin have helped to address the problem to some extent. They do, however, have gastrointestinal side effects. Therefore, pre-clinical and clinical studies on the natural herb Dalchini revealed a sensitizing effect. The herb's polyphenols have the ability to increase insulin-dependent glucose metabolism, which changes how

glucose is transported. According to the study, Dalchini can be used to treat PCOS in women since it reduces irregularities in the menstrual cycle and offers efficient treatment without side effects. When compared to a placebo group, the study also reveals that the herb's extract can be utilized to treat irregular menstrual cycles and ovulation⁴³. According to the study, cinnamon extract acts as an antioxidant and enhances lipid profile. As a result, PCOS-affected women experience fewer side effects and risk factors⁴⁴.

Bauhinia Variegata

In the tropical and temperate areas of India, there is a tree known as *Bauhinia Variegata* or Kanchar, which has been used for many centuries in the Ayurveda. Kanchar Guggul is the form of kanchar that is used to treat PCOS. It works well to cure a variety of ailments, including PCOS, uterine cysts, various joint issues, and hormone imbalances. Guggul is known as "Guggulu" in Sanskrit, and it signifies "to protect from diseases." The purpose of guggul is to boost the lymphatic system's performance as well as the body's ability to rid itself of pollutants. Varuna, black pepper, long pepper, a kwath of Triphala, pure Guggul resin, cardamom, and cinnamon are among the herbs included in Kanchar guggul⁴⁵.

Triphala: Emblica officinalis, Terminalia beletica, Terminalia chebula

The term "triphala" refers to a combination or mixture of the three fruits Amla, Haritaki, and Baheda. Triphala is used to treat PCOS because it has anti-inflammatory properties in addition to being an antioxidant and a natural source of vitamin C. Triphala also has cleansing and purifying properties that aid in the treatment of PCOS. The radicals that Triphala scavenges are superoxide and diphenylpicrylhydrazyl. As a result, it has anti-inflammatory properties. Free radical scavenging is a characteristic of phenolic compounds, which are found in Triphala extracts. By affecting hormone regulation, these chemicals primarily serve to alleviate the issue of menstrual irregularities⁴⁶. According to Ayurveda, "Tridoshic Rasayana" is a therapeutic agent that affects the three constitutional energies of vata, pitta, and kapha. It has balancing and rejuvenating effects on these energies. Triphala is thought to be a combination of Vata, Pitta, and Kapha according to Ayurveda, making it well-balanced and detoxifying. In an old Ayurvedic source, triphala is referred to as a Tridoshic Rasayana, a medicinal substance with rejuvenating and balancing effects on the three humors, or constitutional elements, of Vata, Pitta, and Kapha. Amla is chilly in nature, but Harad, Baheda, and Ama have warm energies. Because it combines all three, triphala is balanced and effective as a remedy for internal cleaning and detoxification⁴⁷.

Saraca Asoka

Leguminosae is the family that the Ashoka tree belongs to. The tree's dry bark contains tannins, catechol, and other substances that contain calcium. The Asoka tree includes a number of important ions, such as phosphate, sodium, calcium, and magnesium. Treatment for PCOS, irregular menstruation patterns, uncontrolled profuse bleeding, uterine spasms, mild to severe discomfort, and dysmenorrhea are the main uses of Ashoka bark. Asoka is regarded as one of the best uterine tonics because it combats irregular menstrual cycles and miscarriage situations. Antimenorrhagia or excessive bleeding is treated with the herb. Women with PCOS and other uterine disorders use both the flower and the bark parts of the plant. Uterine hemorrhage can also be treated using Asoka's stem. Additionally, the oxytocin activity of the herb is said to have thickened the endometrium, the innermost layer of the uterus, helping to prevent uterine diseases. The Ashoka is

thought to behave similarly to estrogen, promoting healthy uterine function and reducing excessive bleeding. In cases of severe menstrual bleeding, it functions as an astringent. Additionally, it induces the uterine muscles to contract. Additionally, uterine fibroid and menorrhagia in PCOS cases are mentioned in the studies⁴⁸.

Ocimum Sanctum

The main medical applications of the sacred herbal plant Tulsi are the management of obesity and hypoglycemia⁴⁹.

Because of its anti-androgenic qualities, it is used to treat polycystic ovarian syndrome. It controls obesity and reduces testosterone production⁵⁰. The body does not use the androgens since the appropriate ovulation process does not occur. Unused androgens are the cause of hirsutism and the acne issue. Tulsi's function is to maintain and utilize androgen levels appropriately. Additionally, it has antioxidant properties⁵¹.

Tinospora Cordifolia

The scientific name for the family member Guduchi is *Tinospora cordifolia*. A medicinal herb known as Menispermaceae has a variety of therapeutic benefits, including hypoglycemia, anti-inflammatory, anti-stress, and ovarian balance. The plant uses the stem portion. Guduchi's primary use is in the management of PCOS. The primary contributors to tissue inflammation are insulin disturbances and ovarian cysts. Guduchi is thought to have anti-inflammatory properties. It serves to naturally strengthen immunity. Women who have PCOS develop insulin resistance, which aids in overcoming that resistance. This plant also regulates menstruation flow⁴⁶. All body tissues are regenerated by guduchi, and it also aids in increasing immunity and metabolism⁵².

Commiphora Molmol

Commiphora molmol, also known as *Commiphora myrrha*, is a member of the genus *Commiphora*, which is regarded as having the most species diversity among all the genera of flowering plants and is descended from the family Burseraceae. Myrrha is known as "murr" in Arabic, which means "bitter"; according to the Unani school of medicine, "murr" refers to an oleo gum resin that is extracted from the tree's bark. Alkaloids, glycosides, volatile oil, saponins, terpenoids, steroids, bitter principle, and others are some of the main phytochemical components of *Commiphora myrrha*⁵³. Myrrha is mostly responsible for amenorrhea, or the absence of menstruation. To help the menstrual cycle, myrrh is coupled with iron-rich foods. Menorrhagia, which is characterized as a medical disease with copious and protracted bleeding throughout the menstrual period, is another function of myrrh in PCOS. Myrrh stops excessive blood loss during irregular and protracted bleeding. The resin may also act as an emmenagogue to increase blood flow when there is a uterine irregularity. Several uterine infections are treated with oleo-gum resin⁵⁴. Any obstruction in the path of the uterus is one of the herb's most crucial functions, and it also plays a part in brief and irregular periods. It encourages controlling menstrual bleeding⁵⁵.

Future aspects of PCOS using herbal treatment

The disorder known as polycystic ovarian syndrome has a number of long-term, chronic health issues. On the long-term impact of PCOS on a woman's health, little research has been done to date. According to numerous studies, PCOS can cause women to have a variety of side effects, including mood fluctuations, weight gain, diabetes, heart disease, and miscarriage. Choosing the best treatments for women going through the postmenopausal stage is still a challenge.

Numerous studies indicate that women with PCOS had higher bone mineral densities. To understand the health hazards associated with women's aging, more research is needed. Identifying the relevant risk factors and genetic alterations both play a crucial role⁵⁶. A few herbs that can be used to cure polycystic ovarian syndrome naturally and without any negative side effects are listed in the review. The long-term use of synthetic medications is linked to a number of negative side effects; as a result, the symptoms of PCOS gradually start to disappear. It is advised to use natural products over the long term⁵⁷.

Conclusion

According to the review, continuous usage of synthetic medications may result in negative effects. On the other hand, herbal medications are secure and offer therapeutic activity without any negative side effects when used for a long period of time. A number of herbs can be taken singly or in combination to reduce PCOS risk factors. Additionally, it was shown that combining a few herbs results in a synergistic impact. It is more common to see the pharmacological action in combination than as a single component. A number of market concoctions combine a number of plants, and each herb enhances the pharmacological effects of the others. Consequently, choosing the right herbs and their interactions is equally crucial. There are several herbal products offered for PCOS, including well-known manufacturers like Himalaya, Patanjali, Dabur, Baidyanath, etc. All these marketed preparations have herbal drugs or a combination of herbal drugs.

References

- Eshre TR. Asrm-Sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. *Fertil Steril*, 2004; 81(1):19-25. <https://doi.org/10.1016/j.fertnstert.2003.10.004>
- Ozcan Dag Z, Alpua M, Isik Y, Buturak SV, Tulmac OB, Turkel Y. The evaluation of temperament and quality of life in patients with polycystic ovary syndrome. *Gynecol Endocrinol*, 2017; 33(3):250-3. <https://doi.org/10.1080/09513590.2016.1254610>
- Celik O, Acbay O. Effects of metformin plus rosuvastatin on hyperandrogenism in polycystic ovary syndrome patients with hyperlipidemia and impaired glucose tolerance. *J Endocrinol Investig*, 2012; 35(10):905-10.
- Norman RJ, Dewailly D, Legro RS, Hickey TE. Polycystic ovary syndrome. *Lancet*. 2007; 370(9588):685-97. [https://doi.org/10.1016/S0140-6736\(07\)61345-2](https://doi.org/10.1016/S0140-6736(07)61345-2)
- Helvacı N, Yildiz BO. Oral contraceptives in polycystic ovary syndrome. *Minerva Endocrinol*, 2014; 39(3):175-87.
- Seaman HE, de Vries CS, Farmer RD. Venous thromboembolism associated with cyproterone acetate in combination with ethinylloestradiol (Dianette): observational studies using the UK general practice research database. *Pharmacoepidemiol Drug Saf*, 2004; 13(7):42-36. <https://doi.org/10.1002/pds.896>
- Messinis IE. Ovulation induction: a mini review. *Hum Reprod*, 2005; 20(10):2688-97. <https://doi.org/10.1093/humrep/dei128>
- Tannus S, Burke YZ, Kol S. Treatment strategies for the infertile polycystic ovary syndrome patient. *Womens Health (Lond)*, 2015; 11(6):901-12. <https://doi.org/10.2217/whe.15.40>
- Dayani Siriwardene SA, Karunathilaka LP, Kodituwakku ND, Karunaratne YA. Clinical efficacy of ayurveda treatment regimen on sub fertility with polycystic ovarian syndrome (PCOS). *Ayu*. 2010; 31(1):24-27. <https://doi.org/10.4103/0974-8520.68203>
- Patelanuradha J, Thakor AP. Prospective use of tephrosia purpurea in remedial treatment of PCOS: Study in wistar rat. *Int Res J Biol Sci*, 2012; 1(3):1-6.

11. Latha ST, Prasanna JL, Rani MJ, Divya K, Babu AMS. A review on natural remedies for prevailing polycystic ovarian disorder. *Indo Am J Pharm.*, 2015; 5(10):3307-3315.
12. Franik S, Kremer JA, Nelen WL, Farquhar C. Aromatase inhibitors for subfertile women with polycystic ovary syndrome. *Cochrane Database Syst Rev.*, 2014; 2:CD010287. <https://doi.org/10.1002/14651858.CD010287.pub2>
13. Balen AH, Morley LC, Misso M, Franks S, Legro RS, Wijayaratne CN, et al. The management of anovulatory infertility in women with polycystic ovary syndrome: an analysis of the evidence to support the development of global WHO guidance. *Hum Reprod Update.*, 2016; 22(6):687-708. <https://doi.org/10.1093/humupd/dmw025>
14. Abu HH. Twenty years of ovulation induction with metformin for PCOS; what is the best available evidence? *Reprod BioMed Online.*, 2016; 32(1):44-53. <https://doi.org/10.1016/j.rbmo.2015.09.015>
15. Lunny CA, Fraser SN. The use of complementary and alternative medicines among a sample of Canadian menopausal-aged women. *J Midwifery Womens Health.*, 2010; 55(4):335-43. <https://doi.org/10.1016/j.jmwh.2009.10.015>
16. Barnes PM, Bloom B, Nahin RL. Complementary and alternative medicine use among adults and children; United States. *Natl Health Stat Report.* 2007.
17. Mobeen H, Afzal N, Kashif M. Polycystic ovary syndrome may be an autoimmune disorder. *Scientifica (Cairo).* 2016; 4071735. <https://doi.org/10.1155/2016/4071735>
18. Balaji S, Amadi C, Prasad S, Bala Kasav J, Upadhyay V, Singh AK, Surapaneni KM, Joshi A. Urban rural comparisons of polycystic ovary syndrome burden among adolescent girls in a hospital setting in India. *BioMed Res Int.*, 2015; 158951. <https://doi.org/10.1155/2015/158951>
19. Choudhary K, Singh R, Garg A, Verma N, Purohit A, Deora D. An updated overview of polycystic ovary syndrome. *Int J Biol Sci.*, 2019; 7(3):1-13. <https://doi.org/10.22159/ijms.2019.v7i3.34248>
20. Nowak DA, Snyder DC, Brown AJ, Demark-Wahnefried W. The effect of flaxseed supplementation on hormonal levels associated with polycystic ovarian syndrome: A case study. *Curr Top Nutraceutical Res.*, 2007; 5(4):177-181.
21. Belwal T, Devkota HP, Singh MK, Sharma R. Chapter 3.40 - St. John's Wort (*Hypericum perforatum*), nonvitamin and nonmineral. *Nutritional Supplements*; Academic Press, 2019, pp. 415-432. <https://doi.org/10.1016/B978-0-12-812491-8.00056-4>
22. Mitsi C, Efthimiou K. Infertility: Psychological-psychopathological consequences and cognitive-behavioural interventions. *Psychiatriki.*, 2014; 25(4) :293-302.
23. O'Reilly E, Seigny M, Sabarre KA, Phillips KP. Perspectives of complementary and alternative medicine (CAM) practitioners in the support and treatment of infertility. *BMC Complement Altern Med.*, 2014; 14:394. <https://doi.org/10.1186/1472-6882-14-394>
24. Rayburn WF, Gonzalez CL, Christensen HD, Stewart JD. Effect of prenatally administered hypericum (St John's wort) on growth and physical maturation of mouse offspring. *Am J Obstet Gynecol.*, 2001; 184(2):191-195. <https://doi.org/10.1067/mob.2001.108339>
25. Canning S, Waterman M, Orsi N, Ayres J, Simpson N, Dye L. The efficacy of hypericum perforatum (st john's wort) for the treatment of premenstrual syndrome: A randomized, doubleblind, placebo-controlled trial. *CNS Drugs.* 2010; 24(3):207-225. <https://doi.org/10.2165/11530120-000000000-00000>
26. Insulite health PCOS. Herbal remedies for PCOS. Available from: <https://pcos.com/herbal-remedies/>.
27. Sing DC, Dhyani S, Kaur GA. Critical review on Guggulu[*Commiphora wightii*(arn.) bhand.] & its miraculous medicinal uses. *Int J Ayurveda Pharma Res.*, 2015; 3(1):1-9.
28. Kavitha A, Narendra BA, Kumar SM, Kiran VS. Evaluation of effect of commiphora wightii in dehydroepiandrosterone (DHEA) induced polycystic ovary syndrome (PCOS) in rats. *Pharma Tutor.*, 2016; 4(1):47-55.
29. Rani R, Mishra S. Phytochemistry of guggul (*commiphora wightii*): A review. *Asian J Res Chem.*, 2013; 6(4): 415-426.
30. Evans WC, Evans D, Trease GE. A taxonomic approach to the study of medicinal plants and animal derived drugs. In: Trease and Evans pharmacognosy, 15th; WB Saunders: Edinburgh, New York, 2002.
31. Duke J, Duke PK, Cellier JL. *Duke Handbook of medicinal herbs*, 2nd; United States, 2002. <https://doi.org/10.1201/9781420040463>
32. Kostova I, Dinchev D. Saponins in tribulusterrestris-chemistry and bioactivity. *Phytochem Rev.*, 2005; 4:111-137. <https://doi.org/10.1007/s11101-005-2833-x>
33. Abadjieva D, Kistanova E. Tribulus terrestris alters the expression of growth differentiation factor 9 and bone morphogenetic protein 15 in rabbit ovaries of mothers and f1 female offspring. *PLoS One.*, 2016; 11(2):e0150400. <https://doi.org/10.1371/journal.pone.0150400>
34. Singh PP, Krishna A. Anti-hyperglycaemic activity of tribulusterrestrisfruit extract restores metabolic imbalance in letrozole induced -PCOS mice. *Int J Pharmacogn Phytochem.*, 2019; 11(4):304-311.
35. Pachiappan S, Matheswaran S, Saravanan PP, Gayathiri M. Medicinal plants for polycystic ovary syndrome: A review of phytomedicine research. *Int J Herb.*, 2017; 5(2):78-80.
36. Kalia V, Jadav AN, Bhuttani KK. In vivo effect of *Asparagus racemosus* on serum gonadotrophin levels in immature female wistar rats. 2nd world congress of Biotech; Division of Herbal medicine: NBRI: Lucknow, 2003, p. 40.
37. Gaitondé BB, Jetmalani MH. Antioxytotic action of saponin isolated from *Asparagus racemosus* Willd (Shatavari) on uterine muscle. *Arch Int Pharmacodyn Ther.*, 1969; 179(1):121-129.
38. Sharma K, Bhavnagar M. *Asparagus racemosus* (Shatavari): A versatile female tonic. *Int J Phar.*, 2011; 2(3):855-863.
39. Ahmad A, Husain A, Mujeeb M, Khan SA, Najmi AK, et al., A review on therapeutic potential of *Nigella sativa*: A miracle herb. *Asian Pac J Trop Biomed.*, 2013; 3(5):337-352. [https://doi.org/10.1016/S2221-1691\(13\)60075-1](https://doi.org/10.1016/S2221-1691(13)60075-1)
40. Sheeraz M. Rational approach towards the role of kalawnji (*nigella sativa* linn) in marz-e- akyas khusyatur rehm (polycystic ovarian syndrome)-a review. *Indo Am J Pharm.*, 2018; 8(5):1089-1096.
41. Sangal A. Role of cinnamon as beneficial antidiabetic food adjunct: A Review *Adv Appl Sci Res.*, 2011; 2(4):440-450.
42. Vangalapati M, Prakash S. A review on pharmacological activities and clinical effects of cinnamon species. *Res J Pharm Biol Chem Sci.*, 2012; 3(1): 653-663.
43. Kort DH, Lobo RA. Preliminary evidence that cinnamon improves menstrual cyclicity in women with polycystic ovary syndrome: A randomized controlled trial. *Am J Obstet Gynecol.*, 2014; 211(5):487.E1-487.E6. <https://doi.org/10.1016/j.ajog.2014.05.009>
44. Borzoei A, Rafrat M, Niromanesh S, Farzadi L, Narimani F, Doostan F. Effects of cinnamon supplementation on antioxidant status and serum lipids in women with polycystic ovary syndrome. *J Tradit Complement Med.*, 2017; 8(1):128-133. <https://doi.org/10.1016/j.jtcme.2017.04.008>
45. Netmeds. *Kanchanar Guggulu*: This ayurvedic formulation treats hormonal imbalance. Available from: <https://www.netmeds.com/health-library/post/kanchanar-guggulu-this-ayurvedic-formulation-treats-hormonal-imbalance>
46. Khandelwal R, Nathani S. An ayurvedic approach to PCOS: A leading cause of female infertility. *Int J Ayurveda Res.*, 2016; 1(3):77-82.
47. Chouhan B, Ramesh K, Mita K, Ramamurthy A, Nathani S. *Triphala*: A comprehensive ayurvedic review. *Int J Res Ayurveda Pharm.*, 2013; 4(4): 612-617. <https://doi.org/10.7897/2277-4343.04433>

48. Aruljothi R, Thiruthani M. Review of saraca asoca for uterine tonic in traditional siddha medicine. *Int J Curr Res Chem Pharm Sci*, 2019; 6(6):1-3.
49. Satapathy S, Das N, Bandyopadhyay D, Mahapatra SC, Sahu DS, Meda M. Effect of tulsi (*ocimum sanctum* linn.) supplementation on metabolic parameters and liver enzymes in young overweight and obese subjects. *Indian J Clin Biochem.*, 2017; 32(3):357-363. <https://doi.org/10.1007/s12291-016-0615-4>
50. Pachiappan S, Matheswaran S, Saravanan PP, Gayathiri M. Medicinal plants for polycystic ovary syndrome: A review of phytomedicine research. *Int J Herb.*, 2017; 5(2):78-80.
51. Khanage SG, Subhash TY, Bhaiyyasaheb IR. Herbal drugs for the treatment of polycystic ovary syndrome (PCOS) and its complications. *Pharm Res.*, 2019; 2(1):5-13.
52. Healthy living. *Saraca asoca* bark. Available from: <https://healthyliving.natureloc.com/wp-content/uploads/2016/08/Ashoka-Bark4>.
53. <https://cdn.shopify.com/s/files/1/0058/0252/4783/articles/st-johns-wort-hypericum-perforatum-primary-v2.jpg?v=1567803563>
54. Fahad T, Ismath S. Phytochemical & therapeutic potentials of Murrmakki (*Commiphora amyrrha*). *Indian J Appl Res.*, 2018; 8(9):102-104.
55. There's an EO for that. Treat PCOS naturally using essential oils. Available from: <https://www.theresaneoforthat.com/treat-pcos-naturally-using-essential-oils>.
56. Barthelmess EK, Naz RK. Polycystic ovary syndrome: Current status and future perspective. *Front Biosci (Elite Ed.)*, 2014; 6:104-119. <https://doi.org/10.2741/E695>
57. Ghani U, Batool A, Rafeeq H, Naeem M. Advancement and future directions towards herbal treatment for various diseases. *Saudi J Med Pharm Sci.*, 2019; 5(11):931-941. <https://doi.org/10.36348/sjmps.2019.v05i11.003>