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REVIEW ARTICLE

A Review on Medicinal Plants and Bioactive Compounds used in Treating PCOS

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ABSTRACT
Polycystic ovarian syndrome is differentiated out by uneven menstrual cycle and it is a neuroendocrine metabolic disorder. Therapy for this disorder is done utilizing man-made drugs that are efficacious. Patients inspired by natural remedies used for efficient treatment results with organic medications in treating PCOS along the restraint in allopathic medication. The perspective of important natural remedies, it's considered that the purpose of various plants as well as bioactive substances within PCOS. We have discussed importance of natural medication in curing PCOS their chemical mixture and mechanism of action in herbal drugs and bioactive compound in this review article. Scientists at work and who tries to understand the role natural drugs in PCOS can get a help from this article which can be resource of good information.
Keywords: Natural medication, Neuroendocrine, PCOS and bioactive compound.

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INTRODUCTION

PCOS is a difficult disorder identified by periods that are irregular, high testosterone levels, and tiny cysts on one or both ovaries. [1] At least 7% of adult women go through this condition called PCOS. PCOS is seen in childbearing age in almost 5 million women the Costs of the United States healthcare system's strategy for PCOS management nearly $4 billion yearly was estimated by National Institutes of Health Office of Disease Prevention [2] A healthcare recognition of PCOS, can result in microcysts in ovaries, unovulation, follicular development in addition to monthly cycle changes. [3]

Females 18 to 44 years of age nearly 5% to 10% of is seen suffering from PCOS according to research, that makes it most frequent endocrine diseases in females of menstrual age in the U.S. PCOS patients have acne, increased hair growth, obesity, infertility and amenorrhea are seen the women are asking help from Health care individual to solve the problem. Females with more chance of cardiovascular disease, endometrial cancer, type-2 and dyslipidaemia diabetes mellitus popular among women having PCOS. [4,5] This article shows the drug therapy management of PCOS. The specific cause of this remains unknown, although a mix of environmental and inherited factors might be the primary contributory factor. [6,7] The correlation among PCOS as well as the gut bacteria has been proven in the past few years, and it is believed to have played a role in the initial identification associated with the disorder. Environmental risk factors-induced an imbalance of the microbes in the gut may be an infectious factor in the onset and progression of diseases. Various microbiota contributes to various infectious features of PCOS, as well as their role in the beginning of different clinical indicators of the condition opens up new treatment options. [8]

Phenotypes

The PCOS fluctuations depends on factors like hyperandrogenism, PCO and anovulation are four phenotypes have been recognized by the medical team. They constantly start from maximum (phenotype A) to the minimum (phenotype D) in ovarian dysfunction. [9,10]

Pathophysiology

The deficiency in the insulin secretion, hypothalamic pituitary axis, ovarian function and ovarian action can be seen in pathophysiology. [11] By making androgens in the ovaries, which result in anovulation, insulin assists in controlling ovarian function and respond to excess insulin. An ovarian abnormality exists and Follicular maturation is a sign of this disorder. Elevated levels of LH and GnRH are its sign, whereas FSH remain constant. GnRH elevation leads to ovarian thecal cells to be stimulated, producing more androgens. Increasing follicular stoppage by inherent FSH levels or introducing foreign FSH. [12] Teenage girls who are soon to enter adolescence are in danger for developing condition. 25% of patients have elevated prolactin level. [13] As per the global characteristic standard, PCOS impacts 8% to 20% of women in reproductive age every year.[14]The importance of pathophysiology is the utilisation of carbs, constant low-grade inflammation, elevated testosterone levels, and high insulin levels.[15]

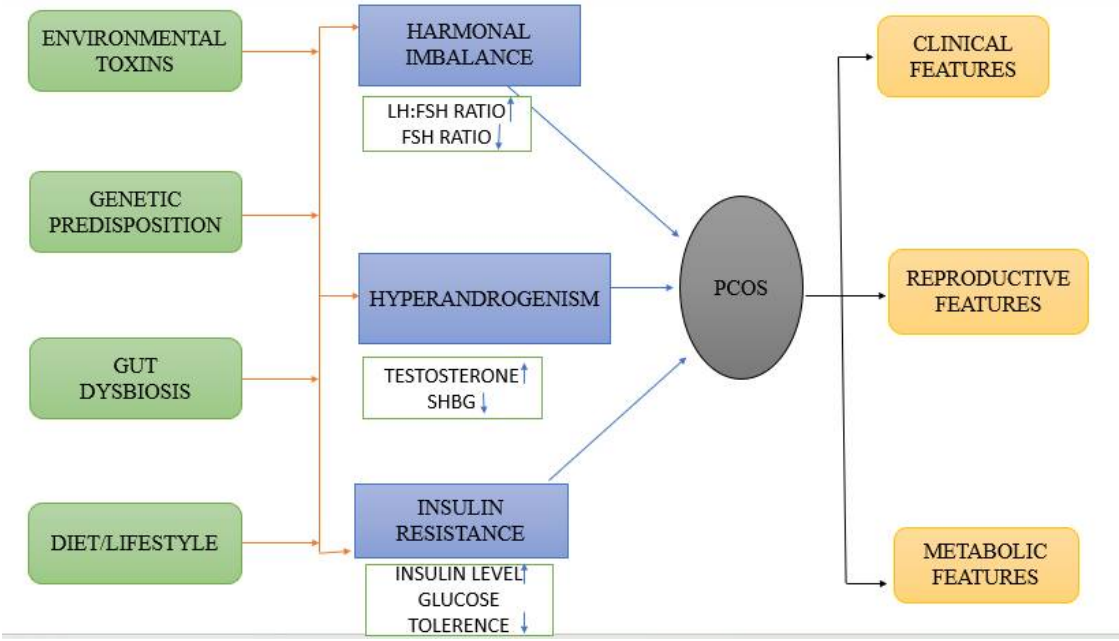

Figure 1: Polycystic ovary syndrome (PCOS) pathogenesis

Medicinal Plants Used in treating PCOS

Table 1: Medicinal plants and their mechanism of action

Medicinal plants	Mechanism of action	References
Cinnamon	Insulin-sensitizing effect. Reductions in serum insulin, IGF-1, LH. Testosterone levels. Elevation of serum FSH levels.	16
Linseed	Regulate estrogen formation lowers androgen level. Reduce increased level of testosterone in blood.	17,18
Spearmint	Regulate the blood ratio of LH and FSH. Lowers total testosterone. Reduces atretic follicles.	19
Aloe vera	Deprives 17β-HSD and 3β-HSD. Lower the overall androgen secretion. It increases estrogen production.	20
Man root	Elevate serum Estradiol while lowering FSH and LH.	21
Fenugreek	Decrease LH/FSH ratio.	22
Ginger	Anti-prostaglandin effect by inhibiting the synthesis of arachanoid acid. Preventing the formation of prostaglandins.	23
Fennel	Induce estrogenic properties in ovarian follicle.	24
Liquorice	Anti-androgen effect. Support release of estrogen.	25
Turmeric	Reduces the follicular sheath. Enhances the ovulation process. Corpus luteum production.	26

Bioactive Compounds Used in the Management of PCOS

Table 2: Bioactive compounds and their mechanism of action

Bioactive compound	Mechanism of action	References
Quercetin	Phenolic ring in quercetin lowers steroidogenic enzyme 3β-HSD and 17β-HSD.	27
Naringin	When rats received letrozole to create PCOS, the steroidogenic enzymes alleviate symptoms of hormone disorders. Elevated serum insulin levels preserve the normal ovarian morphology.	28,29
Rutin	Rutin could boost the level of GLUT4 and dependent on glucose antibody kinase activity, which would improve the absorption of glucose, control plasma diabetes levels, lower danger of developing diabetes in patients. In PCOS rats, Rutin corrects hormonal imbalances and raises steroidogenic ovarian proteins.	30,31
Resveratrol	By reducing serum concentrations of DHEA and testosterone. Changing ovary and adrenal glands capacity to produce androgen, RVT exacerbates hyperandrogenism in PCOS. RVT treats hyper stimulation of the ovary syndrome-related endometriosis, subfertility, ovulation disorders by dropping VEGF, mRNA and VEGF protein.	32-33
Catechin	It increased insulin antibody (IRS-1) and PI3K signals, reversed defects in ovarian anatomy, attenuated uterine inflammation. Inhibited the expression of STAT3 signalling, MMP2, and MMP9 in the female reproductive tract in insulin therapy- and HCG-persuaded mice with PCOS. Moreover, they increased NF-κB.	34
Gallic acid	A rise in proinflammatory cytokines was detected. Rats treated with GA had reduced levels of inflammatory cytokines in their ovaries, suggesting an impact.	35
Mangiferin	Reduce the pp65/p65 ratio and inhibit the inflammatory cytokines like IL-6, IL-1β, and TNF-α to alleviate inflammation in DHEA caused PCOS.	36

Future Scope

While studying PCOS in detail their phenotypes, pathophysiology and etiology we have seen that PCOS has become an important issue in many women now a day's. The studies are required to assess the strength of different medicinal plants and bioactive compounds under in vitro conditions along with their validation, confirmation and mechanism of action as there are no side effects in them as these are natural products. These research may help us to bring the natural phytotherapy at clinical platform and easy availability of medicines to each and every women suffering from PCOS and its related complications.

CONCLUSION

PCOS is the most recurrent hormonal illness in females from pubescent to pre-menopause, with different types of problems, including infertility, metabolic and cardiovascular issues and long-term health problems that can last a lifetime. Synthetic medications have shown great management for the treatment of PCOS, but adverse drug reactions make their value for long-term cure questionable. To improve recovery rates and acceptance, patients are relying on herbal therapy as an alternative to synthetic medicines for the control and treatment of PCOS. The current review gives a review of medicinal plants that are beneficial for PCOS and its complications. We have reviewed various key medicinal plants, different bioactive compounds and their mechanism of action that are significance in PCOS management. We are sure that our assessment will be of significant use to researchers working on medicinal therapies to treat PCOS.

REFERENCES

1. Umland EM, Weinstein LC, Buchanan EM. Menstruation-related disorders. In: DiPiro JT, Talbert RL, Yee GC, et al., editors. *Pharmacotherapy: A Pathophysiologic Approach.* 8th ed. New York: McGraw-Hill;2011;1393.

2. Lin LH, Baracat MC, Gustavo AR. (2013). Androgen receptor gene polymorphism and polycystic ovary syndrome. *Int J Gynaecol Obstet.* 120:115–118
3. Aubuchon M, Legro RS. (2011). Polycystic ovary syndrome: Current infertility management. *Clin Obstet Gynecol.* 54(4):675–684.
4. American Congress of Obstetricians and Gynecologists. ACOG Practice Bulletin No. 108: Polycystic Ovary Syndrome. *Obstet Gynecol.* 2009;114(4):936–949.
5. National Institutes of Health Department of Health and Human Services. *Beyond Infertility: Polycystic Ovary Syndrome (PCOS)* NIH Pub.2008;08-5863.
6. McFarland C. (2012). Treating polycystic ovary syndrome and infertility. *MCN Am J Matern Child Nurs.* 37(2):116–121.
7. Konatham Teja Kumar Reddy, & M. Akiful Haque. (2022). Develop and validate a highly sensitive method for the estimation of Molnupiravir in rat plasma by high-performance liquid chromatography-tandem mass spectroscopy and its application to pharmacokinetic studies. Journal of Pharmaceutical Negative Results, 28–3
8. Batra M., Bhatnager R, Kumar A, Suneja P. (2022). Interplay between PCOS and microbiome: The road less travelled. *Am. J. Reprod. Immunol.* 88:e13580.
9. Mumusoglu S, Yildiz B.O. (2020). Polycystic ovary syndrome phenotypes and prevalence: Differential impact of diagnostic criteria and clinical versus unselected population. *Curr. Opin. Endocr. Metab. Res.* ;12: 66–71.
10. Reddy KT, Haque MA. (2022). Development and Validation of a High Throughput Lc-Ms/MS Method for Quantitation of Ipilimumab in Human Plasma. International Journal of Pharmaceutical Quality Assurance. ;13(3):303-7.
11. Urbanek M. (2007). The genetics of polycystic ovary syndrome. *Natl Clin Pract Endocrinol Metab.* 3:103–111.
12. Marx TL, Mehta AE. (2003). Polycystic ovary syndrome: Pathogenesis and treatment over the short and long term. *Cleve Clin J Med.* 70(1):31–33.
13. Witchel S.F, Oberfield S.E, Peña A.S. (2019). Polycystic Ovary Syndrome: Pathophysiology, Presentation, and Treatment with Emphasis on Adolescent Girls. *J. Endocr. Soc.* 3: 1545–1573.
14. Konatham Teja Kumar Reddy, Penke Vijaya Babu, Rajinikanth Sagapola, & Peta Sudhakar. (2022). A Review of Artificial Intelligence In Treatment Of COVID-19. Journal of Pharmaceutical Negative Results, 254–264. https://doi.org/10.47750/pnr.2022.13.S01.31
15. Barrea L, Marzullo P, Muscogiuri G, Di Somma C, Scacchi M, Orio F, Aimaretti G, Colao A, Savastano S. (2018). Source and amount of carbohydrate in the diet and inflammation in women with polycystic ovary syndrome. *Nutr. Res. Rev.* 31:291–301.
16. Xita N, Georgiou I, Tsatsoulis A. (2002). The genetic basis of polycystic ovary syndrome. *Eur J Endocrinol.*147:717–725.
17. National Institutes of Health Department of Health and Human Services. *Beyond Infertility: Polycystic Ovary Syndrome (PCOS)* NIH.2008;08-5863.
18. Konatham Teja Kumar Reddy et.al (2006). High Performance Liquid Chromatography for The Simultaneous Estimation of Anti-Ulcer Drugs in Pharmaceutical Dosage Form, journal of Positive School Psychology, Vol. 6, No. 9, 4524-452
19. Teja Kumar Reddy Konatham, M. Anuradha (2020), a stability indicating method development and validation of Telmisartan and Nifedipine in pure form using RP-HPLC. International Journal of Pharmaceutical, Biological and Chemical Sciences, 9(3): 36-44
20. Teja Kumar Reddy Konatham et al, (2021). A Systematic Review on Method Development and Validation of Few Antiviral Drugs by Using RP-HPLC. Ijppr.Human, Vol. 21 (3): 651-661.
21. Yelampalli SR, Gandla K, Reddy KT, Ibrahim AE, El Deeb S. (2023). Determination of Sodium, Potassium, and Magnesium as Sulfate Salts in Oral Preparations Using Ion Chromatography and Conductivity Detection. Separations. 1;10(2):99.
22. Azziz R, Carmina E, Dewailly D, et al. (2006). Position statement: Criteria for defining polycystic ovary syndrome as a predominantly hyper-androgenic syndrome. An Androgen Excess Society guideline. *J Clin Edocrinol Metab.* ;91:4237–4245.
23. Bulsara J, Patel P, Soni A, Acharya S. (2021). A review: Brief insight into polycystic ovarian syndrome. *Endocr. Metab. Sci.* 3:100085.
24. Konatham Teja Kumar Reddy, Kumaraswamy Gandla, Penke Vijaya Babu, M Vinay Kumar Chakravarthy, Pavuluri Chandrasekhar, & Rajinikanth Sagapola. (2022). A Critical Review On Bioanalytical Method Development and Validation Of Few Oncology Drugs By Using Lc-Ms-Ms. Journal of Pharmaceutical Negative Cause of Polycystic Ovary Syndrome. *Front. Endocrinol.* 2021;12:741-764.
25. Marshall J.C, Dunaif A. Should all women with PCOS be treated for insulin resistance? *Fertil Steril.* 2012;97:18–22.
26. De Leo V, la Marca A, Petraglia F. Insulin-Lowering Agents in the Management of Polycystic Ovary Syndrome. *Endocr. Rev.* 2003;24:633–667.
27. Kumar R., Minerva S, Shah R, Bhat A, Verma S, Chander G, Bhat G.R, Thapa N, Bhat A, Wakhloo A, et al. (2022). Role of genetic, environmental, and hormonal factors in the progression of PCOS: A review. *J. Reprod. Healthc. Med.* ;3:1-3.
28. Khan M.J, Ullah A, Basit S. (2019). Genetic Basis of Polycystic Ovary Syndrome (PCOS): Current Perspectives. *Appl. Clin. Genet.*12:249–260.

29. Ajmal N, Khan S.Z, Shaikh R. (2019). Polycystic ovary syndrome (PCOS) and genetic predisposition: A review article. *Eur. J. Obstet. Gynecol. Reprod. Biol. X.* 3:60-100.
30. Szczuko M, Skowronek M, Zapalowska-Chwyc M, Starczewski A.(2016). Quantitative assessment of nutrition in patients with polycystic ovary syndrome (PCOS) *Roczniki Państwowego Zakładu Higieny.* 67:4.
31. González F, Considine R.V, Abdelhadi O.A, Acton A.J. (2019). Saturated fat ingestion promotes lipopolysaccharide-mediated inflammation and insulin resistance in polycystic ovary syndrome. *J. Clin. Endocrinol. Metab.* 104:934–946.
32. Barber T.M, Hanson P, Weickert M.O, Franks S. (2019). Obesity and Polycystic Ovary Syndrome: Implications for Pathogenesis and Novel Management Strategies. *Clin. Med. Insights. Reprod. Health.*13: 1179558119874042.
33. Glueck C.J, Goldenberg N. (2019). Characteristics of obesity in polycystic ovary syndrome: Etiology, treatment, and genetics. *Metabolism.* 92:108–120.
34. Barber T.M, Kabisch S, Pfeiffer A.F, Weickert M.O. (2020). The health benefits of dietary fibre. *Nutrients.*12:3209.
35. Szczuko M, Zapalowska-Chwyć M, Drozd R. (2019). A low glycemic index decreases inflammation by increasing the concentration of uric acid and the activity of glutathione peroxidase (GPx3) in patients with polycystic ovary syndrome (PCOS) *Molecules.* 24:1508.
36. Hoover S.E, Gower B.A, Cedillo Y.E, Chandler-Laney P.C, Deemer S.E, Goss A.M. (2021). Changes in Ghrelin and Glucagon following a Low Glycemic Load Diet in Women with PCOS. *J. Clin. Endocrinol. Metab.* 106:e2151–e2161.
37. Akintayo C.O, Johnson A.D, Badejogbin O.C, Olaniyi K.S, Oniyide A.A, Ajadi I.O, Ojewale A.O, Adeyomoye O.I, Kayode A.B. (2021). High fructose-enriched diet synergistically exacerbates endocrine but not metabolic changes in letrozole-induced polycystic ovarian syndrome in Wistar rats. *Heliyon.* 7:58-90.