



ORIGINAL ARTICLE

Pre-formulation of a Polyherbal Churna Containing Shatavari, Ashoka, Anardana, Gokhru, Amla, and Alsi: A Comprehensive Study

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ABSTRACT

Polyherbal formulations have been widely used in traditional systems of medicine due to their synergistic therapeutic effects and improved safety profile. The present study focuses on the formulation and preformulation evaluation of a polyherbal churna prepared using selected medicinal plants such as Shatavari, Ashoka, Anardana, Gokhru, Amla, and Alsi. These herbs are well known for their potential role in improving reproductive health, antioxidant activity, and overall physiological balance. The churna was prepared by drying, pulverizing, and sieving the individual plant materials, followed by uniform mixing in appropriate proportions. Preformulation studies were carried out to evaluate various parameters including organoleptic properties (color, odor, taste), physicochemical characteristics such as ash value, extractive value, and moisture content, as well as preliminary phytochemical screening tests like alkaloids, flavonoids, phenols, carbohydrates, tannins etc. These parameters are essential to ensure the quality, purity, and consistency of the herbal formulation.

KEYWORDS: Polyherbal churna, preformulation study, pharmacognostic evaluation, phytochemical screening, standardization, Shatavari (*Asparagus racemosus*), Ashoka (*Saraca asoca*), reproductive health.

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INTRODUCTION

Infertility has emerged as a significant health concern worldwide, affecting both men and women due to changing lifestyles, stress, hormonal imbalance, and environmental factors. In recent years, there has been a growing interest in herbal medicines as safer and more holistic alternatives to conventional therapies (Dwivedi et al., 2021). Traditional systems like Ayurveda emphasize the use of polyherbal formulations, which combine multiple medicinal plants to enhance therapeutic efficacy and reduce side effects (Tripathi et al., 2010). The selected herbs in this formulation—Shatavari (*Asparagus racemosus*), Ashoka (*Saraca asoca*), Gokhru (*Tribulus terrestris*), Amla (*Embolica officinalis*), Anardana (*Punica granatum*), and Alsi (*Linum usitatissimum*)—are well known for their beneficial effects on reproductive health. These herbs possess properties such as hormone regulation, antioxidant activity, improvement of reproductive function, and overall strengthening of the body. Pre formulation studies play a crucial role in the development of any herbal formulation (Gehlot et al., 2021). These studies help in understanding the physical and chemical properties of the raw materials, ensuring quality, purity, and stability of the final product. Parameters such as organoleptic evaluation, particle size, ash value, moisture content, and extractive values are essential to standardize the formulation.

MATERIAL AND METHODS

Collection of herbs

All the herbal powders were collected from the local market Marothiya, Indore.

Organoleptic Property

Organoleptic properties refer to the characteristics of a substance that can be observed and evaluated using the human senses. These include features such as colour, odour, taste, and texture. organoleptic evaluation is an important preliminary step to assess the quality, purity, and overall acceptability of the product (Patel et al., 2020).

Flow Property

Flow properties refer to the ability of a powder or granules to move or flow smoothly from one place to another. In pharmaceutical formulations like polyherbal churna, good flow property is important for proper mixing, handling, and uniform filling during processing (Patel et al., 2020).

Bulk Density: Bulk density is defined as the ratio of the mass of a powder to its bulk volume, which includes the volume of the particles as well as the spaces between them.

Procedure:

- Accurately weigh a known quantity of the churna powder.
- Transfer it gently into a clean, dry measuring cylinder without tapping or compacting, and note the volume occupied (bulk volume).
- Calculate bulk density using the formula:

Bulk Density = Mass of powder / Bulk Volume.

Tapped Density: Tapped density is defined as the ratio of the mass of a powder to the volume it occupies after being subjected to a specified number of taps or vibrations. It represents the maximum packing of the powder by reducing the spaces between particles.

Procedure:

- Weigh a known quantity of the churna powder and transfer it into a clean, dry measuring cylinder.
- Tap the cylinder mechanically or manually (usually 100 times or until constant volume is reached) to allow the powder to settle.
- Note the final tapped volume and calculate using the formula:

$$\text{Tapped Density} = \text{Tapped Volume} / \text{Mass of powder}$$

Carr's Index: parameter used to evaluate the flowability and compressibility of a powder. Carr's Index indicates how easily a powder can be compressed, which helps in determining its flow properties.

$$\text{Carr's Index (\%)} = [(\text{Tapped Density} - \text{Bulk Density}) / \text{Tapped Density}] \times 100$$

Hausner's Ratio: Hausner's ratio is defined as the ratio of tapped density to bulk density of a powder. It is an important parameter used to evaluate the flow properties of powders.

$$\text{Hausner's Ratio} = \text{Tapped Density} / \text{Bulk Density}$$

Angle of Repose: Angle of repose is defined as the maximum angle formed between the surface of a pile of powder and the horizontal plane when the powder is allowed to flow freely. A smaller angle indicates good flowability, while a larger angle suggests poor flow due to higher friction between particles.

Procedure:

1. Place a funnel at a fixed height (5 cm) and allow the powder to flow freely onto a flat surface to form a conical heap.
2. Measure the height (h) of the powder cone and the radius (r) of its base.
3. Calculate the angle of repose.

The formula for Angle of Repose is:

$$\theta = \tan^{-1} \frac{h}{r}$$

Where:

- θ = angle of repose
- h = height of the powder cone
- r = radius of the base of the cone

Physicochemical Parameters (Patel et al., 2020)

Moisture content: Moisture content is the amount of water present in a sample, expressed as a percentage of its total weight. It is important for maintaining stability and preventing microbial growth in formulations.

$$\text{Moisture Content (\%)} = \frac{\text{Initial Weight} - \text{Final Weight}}{\text{Initial Weight}} \times 100$$

Ash value: Ash value is the amount of inorganic residue remaining after complete incineration of a sample, indicating its purity and presence of impurities.

$$\text{Ash Value (\%)} = \frac{\text{Weight of Ash}}{\text{Weight of Sample}} \times 100$$

Solubility: Solubility is the ability of a substance (solute) to dissolve in a solvent to form a homogeneous solution at a specific temperature and pressure. It indicates how much of the substance can dissolve in a given amount of solvent.

pH Value: pH value is a measure of how acidic or basic a substance is. It indicates the concentration of hydrogen ions present in a solution. A pH less than 7 shows acidity, a pH of 7 is neutral, and a pH greater than 7 indicates a basic (alkaline) nature.

Phytochemical Screening (Singh, 2022; Patel et al., 2020)

Test for Alkaloids

Dragendorff's Method: The extract is acidified with dilute hydrochloric acid and treated with Dragendorff's reagent. Formation of an orange or reddish precipitate indicates alkaloids.

Mayer's Method: The extract is treated with Mayer's reagent after acidification. A cream or pale-yellow precipitate confirms alkaloids.

Test for Saponins

Foam Method: The extract is shaken vigorously with water in a test tube. A stable foam is produced and persists for some time. This indicates the presence of saponins.

Test for Phenols

Ferric Chloride Method: The extract is treated with ferric chloride solution. A blue, green, or purple color develops. This indicates phenolic compounds.

Lead Acetate Method: The extract is treated with lead acetate solution. A white precipitate is formed. This confirms phenols.

Test for Flavonoids

Shinoda Method: The extract is treated with magnesium ribbon and concentrated hydrochloric acid. A pink or red color develops in the solution. This indicates the presence of flavonoids.

Alkaline Reagent Method: The extract is treated with sodium hydroxide solution. A yellow color is formed which disappears on addition of acid. This confirms flavonoids.

Test for Tannins

Ferric Chloride Method: The extract is treated with ferric chloride solution. A blue-black or green coloration appears. This indicates the presence of tannins.

Test for Terpenoids

Salkowski Method: The extract is mixed with chloroform and concentrated sulfuric acid is carefully added along the side of the test tube. A reddish-brown coloration appears at the interface. This indicates the presence of terpenoids.

Liebermann-Burchard Method: The extract is treated with chloroform, acetic anhydride, and concentrated sulfuric acid. A color change from pink to blue-green is observed. This confirms the presence of terpenoids.

Test for Glycosides

Keller-Killiani Method: The extract is treated with glacial acetic acid, ferric chloride, and sulfuric acid. A brown ring is formed at the interface. This indicates glycosides.

Test for Steroids

Liebermann-Burchard Method: The extract is treated with chloroform, acetic anhydride, and concentrated sulfuric acid. A color change from red to blue-green is observed. This indicates the presence of steroids.

Salkowski Method: The extract is mixed with chloroform and concentrated sulfuric acid is added carefully. A red or brown coloration appears at the interface. This confirms the presence of steroidal compounds.

Test for Carbohydrates

Molisch's Method: The extract is treated with Molisch reagent and concentrated sulfuric acid. A violet ring is formed at the junction. This indicates carbohydrates.

Benedict's Method: The extract is heated with Benedict's reagent. A red or orange precipitate is formed. This confirms reducing sugars.

Test for Phytoestrogens

Alkaline Reagent Method: The extract is treated with sodium hydroxide solution. A yellow coloration appears in the solution. This color disappears on addition of dilute acid, indicating the presence of phytoestrogens.

Ferric Chloride Method: The extract is treated with ferric chloride solution. A greenish or violet coloration develops. This indicates phenolic compounds including phytoestrogens.

RESULT AND DISCUSSION

The selected medicinal plants along with their botanical identity, parts used, source of procurement, and respective quantities are summarized in the table below. These ingredients will be employed in varying proportions to develop three different formulations of the polyherbal churna.

S.no.	Ingredients	Part used	Area	Quantity (gm)
1.	Shatavari (<i>Asparagus racemosus</i>)	Roots	Local market	100
2.	Gokhru (<i>Tribulus terrestris</i>)	Fruit	Local market	100
3.	Amla (<i>Emblica officinalis</i>)	Fruit	Local market	100
4.	Anardana (<i>Punica granatum</i>)	Fruit	Local market	100
5.	Alsi (<i>Linum usitatissimum</i>)	Seeds	Local market	100
6.	Ashoka (<i>Saraca asoca</i>)	bark	Local market	100

Table.1 Herbal Ingredients required for formulation

The organoleptic properties of the selected herbal ingredients were evaluated based on their sensory characteristics such as color, odor, taste, and texture, and the observations are presented in the table below.

Table 2 Organoleptic Properties of Herbs

S.no.	Organoleptic properties	Shatavari	Gokhru	Amla	Anardana	Alsi	Ashoka
1.	Appearance	Powder	Powder	Powder	Powder	Powder	Powder
2.	Colour	Creamish/Biege	Yellowish Green	Light Brown	Light Brown	Brown	Reddish Brown
3.	Odour	Sweet Almond	Faintly Aromatic	Earthy Aroma	Fruity	Earthy	Slightly Aromatic
4.	Taste	Sweet	Slightly Bitter	Sour, Tart	Tangy, Sour & Sweet	Pleasant & Slightly Nutty	Astringent

The physicochemical testing of different ingredients is given in Table 3. The following results represent the physicochemical evaluation of the selected ingredients carried out to ensure their quality, purity, and suitability for formulation.

Table 3 Physicochemical testing of Herbs

Parameters	Shatavari	Gokhru	Amla	Anardana	Alsi	Ashoka
Moisture content	5%	4%	2%	5%	5%	2%
Ash value	21.2%	52%	27%	20%	85.4%	27%
pH	6	3	3	5	6	4



Fig. 1 Ash value

Fig. 2 pH value

Fig. 3 Moisture content

Solubility studies of the formulation were carried out using different solvents such as water, acetone, and benzene in order to determine its solubility behavior in various media.

Table 4: Solubility

Solvents	Shatavari	Gokhru	Amla	Anardana	Alsi	Ashoka
Water	Sparingly soluble	Very slightly soluble	Very slightly soluble	Sparingly soluble	Very slightly soluble	Very slightly soluble
Acetone	Practically insoluble	Slightly soluble	Sparingly soluble	Practically insoluble	Slightly soluble	Sparingly soluble
Benzene	Very slightly soluble	Slightly soluble	Sparingly soluble	Practically insoluble	Practically insoluble	Sparingly soluble

The flow properties of the powdered ingredients were evaluated using parameters such as bulk density, tapped density, angle of repose, Hausner's ratio, and Carr's index to assess their flowability and compressibility characteristics prior to formulation. The results are given in Table 5.

Table. 5 Powder Flow Properties

Parameters	Shatavari	Gokhru	Amla	Anardana	Alsi	Ashoka
Bulk Density (gm/ml)	0.48	0.4	0.66	0.5	0.4	0.36
Tapped Density (gm/ml)	0.57	0.57	0.85	0.62	0.62	0.51
Carr's Index	15%	29%	22%	19.3%	35.4%	7.6%
Hausner's Ratio	1.18	1.42	1.28	1.24	1.55	1.41
Angle of Repose	36.87°	38.66°	38.66°	45°	44.1°	45°

The phytochemical screening of the selected drugs was carried out to identify the presence of various bioactive constituents such as alkaloids, flavonoids, tannins, saponins, glycosides, and terpenoids. The results obtained indicate the qualitative presence or absence of these phytoconstituents, which may contribute to the therapeutic potential of the drugs.

Table. 6 Phytochemical Screening

Phytoconstituents	Shatavari	Gokhru	Amla	Anardana	Alsi	Ashoka
Alkaloids	+	+	+	+	+	+
Saponins	+	+	+	+	-	+
Phenols					+	+
Flavonoids	-	+	+	+	+	+
Tannins	+	+	-	-	-	+
Terpenoids	+	+		+		-
Glycosides		-		+		
Steroids	-			+	-	
Carbohydrates			+			
Phytoesterols			-			

CONCLUSION

The present study successfully carried out the preformulation and evaluation of a polyherbal churna containing Shatavari, Ashoka, Anaardana, Gokhru, Amla, and Alsi. The organoleptic, physicochemical, and flow property evaluations confirmed that the selected ingredients possess acceptable quality, purity, and suitable characteristics for formulation. The phytochemical screening revealed the presence of important bioactive constituents such as alkaloids, flavonoids, tannins, saponins, and terpenoids, which are known for their therapeutic potential. These findings support the traditional use of these herbs in improving reproductive health and overall well-being. Thus, the formulated polyherbal churna can be considered a promising and effective herbal preparation, although further studies including pharmacological and clinical evaluation are recommended to establish its efficacy and safety.

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