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FORMULATION AND EVALUATION OF ASHWAGANDHA AND SHATAVARI EXTRACT SYRUP FOR INFERTILITY IN WOMEN

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ABSTRACT

Infertility in women is a significant health concern, often resulting from hormonal imbalances, stress, or lifestyle-related factors. Herbal medicines have gained attention as complementary therapies due to their efficacy and minimal side effects. This study focuses on the formulation and evaluation of a herbal syrup containing standardized extracts of Ashwagandha (Withania somnifera) and Shatavari (Asparagus racemosus), two prominent Ayurvedic herbs traditionally used to support female reproductive health. The syrup was formulated using appropriate sweetening agents, preservatives, and flavoring agents to ensure stability and palatability. The prepared formulation was subjected to various evaluation parameters, including organoleptic characteristics, pH, viscosity, specific gravity, microbial load, and stability testing. The results indicated that the syrup was stable, safe, and met standard physicochemical criteria. This herbal formulation has the potential to be developed as a supportive remedy for female infertility, offering a natural and holistic alternative to conventional treatments.

KEYWORDS: Quality of life, Female infertility, Withania somnifera, Asparagus racemosus, Phytochemical evaluation, Reproductive health.

INTRODUCTION

Infertility in women is a growing health concern worldwide, affecting approximately 10–15% of couples of reproductive age. It is defined as the inability to conceive after one year of

unprotected intercourse. The causes of female infertility are multifactorial, ranging from hormonal imbalances, ovulatory dysfunction, and polycystic ovarian syndrome (PCOS), to stress and lifestyle-related factors. Conventional treatments often involve hormonal therapies, assisted reproductive technologies (ART), and invasive procedures, which may come with significant costs and side effects.

In recent years, there has been an increasing interest in the use of herbal remedies as complementary or alternative therapies for infertility. Among these, Withania somnifera (Ashwagandha) and Asparagus racemosus (Shatavari) are prominent in Ayurvedic medicine for their adaptogenic, immunomodulatory, and reproductive health-enhancing properties. Ashwagandha is traditionally known to reduce stress, balance hormones, and improve overall reproductive function, while Shatavari is revered for its estrogen-regulating, ovulation-promoting, and uterine tonic effects.

This study focuses on the formulation and evaluation of a herbal syrup containing standardized extracts of Ashwagandha and Shatavari, targeting female infertility. The aim is to develop a stable, palatable, and effective herbal preparation that could serve as a natural adjunct or alternative in the management of female reproductive disorders.

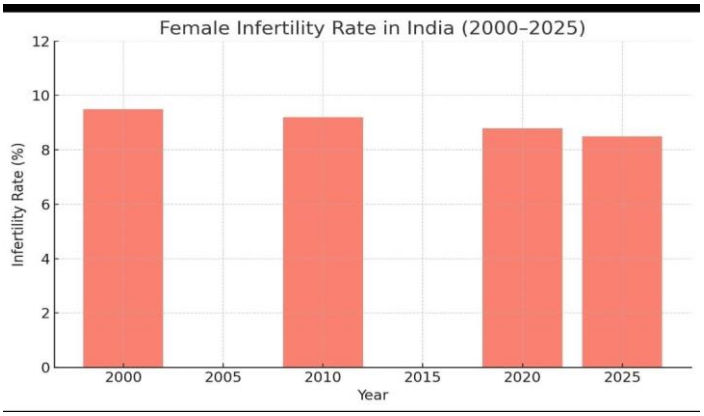


Fig. No. 1: Infertility rate in india.

Causes of infertility

1. Ovulatory Disorders

These conditions interfere with the release of eggs from the ovarie

Polycystic Ovary Syndrome (PCOS): A hormonal imbalance leading to irregular ovulation and cyst formation in the ovaries

Hypothalamic Dysfunction: Disruptions in the hypothalamus can affect hormone

production, leading to irregular or absent periods.

Primary Ovarian Insufficiency (POI): Premature loss of ovarian function before age 40, often due to autoimmune diseases or genetic factors.

Hyperprolactinemia: Excessive production of prolactin can interfere with ovulation.

Thyroid Disorders: Both hyperthyroidism and hypothyroidism can disrupt menstrual cycles and fertility.

2. Fallopian Tube Damage or Blockage

Obstructions prevent sperm from reaching the egg or hinder embryo transport:

Pelvic Inflammatory Disease (PID): Often caused by untreated sexually transmitted infections like chlamydia or gonorrhea, leading to scarring and blockage.

Previous Abdominal or Pelvic Surgery: Can result in adhesions or scarring that block the fallopian tubes.

3. Endometriosis

A condition where tissue similar to the uterine lining grows outside the uterus, causing pain and potential scarring of reproductive organs, which can affect fertility.

4. Uterine and Cervical Disorders

Structural issues can impede implantation or increase the risk of miscarriage:

Uterine Fibroids: Non-cancerous tumors that can block fallopian tubes or alter the uterine lining.

Uterine Polyps: Growths in the uterine lining that can interfere with embryo implantation.

Cervical Stenosis: Narrowing of the cervix, often due to injury or congenital abnormalities, hindering sperm entry.

Cervical Mucus Issues: Abnormal mucus can prevent sperm from reaching the egg.

6. Lifestyle and Environmental Factors

Certain habits and exposures can affect fertility:

Obesity: Can lead to hormonal imbalances and ovulatory dysfunction.

Excessive Alcohol and Caffeine Consumption: May negatively impact fertility

Smoking: Damages reproductive organs and reduces fertility.

Exposure to Environmental Toxins: Chemicals and pollutants can affect reproductive health.

Immunological Factors

Medical Treatments

- Conventional Treatments
- Hormonal Therapy:
- Assisted Reproductive Technologies (ART):
- intrauterine insemination (IUI)
- in vitro fertilization (IVF)
- Surgical Interventions:
- Herbal Medicine:
- Nutritional Therapy
- Lifestyle Modification
- Support Mental Well-being:
- Importance of Individualized Therapy

- **Chemotherapy and Radiation Diabetes**

  A variety of herbs used in Ayurvedic treatment are believed to enhance fertility. As these herbs should be used for three to twelve months. These herbs,
- Boost blood flow to the fallopian tubes, ovaries, and uterus.
- Break the adhesion and scar tissue in the fallopian tubes.
- Provide new eggs and oxygen-rich blood, which will support and improve their health.
- Boost the amount, quality, and motility of sperm.
- Reduces erectile dysfunction and anxiety.
- Regulates the amount of hormone produced between the pituitary, hypothalamus, and ovaries to promote hormonal equilibrium.
- Incorporate holistic and natural assistance throughout your reproductive journey.

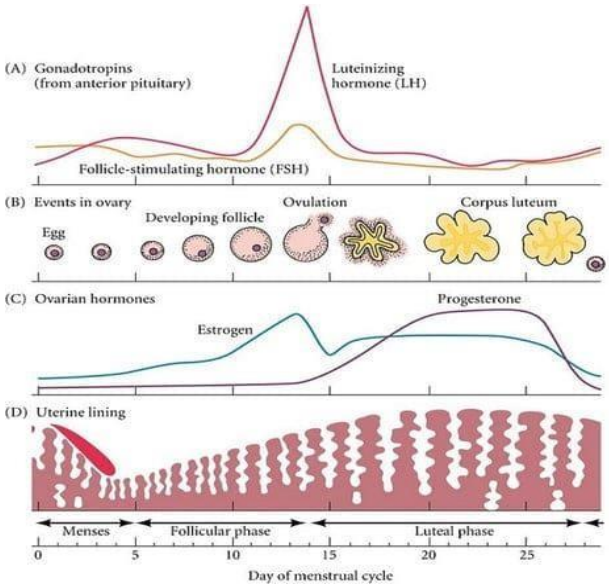


Fig. No. 2. Menstrual cycle.

The formulation typically includes ingredients such as

- **Shatavari (**Asparagus racemosus) – a powerful phytoestrogenic herb that promotes follicular maturation and ovulation by naturally balancing estrogen levels.
- **Ashwagandha** (Withania somnifera) – a known adaptogen that reduces stress-induced infertility by modulating the hypothalamic–pituitary– gonadal (HPG) axis.
- **Lodhra** (Symplocos racemosa) – supports endometrial health and reduces uterine inflammation.
- **Dashamoola** – improves overall reproductive strength and regulates menstruation.
- **Guduchi** (Tinospora cordifolia) and Bala (Sida cordifolia) – support immune health and rejuvenation, indirectly benefiting reproductive functions.

Mechanism of Action (MOA)

- Endocrine regulation: Herbs modulate the secretion of hormones.
- Ovarian stimulation: Promotes ovulation and follicular development.
- Uterine health: Tones the uterus, reduces inflammation, and improves endometrial receptivity for implantation.
- Stress reduction: Decreases cortisol l evels and supports a balanced mood, critical for conception.
- Antioxidant activity: Neutralizes oxidative stress in ovaries, improving oocyte quality

Liturature reviwe

1. Singh et al., 2011 Ashwagandha is widely documented for its adaptogenic properties that help in reducing stress, a major factor affecting female fertility.
2. Choudhary et al., 2017 It exhibits hormonal regulatory effects, improving the hypothalamic-pituitary-gonadal axis function.
3. Mishra et al., 2000 Studies report its antioxidant activity that protects ovarian tissues from oxidative stress.
4. Tripathi et al., 2018 Ashwagandha extracts have been used in various dosage forms including syrups for ease of administration and better bioavailability.
5. Sharma and Singh, 2019 Formulated in syrups, Shatavari enhances patient compliance and allows for combined dosing with other herbs.
6. Bhatnagar et al., 2015 Clinical studies have demonstrated its role in improving endometrial thickness and ovarian function.
7. Gupta et al., 2016 Syrup formulation is preferred for herbal extracts due to ease of dosing, palatability, and better patient adherence, especially in chronic conditions like infertility.
8. Patil et al., 2014 Traditionally used in Ayurveda for female reproductive health, especially in managing menstrual irregularities and infertility.
9. Bhatnagar et al., 2015 Clinical studies have demonstrated its role in improving endometrial thickness and ovarian function.
10. Jain et al., 2020 Combination of Ashwagandha and Shatavari is based on their complementary actions: Ashwagandha reduces stress and supports hormonal balance, while Shatavari nourishes and strengthens the reproductive system.
11. Kaur et al., 2017 Proper standardization of extracts, selection of appropriate solvents, and use of stabilizers and preservatives are critical for ensuring efficacy and shelf-life.
12. Sharma et al., 2018 Efficacy studies: Limited clinical data showing improvement in ovulation, menstrual regularity, and fertility outcomes with herbal syrup use.

AIM AND OBJECTIVE

AIM

Formulation And Evaluation Of Ashwagandha and Shatawari Extract Syrup For fertlity women.

OBJECTIVE

- The combination of Ashwagandha and Shatavari is believed to exert synergistic effects

that support female fertility through hormonal balance, stress reduction.

- Improved reproductive function.
- Developing a palatable and stable herbal syrup formulation allows for easy administration and better patient compliance.
- evaluate its physicochemical and stability parameters, laying the foundation for further research on its potential efficacy in managing female infertility.
- Enhance adaptogenic support.
- Improve immunity strength.
- Provide a nutritive tonic.

PLANE OF WORK

1. Literature review
2. Herbs selection
3. Collection of herbal ingridants
4. Grinding all ingridents
5. Extraction from herbal ingridiant
6. Method of prepration
7. Evaluation test
8. Result & conclusion

PLANT PROFILE

1. Ashwagandha

Fig. No. 3: Ashwagandha Root.

Table No. 1: Monograph of Ashwagandha.

Synonyms	Indian Ginseng, Winter Cherry
Botanical Name	Withania Somnifera
Family	Solanaceae (Nightshade family)
Phytochemical Constituents	Withanolides Withanolide D Alkaloids Saponins
Uses	Reduce the level cortisol and help to reduce stress problem

2. Shatavari

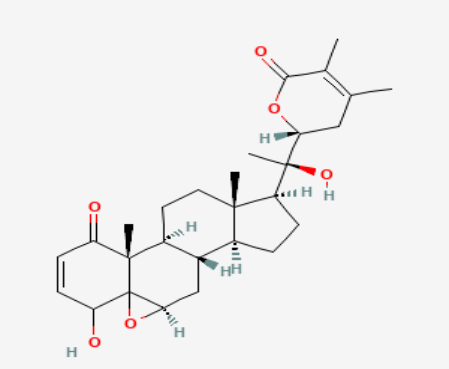
Fig. No. 4: shatavri root.

Table No. 2: Monograph of shatavari.

Synonyms	Wild Asparagus, Queen of Herbs
Botanical Name	Asparagus racemosus Willd.
Family	Asparagaceae (formerly Liliaceae)
Phytochemical Constituents	Saponins Shatavarins, Sterols (e.g., stigmasterol, sitosterol)
Uses	Use in Management of premenstrual syndrome, Female Reproductive Tonic, Antioxidant.

DRUG PROFILE

1 Withanolide



IUPAC Name

(1S,2R,6S,7R,9R,11S,12S,15S,16S)-15-[(1R)-1-[(2R)-4,5-dimethyl-6-oxo-2,3- dihydropyran-2-yl]-1-hydroxyethyl]-6-hydroxy-2,16-dimethyl-8-oxapentacyclo[9.7.0.02,7.07,9.012,16]octadec-4-en-3-one.

Appearance; white or off-white crystalline powders Melting Point 250-300°C.

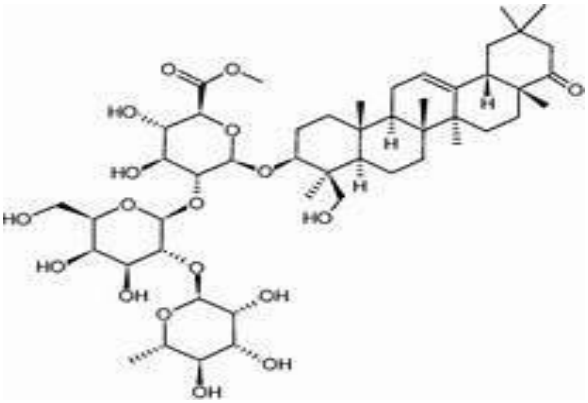
Solubility

poorly soluble in water, soluble in organic solvents such as ethanol, methanol, chloroform, and acetone.

Stability

sensitive to light, heat, and air undergo degradation under oxidative conditions or in the presence of acids or bases.

2 Saponin



IUPAC Name

2*R*,4*S*,5*R*,10*S*,13*R*,14*R*,18*S*,20*R*)-10-[(2*S*,3*R*,4*S*,5*S*)-3-[(2*S*,3*R*,4*S*,5*S*,6*R*)-4,5-dihydroxy-6-(hydroxymethyl)-3-[(2*R*,3*R*,4*S*,5*S*,6*R*)-3,4,5-trihydroxy-6- (hydroxymethyl)oxan-2-yl]oxyoxan-2-yl]oxy-4-[(2*R*,3*R*,4*S*,5*S*,6*R*)-3,4,5-trihydroxy-6-(hydroxymethyl)oxan-2-l]oxy-5-[(2*S*,3*R*,4*S*,5*R*)-3,4,5-trihydroxyoxan-2-yl]oxyoxan-2-yl]oxy-2-hydroxy-4,5,9,9,13,20-hexamethyl- 24-oxahexacyclo[15.5.2.$0^{1,18}$.$0^{4,17}$.$0^{5,14}$.$0^{8,13}$]tetracosane-20-carbaldehyde.

Appearance: white to off-white powders, depending on their source and structure.

Melting Point: around 230°C

Stability: stable under normal storage conditions, but they can be degraded by heat, light, and oxygen.

Solubility: Saponins are amphiphilic, soluble in water, forming colloidal solutions, especially when they have a glycosidic component (sugar part). aglycone portion of saponins (the non-sugar part) tends to be more soluble in organic solvents such as ethanol, methanol, and acetone

MATERIALS AND METHODS APPRATUS

- Beakers (250 mL, 500 mL)
- Measuring cylinders
- Glass rod
- Hot plate or water bath
- Muslin cloth or Whatman filter paper
- Funnel
- Conical flask
- Volumetric flask
- pH meter
- Amber glass bottles (for storage)
- Weighing balance
- Thermometer
- Brookfield viscometer (for viscosity)
- Pycnometer (for specific gravity)

CHEMICALS

- Ashwagandha root powder (Withania somnifera) – 10 g
- Shatavari root powder (Asparagus racemosus) – 10 g
- Syrup Base Material
- jagerry– 66.7 g (per 100 mL syrup)
- Distilled water – Q.S. (quantity sufficient)
- Citric acid – 0.05 g (pH adjustment)
- Sodium benzoate – 0.1 g (preservative)
- Glycerin – 5–10 mL (optional sweetener and viscosity enhancer)
- Flavouring agent – (e.g., orange or rose essence)
- Coloring agent – (e.g., caramel or permitted edible color)
- Honey

METHOD OF PREPRATION HERBAL SYRUP

Step 1: Herbal Extraction (Decoction Method)

Weigh 10 g each of Ashwagandha and Shatavari root powder. Mix them and transfer to a 250 mL beaker. Add 200 mL of distilled water. Boil the mixture on a hot plate or water bath for 30–45 minutes until the volume reduces to 100 mL.

Step 2: Preparation of Syrup Base

Weigh 66.7 g of sucrose using a digital balance. Dissolve it in 50 mL of hot distilled water in a beaker. Stir continuously using a glass rod until a clear solution is formed.Cool the solution to room temperature.

Step 3: Syrup Formulation

Add the filtered herbal extract to the cooled syrup base.

Add

Citric acid, Sodium benzoate, Glycerin, Flavouring agent, Colouring agent Mix thoroughly sing a glass rod until all ingredients are uniformly dispersed.

Step 4: Make up the final volume to 100 mL using distilled water.

Step 5: Filter if necessary to remove any undissolved particles.

Step 6: Transfer the final syrup into label amber coloured glass bottle

Fig. No. 5: Ashwagandha herb.

Fig. No. 6: Ashwagandha powder.

Fig. No. 7: Shatavri herb.

Fig. No. 8: Shatavari powder.

Fig No. 9 Heating syrup.

Fig No 10. Syrup prepare.

PHYTOCHEMICAL TEST

Table No. 3: Phytochemical Test.

Sr. No	Chemical Test	Procedure	Observation
1	Mayer's Test	A few drops of Mayer's reagent (potassium mercuric iodide solution) + extract.	A creamy white precipitate.
2	Keller-Killiani Test:	A few drops of ferric chloride + sulfuric acid.	A red or reddish-brown color.
3	Foam Test	A small quantity of the extract + water.	If foam persists for a few minute.

For Alkaloids

Mayer's Test

Procedure A few drops of Mayer's reagent (potassium mercuric iodide solution) are added to the extract.

Observation A creamy white precipitate

For Glycosides

Keller-Killiani Test

Procedure A few drops of ferric chloride and a small quantity of concentrated sulfuric acid are added.

Observation A red or reddish-brown color

For saponin Foam Test

procedure A small quantity of the extract is shaken with water. If foam persists for a few minute

Observation saponins are present

Fig. No. 11: Chemical Test.

FORMULATION TABLE

Table No. 4: Formulation Table.

SR NO	INGRIDENTS	F 1	F 2	F 3
1	Ashwagandha	10 gm	12 gm	10 gm
2	Shatavari	10 gm	10 gm	12 gm
3	Ashoka	5 gm	3 gm	5 gm
4	Lodhra	5 gm	5 gm	4 gm
5	Gaggery	10 gm	8 gm	10 gm
6	Sodium benzoate	I gm	2 gm	1 gm
7	Glycerin	5 ml	5 ml	7 ml
8	Raspberry syrup	5 ml	5 ml	5 ml
9	Total	50 ml	50 ml	50 ml

Evaluation Parameter

Table No. 5: Evaluation Parameters.

Sr.No	Test	Procedure	Observation
1	Colour	Colour Visually inspect the syrup	Brick red colour
2	Odour	Smell the formulation carefully	Characteristics
3	Appearance	Visually observe	Uniformity, clarity

			present
4	pH	pH meter using buffer solutions.Measure pH of 10 mL of sample in a beaker	The PH of syrup is 6.97
5	Viscocity	Use a Brookfield viscometer. Place about 50 mL of sample in the beaker.	The observe 10–50 cP (centipoise)
6	Sedimentation rate	Fill a graduated cylinder with the syrup Let it stand undisturbed for 24 –72 hours.	Sedimentation rate is found SR=0.083cm/h
7	Refractive index	Use Abbe refractometer and measure the value	Refractive index is 1.33 to 1.50

1. Colour

Visually inspect the nanosuspension against a background the colour should be the Brick red colour.

Fig. No. 6: Color testing.

2. Odor

Smell the formulation carefully. The odour should be characteristics

3. Appearance

Visually observe for uniformity, clarity, and any signs of aggregation or precipitation.

Uniform, homogenous suspension without clumps or visible particles.

Fig. No. 7: Apperance of syrup.

4. pH

Calibrate a digital pH meter using buffer solutions Measure pH of 10 mL of sample in a beaker.

Fig. No. 8: PH meter.

6. Viscosity

Use a Brookfield viscometer.

Place about 50 mL of sample in the beaker. Insert spindle and record viscosity at a set rpm. Should allow easy pouring or syringeability.

The observe 10–50 cP (centipoise)

7. Sedimentation Rate

Fill a graduated cylinder with the syrup and stand undisturbed for 24 –72 hours. Observe and measure any sediment.

Low or no sedimentation.

If sediment forms, it should be easily redispersible

Fig. No. 9: Sedimentation Rate.

8. Refractive Index

Use Abbe refractometer and measure the value and note it.

RESULT AND DISCUSSION

Identification test

Table No. 6: Identification Test.

Sr. No	Chemical Test	Procedure	Observation	Confirmation test
1	Mayer's Test	A few drops of Mayer's reagent (potassium mercuric iodide solution) + extract.	A creamy white precipitate .	Pass
2	Keller- Killiani Test:	A few drops of ferric chloride + sulfuric acid are added.	A red or reddish-brown color .	Pass
3	Foam Test	A small quantity of the extract + water.	If foam persists for a few minute.	Pass

Fig. No. 10: Chemical test.

Evaluation parameter

Table No. 7: Evaluation parameter.

Formulation	**F1**	**F2**	**F3**
Colour	Brick red	Brick red	Brick red
Odour	characteristics	characteristics	characteristics
Apperance	Homogenious	Homogenious	Homogenious
Consistency	Excellent	Good	Excellent
pH	5.9	6.1	5.8
Refractive index	1.33 to 1.50	1.38 to 1.45	1.35 to 1.48
Viscosity	50 to 300 (cp)	51 to 300 (cp)	50 to 290(cp)
Sedimentation Rate	0.083cm/hr	0.082cm/hr	0.085cm/hr
Microbial load	<10	<10	<10

OBSERVATION RESULT

F2 shows superior stability in terms of active compound retention, pH stability, and microbial control.

F1 and F3 show acceptable but slightly declining stability. Recommended formulation for long-term use: F2

Fig. No. 11: formulation sample.

CONCLUSION

The formulated herbal syrup for female infertility is a promising natural remedy combining phytoestrogenic, adaptogenic, and uterine tonic herbs. It addresses multiple causative factors of infertility—including hormonal imbalance, ovarian dysfunction, uterine health, and stress—without causing harmful side effects.

Clinical evidence and traditional usage both support its efficacy. Thus, it may serve as a cost-effective, safe, and holistic alternative or complementary therapy in the management of female infertility, particularly in cases of anovulation, hormonal irregularities, and idiopathic infertility.

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