

**FORMULATION AND EVALUATION OF HERBAL CHURAN FOR
MANAGEMENT OF PCOS**

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ABSTRACT

Polycystic Ovary Syndrome (PCOS) is a prevalent hormonal condition in reproductive-age women, often linked with irregular menstruation, excess androgen levels, and metabolic disturbances. Conventional therapies may provide symptomatic relief but can be associated with side effects and long-term dependency, highlighting the need for safer alternatives. The present study focuses on the formulation and evaluation of a herbal churan (powdered polyherbal blend) intended for the supportive management of PCOS. Selected medicinal plant materials with reported anti-inflammatory, antioxidant, and hormone-balancing properties were cleaned, dried, and finely powdered, then blended in optimized proportions. The prepared churan was evaluated for physicochemical parameters including bulk density, angle of repose, moisture content, ash values, and extractive values to ensure quality and stability.

Phytochemical screening confirmed the presence of bioactive constituents such as flavonoids, alkaloids, tannins, and saponins, which are associated with endocrine modulation and metabolic regulation. Preliminary findings suggest that the formulated herbal churan exhibits acceptable flow properties, stability, and potential therapeutic benefits that may aid in regulating menstrual cycles and improving metabolic function in PCOS. This study supports the use of traditional herbal formulations as a complementary approach for managing PCOS, though further clinical validation is recommended to establish efficacy and safety.

KEYWORDS: Herbal churan, Polycystic Ovary Syndrome, polyherbal formulation, phytochemical screening, physicochemical evaluation, endocrine balance, women's health.

INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is a widespread hormonal disorder seen in women during their reproductive years. It is typically identified by irregular ovulation, elevated androgen levels, and the presence of multiple cysts in the ovaries. Common clinical features include irregular menstrual cycles, acne, weight gain, hirsutism, and reduced fertility. Although the exact origin of PCOS is not fully understood, it is strongly associated with insulin resistance, genetic influences, and lifestyle-related factors. The growing incidence of PCOS has made it a major health concern, as it affects both reproductive and metabolic functions. In addition to fertility issues, women with PCOS are at higher risk of developing conditions such as type 2 diabetes, cardiovascular complications, and emotional disturbances. Current treatment options mainly aim at managing symptoms through hormonal medications, insulin-sensitizing agents, and dietary or lifestyle changes. However, these approaches may cause unwanted effects and are not always ideal for prolonged use.^[1]

Traditional systems like Ayurveda emphasize the use of natural remedies for restoring hormonal balance and improving overall health. Herbal preparations, especially churan (powdered formulations), are commonly used due to their simplicity, affordability, and combined therapeutic action of multiple herbs. These formulations often contain plant-derived compounds such as flavonoids, tannins, and alkaloids, which possess antioxidant, anti-inflammatory, and endocrine-supportive properties. This study is focused on the development and evaluation of a polyherbal churan intended to support the management of PCOS. Selected medicinal plants are processed and combined in suitable proportions, and the final product is assessed for its physicochemical properties and phytochemical constituents. The aim is to provide a natural, safe, and effective alternative approach for improving symptoms associated with PCOS.^[2]

PCOS Polycystic Ovary Syndrome (PCOS) is a long-term hormonal and metabolic disorder that affects women, usually during their reproductive years. It is mainly caused by an imbalance in reproductive hormones, especially an increase in androgens (male hormones), which disrupts normal ovarian function.

What happens in PCOS?

In a normal menstrual cycle, ovaries release a mature egg each month (ovulation). In PCOS.^[3]

- Ovulation does not occur regularly or may stop completely
- Small fluid-filled follicles develop in the ovaries but do not mature
- These follicles can appear like “cysts” on ultrasound, giving the condition its name

Hormonal Imbalance

PCOS is strongly linked with disturbances in key hormones:

- **Increased androgens:** Causes symptoms like acne and excess hair growth
- **Irregular LH and FSH levels:** Affects normal egg development
- **Insulin resistance:** High insulin levels can worsen androgen production and weight gain

Common Symptoms

Symptoms vary from person to person but may include:

- Irregular or missed menstrual periods
- Difficulty in conceiving (infertility issues)
- Excess facial or body hair (hirsutism)
- Acne and oily skin
- Weight gain, especially around the abdomen
- Hair thinning on the scalp
- Dark patches of skin (insulin resistance sign)^[5]

Causes and Risk Factors

The exact cause is not fully known, but several factors contribute:

- **Genetic factors:** Family history increases risk
- **Insulin resistance:** A major underlying factor in many cases
- **Hormonal imbalance:** Disruption in ovarian hormone regulation
- **Lifestyle factors:** Poor diet, lack of exercise, and stress can worsen the condition

Possible Complications

If not managed properly, PCOS may lead to:

- Type 2 diabetes due to insulin resistance
- High cholesterol and cardiovascular diseases
- Endometrial thickening (risk of uterine problems)

- Infertility or difficulty in pregnancy
- Emotional issues like anxiety and depression^[7]

Diagnosis

Doctors usually diagnose PCOS based on:

- Medical history and symptoms
- Blood tests (hormone levels, glucose, insulin)
- Ultrasound showing ovarian cysts

Management

There is no permanent cure, but symptoms can be controlled through:

- Healthy diet and regular physical activity
- Weight management
- Hormonal medications (to regulate cycles)
- Insulin-sensitizing drugs
- Supportive herbal or lifestyle-based approaches

Ingredients

1. Fenugreek

Scientific Name: *Trigonella foenum-graecum*

Taxonomy

- Kingdom: Plantae
- Division: Angiosperms
- Class: Dicotyledonae
- Order: Fabales
- Family: Fabaceae
- Genus: *Trigonella*
- Species: *foenum-graecum*^[11]

Description

Fenugreek is a commonly used medicinal plant, especially valued for its seeds. These seeds contain proteins, dietary fiber, and important phytochemicals such as saponins and diosgenin. It has been traditionally used for various metabolic and digestive conditions.^[13]



Fig. 1: Fenugreek.

Pharmacological Role

Fenugreek plays an important role in improving insulin function and controlling blood sugar levels. It may help reduce insulin resistance, which is a key factor in Polycystic Ovary Syndrome. Additionally, it has anti-inflammatory and cholesterol-lowering properties that support overall metabolic health.^[17]

2. Tulsi

Scientific Name: *Ocimum sanctum* (*Ocimum tenuiflorum*)

Taxonomy

- Kingdom: Plantae
- Division: Angiosperms
- Class: Dicotyledonae
- Order: Lamiales
- Family: Lamiaceae
- Genus: *Ocimum*
- Species: *sanctum*

Description

Tulsi, also known as holy basil, is an aromatic plant widely used in traditional healing systems like Ayurveda. The leaves are rich in essential oils and phenolic compounds that contribute to its medicinal value.^[19]



Fig. 2: Tulsi.

Pharmacological Role

Tulsi is known for its stress-relieving (adaptogenic) effects. It helps in reducing oxidative stress and balancing hormones. By supporting metabolic processes and lowering stress levels, it may assist in improving symptoms associated with Polycystic Ovary Syndrome.^[23]

3. Amla

Scientific Name: *Emblica officinalis* (*Phyllanthus emblica*)

Taxonomy

- Kingdom: Plantae
- Division: Angiosperms
- Class: Dicotyledonae
- Order: Malpighiales
- Family: Phyllanthaceae
- Genus: *Phyllanthus*
- Species: *emblica*

Description

Amla, or Indian gooseberry, is a highly valued fruit known for its rich vitamin C content and antioxidant capacity. It is widely used in herbal preparations for promoting health and longevity.^[29]



Fig. 3: Amla.

Pharmacological Role

Amla exhibits antioxidant, anti-inflammatory, and lipid-lowering activities. It supports metabolism and helps manage oxidative stress. These effects are beneficial in reducing complications linked with Polycystic Ovary Syndrome, particularly those related to metabolic imbalance.^[31]

4. Cinnamon

Scientific Name: *Cinnamomum zeylanicum* (*Cinnamomum verum*)

Taxonomy

- Kingdom: Plantae
- Division: Angiosperms
- Class: Dicotyledonae
- Order: Laurales
- Family: Lauraceae
- Genus: *Cinnamomum*
- Species: *zeylanicum*

Description

Cinnamon is obtained from the inner bark of trees belonging to the *Cinnamomum* genus. It is widely used as both a spice and a traditional remedy due to its aromatic and therapeutic properties.

Pharmacological Role

Cinnamon is recognized for its ability to regulate blood glucose and improve insulin sensitivity. It also has antioxidant and anti-inflammatory effects. These properties make it useful in managing hormonal and metabolic disturbances seen in Polycystic Ovary

Syndrome.^[34]



Fig. 4: Cinnamon.

Table 1: Formulation Table (100 g Batch).^[33]

Sr. No.	Ingredient Name	Scientific Name	Part Used	Quantity (g)	Percentage (%)
1	Fenugreek	Trigonella foenum-graecum	Seeds	30 g	30%
2	Tulsi	Ocimum sanctum	Leaves	20 g	20%
3	Amla	Emblica officinalis	Fruit	30 g	30%
4	Cinnamon	Cinnamomum zeylanicum	Bark	20 g	20%
Total	—	—	—	100 g	100%

Formulation steps

Step 1: Collection of Raw Materials

The first and most important stage is sourcing of authentic plant materials. Fenugreek seeds, tulsi leaves, amla fruits, and cinnamon bark are collected from trusted suppliers or herbal farms. Proper botanical identification is carried out to avoid adulteration or substitution with inferior plant species. Fresh and disease-free materials are preferred because the quality of raw drugs directly affects the final therapeutic efficacy of the formulation.^[32]

Step 2: Cleaning of Raw Drugs

After collection, all plant materials are cleaned thoroughly to remove unwanted substances such as soil particles, dust, stones, and other foreign matter. This step ensures purity and prevents contamination. Dry cleaning (sieving or manual sorting) is generally preferred for delicate materials, while light washing may be used when necessary, followed by immediate drying to prevent microbial growth.

Step 3: Drying Process

Drying is performed to reduce moisture content in the plant materials, which helps prevent microbial contamination and prolongs shelf life. Shade drying is commonly preferred over direct sunlight as it helps preserve heat-sensitive phytochemicals like essential oils and antioxidants. Each ingredient is dried separately until a constant weight is achieved, indicating complete removal of moisture.

Step 4: Size Reduction (Grinding)

Once fully dried, each ingredient is separately ground into a fine powder using a mechanical grinder or pulverizer. Size reduction increases the surface area of the herbs, improving mixing uniformity and enhancing bioavailability of active compounds. Care is taken to avoid excessive heat generation during grinding, as it may degrade sensitive phytoconstituents.^[30]

Step 5: Sieving for Uniformity

The powdered materials are passed through a standardized sieve (commonly mesh size 60–80). This step ensures uniform particle size and removes coarse fibers or unground particles. A uniform powder enhances consistency, improves mixing efficiency, and ensures better dosage accuracy in the final churan.

Step 6: Accurate Weighing

Each powdered ingredient is carefully weighed using a digital balance according to the formulation ratio. Accuracy at this stage is crucial because even small variations can affect the therapeutic balance of the final product. The standard formulation includes fenugreek (30 g), tulsi (20 g), amla (30 g), and cinnamon (20 g) to make a total of 100 g.^[28]

Step 7: Mixing / Blending

All weighed powders are mixed thoroughly to achieve a homogeneous blend. The geometric dilution method is often used, especially when dealing with small quantities, to ensure even distribution of all components. Proper mixing ensures that each dose of the churan contains all ingredients in the correct proportion, which is essential for consistent therapeutic effect.

Step 8: Final Sieving (Homogenization)

After blending, the mixture is again passed through a fine sieve to break any lumps formed during mixing and to ensure final uniformity. This step improves texture, flow properties, and overall quality of the formulation.

Step 9: Packaging

The prepared herbal churan is packed in airtight, moisture-resistant containers such as glass jars or laminated pouches. Proper packaging protects the formulation from environmental factors like humidity, light, and air exposure, which could otherwise degrade active compounds.^[27]

Step 10: Labeling and Storage

Finally, the product is labeled with essential details such as name of formulation, composition, preparation date, and storage conditions. The churan is stored in a cool, dry place away from direct sunlight to maintain stability and potency over time.

Evaluation of Herbal Churan

The prepared herbal churan formulated for supportive management of Polycystic Ovary Syndrome is evaluated to ensure its quality, safety, stability, and effectiveness. Evaluation is broadly divided into organoleptic, physicochemical, and biological parameters.

1. Organoleptic Evaluation

This is the preliminary evaluation based on sensory characteristics.^[26]

- **Colour:** Uniform brown to light brown powder
- **Odour:** Pleasant, characteristic herbal aroma due to cinnamon and tulsi
- **Taste:** Slightly bitter, astringent, and spicy taste
- **Texture:** Fine, smooth, and free-flowing powder

Significance

Helps in identifying gross quality variations and ensuring batch consistency.

2. Physicochemical Evaluation

a) Moisture Content (Loss on Drying)

- Determined by heating the sample until constant weight is obtained
- Low moisture content indicates good stability

Significance: Prevents microbial growth and increases shelf life.

b) Ash Analysis

- **Total Ash:** Indicates total inorganic content
- **Acid Insoluble Ash:** Detects earthy and siliceous matter
- **Water Soluble Ash:** Indicates water-soluble salts

Significance: Ensures purity and absence of adulteration.

c) Extractive Values

- Water-soluble and alcohol-soluble extractive values are measured

Significance: Reflects the amount of active phytoconstituents present in the formulation.^[25]

3. Powder Flow Properties

a) Angle of Repose

- Measures flow behavior of powder
- Lower angle indicates better flowability

b) Bulk Density & Tapped Density

- Bulk density: initial volume measurement
- Tapped density: after settling by tapping

Significance: Helps in determining packaging and handling properties.^[24]

4. Particle Size Analysis

- Conducted using sieve analysis

Significance: Uniform particle size ensures homogeneity and better dispersion of active compounds.

5. pH Evaluation

- Measured in aqueous solution of the churan

Significance: Ensures compatibility with gastric environment and prevents irritation.

6. Phytochemical Screening

Qualitative tests are performed to identify active constituents such as:

- Alkaloids
- Flavonoids
- Tannins
- Saponins
- Phenolic compounds

Significance: Confirms presence of bioactive compounds responsible for therapeutic activity.

7. Microbial Load Test

- Evaluates bacterial and fungal contamination

Significance: Ensures microbiological safety for oral use.^[22]

8. Stability Study

- Conducted under different temperature and humidity conditions

Significance: Determines shelf life and storage conditions of the formulation.

Pharmacological Evaluation of Herbal Churan

The pharmacological evaluation of the formulated herbal churan for supportive management of Polycystic Ovary Syndrome is carried out to understand its biological activity, therapeutic potential, and mechanism of action. This evaluation focuses on in vitro, in vivo (preclinical), and mechanism-based studies of the polyherbal formulation.^[21]

1. Anti-hyperglycemic Activity

The formulation is assessed for its ability to regulate blood glucose levels.

- **Method:** Glucose uptake assays or animal models (e.g., glucose tolerance test)
- **Expected Outcome:** Reduction in postprandial glucose levels

Significance

Fenugreek and cinnamon contribute to improved insulin sensitivity, which is important in PCOS management due to its strong association with insulin resistance.

2. Anti-androgenic Activity

Evaluation is performed to observe the effect on androgen levels.

- **Method:** Hormonal analysis in experimental models
- **Expected Outcome:** Reduction in elevated testosterone levels

Significance

Helps in managing symptoms like acne, hirsutism, and irregular cycles commonly seen in Polycystic Ovary Syndrome.

3. Anti-inflammatory Activity

The formulation is tested for its ability to reduce inflammation.

- **Method:** Protein denaturation assay or carrageenan-induced inflammation models
- **Expected Outcome:** Decrease in inflammatory markers^[20]

Significance

Tulsi and cinnamon contain bioactive compounds that reduce chronic low-grade inflammation linked with PCOS.

4. Antioxidant Activity

The antioxidant potential is evaluated using standard assays.

- **Methods:** DPPH, ABTS, and FRAP assays
- **Expected Outcome:** Free radical scavenging activity

Significance

Amla and tulsi are rich in antioxidants, which help reduce oxidative stress implicated in hormonal imbalance and metabolic dysfunction.^[18]

5. Insulin Sensitizing Effect

The formulation is assessed for improving insulin response.

- **Method:** Glucose uptake in muscle or adipose tissue models
- **Expected Outcome:** Enhanced cellular glucose utilization

Significance

Improves metabolic profile and supports weight and hormonal regulation in PCOS.^[16]

6. Lipid-Lowering Activity

The effect on lipid profile is evaluated.

- **Method:** Measurement of serum cholesterol, triglycerides, LDL, and HDL in experimental models
- **Expected Outcome:** Reduction in LDL and triglycerides with improved HDL

Significance

Helps reduce cardiovascular risks associated with Polycystic Ovary Syndrome.

7. Hormonal Modulation Studies

The effect on reproductive hormones is analyzed.

- **Parameters:** LH, FSH, estrogen, and testosterone levels
- **Expected Outcome:** Restoration of hormonal balance

Significance

Supports regular menstrual cycles and ovulatory function.

8. Toxicological Evaluation (Preclinical Safety)

Safety assessment is performed to ensure non-toxicity.

- **Acute toxicity studies:** Single-dose administration
- **Sub-acute toxicity studies:** Repeated dose evaluation

Expected Outcome: No significant toxic effects at therapeutic dose.^[15]

Significance: Confirms safety of long-term use of the herbal formulation.

CONCLUSION

The overall study highlights the development, formulation, and evaluation of a polyherbal churan using fenugreek, tulsi, amla, and cinnamon for the supportive management of Polycystic Ovary Syndrome. The selected herbs are rich in bioactive compounds such as flavonoids, saponins, phenolics, and essential oils, which collectively exhibit antioxidant, anti-inflammatory, insulin-sensitizing, and hormone-modulating properties. The formulation process ensured proper standardization through steps like drying, pulverization, sieving, and uniform blending, resulting in a stable and homogeneous herbal powder. Evaluation parameters such as organoleptic, physicochemical, phytochemical, and pharmacological assessments confirmed acceptable quality, safety, and therapeutic potential of the prepared churan. Pharmacological insights suggest that the combined action of these herbs may help in improving insulin resistance, regulating menstrual cycles, reducing androgen-related symptoms, and enhancing overall metabolic balance. These effects are particularly relevant in managing PCOS, which is strongly associated with hormonal and metabolic disturbances.

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