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Research Article

Herbal Intervention for Scabies: Development and Standardization of *Naregamia Alata* Based Polyherbal Powder

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ABSTRACT

Scabies is a highly contagious parasitic skin disease that continues to be a major public health problem, particularly in developing countries and the limitations of conventional therapies have increased interest in herbal alternatives. The present study aimed to develop and standardize a *Naregamia alata* based polyherbal powder containing *Naregamia alata*, *Azadirachta indica*, and *Curcuma longa* for the management of scabies. The plant materials were collected, authenticated, shade dried and powdered and pharmacognostical evaluation of *Naregamia alata* leaves was performed. Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, polyphenols, tannins and carbohydrates. The polyherbal powder was formulated in appropriate proportions and evaluated for its organoleptic, physicochemical and antimicrobial parameters. Thin layer chromatography of *Naregamia alata* extract was carried out, and the presence of flavonoids and polyphenols are confirmed. These phytochemical constituents are supposed to be responsible for the observed antimicrobial activity. Antimicrobial evaluation against *Escherichia coli* was demonstrated by Agar well Diffusion method using Ciprofloxacin as standard drug. The results indicate that the developed polyherbal powder possesses significant antimicrobial activity, supporting its potential use in the treatment of scabies.

INTRODUCTION

Scabies is a highly contagious skin disease caused by *Sarcoptes scabiei*, affecting millions globally, especially in developing countries. Although conventional treatments such as permethrin and ivermectin are effective, their use is limited by

resistance, toxicity, and recurrence. Herbal medicines have gained increasing attention due to their safety, affordability, and therapeutic potential⁽¹⁾. Medicinal plants such as *Naregamia alata*, *Azadirachta indica*, and *Curcuma longa* are well known for their antimicrobial, anti-inflammatory, and antiparasitic properties and

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have been traditionally used in the management of skin disorders. Therefore, the present study aims to develop a polyherbal powder formulation and evaluate its pharmacognostic, physicochemical, and antimicrobial properties⁽²⁾.

Naregamia alata is a small medicinal herb from the Rutaceae family, commonly found in tropical regions of India and used in traditional Ayurvedic medicine. It is known for its anti-inflammatory and antimicrobial properties and is used to treat skin



Fig 1 : *Naregamia alata*



Fig 2 : *Curcuma longa*



Fig3: *Azadirachta indica*

MATERIALS AND METHODS

Collection & authentication of plant materials

Fresh leaves of *Naregamia alata*, *Azadirachta indica*, and rhizomes of *Curcuma longa* were collected from different regions of Kerala and authenticated by a qualified expert.

Pharmacognostical evaluation

Morphological characteristics (color, odor, taste, size, and shape) and microscopical features of *Naregamia alata* leaves were evaluated using standard parameters.⁽⁴⁾

Phytochemical studies

Hydroalcoholic extraction was performed by macerating 5 g of powdered *Naregamia alata* leaves in ethanol:water (70:30) for 7 days, followed by filtration and evaporation to dryness⁽⁵⁾. The extract was dissolved in ethanol and was used to test the presence of bioactive

diseases, wounds, and digestive disorders. *Azadirachta indica* is a medicinal tree widely found in India and used in Ayurveda for its antimicrobial and anti-inflammatory properties. It is commonly used to treat skin diseases, infections, and dental problems. *Curcuma longa* is a perennial herb known for its active compound curcumin, which has strong antioxidant and healing effects. It is widely used for wounds, inflammation, and digestive disorders⁽³⁾

compounds like alkaloids, flavonoids, carbohydrates, tannins, polyphenols, terpenoids, sterols, saponins, glycosides, proteins & amino acids.⁽⁶⁾

Preparation of polyherbal powder

Dried plant materials of *Naregamia alata*, *Azadirachta indica*, and *Curcuma longa* were powdered separately, sieved & mixed thoroughly to obtain a uniform blend, and stored in airtight containers^(7,8).

Table 1: Formulation of polyherbal powder

SR.NO	INGREDIENTS	QUANTITY
1.	<i>Naregamia alata</i>	15g
2.	<i>Azadirachta indica</i>	6g
3.	<i>Curcuma longa</i>	4g

Standardization of polyherbal powder

Organoleptic evaluation

The formulation was evaluated for color, odor, taste, and texture using sensory observation methods.

Physicochemical evaluation

Moisture Content (Loss on Drying)

Moisture content was determined by drying the sample to constant weight and calculated as percentage weight loss.⁽⁹⁾

$$\text{Moisture content (LOD)} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

Ash value

Total ash, acid-insoluble ash, and water-soluble ash were determined to evaluate inorganic content and purity of the formulation.

$$\text{Total Ash} = \frac{\text{weight of ash}}{\text{weight of sample}} \times 100$$

$$\text{Acid-Insoluble Ash} = \frac{\text{weight of acid insoluble residue}}{\text{weight of sample}} \times 100$$

$$\text{Water-Soluble Ash} = \frac{\text{weight of water soluble residue}}{\text{weight of sample}} \times 10$$

pH

The pH was measured by preparing a 1% aqueous suspension of the powder and determining the value using pH paper.⁽¹⁰⁾

Extractive Value

Alcohol-soluble and water-soluble extractive values were determined by maceration and evaporation to dryness, indicating the amount of active constituents present.

Particle size & flow properties

Angle of repose

Determined by fixed funnel method to assess flowability of the powder.

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

Bulk density

Measured to evaluate packing ability and compressibility.

$$\text{Bulk density} = \frac{\text{Mass of powder}}{\text{Bulk volume}}$$

$$\text{Tapped density} = \frac{\text{Mass of powder}}{\text{Tapped volume}}$$

Carr's Index and Hausner's Ratio

Calculated from bulk and tapped densities to determine flow properties of the formulation.⁽¹¹⁾

$$\text{Carr's index} = \frac{\text{Tapped density} - \text{Bulk density}}{\text{Tapped density}} \times 100$$

$$\text{Hausner's ratio} = \frac{\text{Tapped density}}{\text{Bulk density}}$$

Thin layer chromatography

TLC analysis was performed using curcumin as a standard marker. The sample and standard solutions were spotted on silica gel plates and developed using ethanol:water (1:9) solvent system. The plates were observed under UV light, and similarity in spot position confirmed the presence of phytoconstituents.⁽¹²⁾

In-vitro antimicrobial activity

Antimicrobial activity was evaluated against *Escherichia coli* using agar well diffusion method. The formulation was introduced into wells of inoculated nutrient agar plates and incubated at 37°C for 24 hours & zone of inhibition was measured.⁽¹³⁾

Polyherbal powder-milk interaction study

1.Organoleptic and immediate-use observation study



The formulation was mixed with warm milk showed no curdling, precipitation, foul odor, or abnormal color change up to 30 minutes. A uniform yellow color was observed, indicating good compatibility and suitability for immediate consumption.

2. pH stability study

The pH of the polyherbal extract (~8.0), milk (~6.5), and the mixture (~8.0) showed no significant variation, indicating absence of interaction and good pH stability.

3. Short-term stability study

The formulation remained stable for 1 hour without any changes in color, odor, or phase separation, confirming compatibility within the normal consumption period.

4. Centrifugation study

No difference in precipitate formation was observed between milk and the formulation mixture after centrifugation, indicating physical stability and no interaction.^(14,15)

RESULTS & DISCUSSION

Collection & authentication of plant materials

Fresh healthy leaves of *Naregamia alata* were collected from Thiruvallur, Vadakara, Kerala, fresh leaves of *Azadirachta indica* from Payangadi, Kannur, Kerala and mature rhizomes of *Curcuma longa* from Payyannur, Kannur, Kerala. The collected plants were authenticated by Dr. Athira Chandran, Associate professor, MVR Ayurveda Medical College, Parassinikadavu, Kannur.

Pharmacognostical Evaluation

Morphological evaluation

Table 2: : Morphological characterization

SR.NO	PARAMETERS	OBSERVATION
1	Colour	Fresh leaf: Dark green on upper surface and lighter green on lower surface. Dried leaf: Yellowish-green to pale green.
2	Odour	Characteristic, mild leafy odour
3	Taste	Bitter
4	Size	Length: 2-6cm Width: 1-3cm
5	Shape	Obovate to elliptic Trifoliate arrangement

Microscopical Evaluation

Transverse section

Numerous free hand sections of leaf were taken, stained using safranin and mounted.

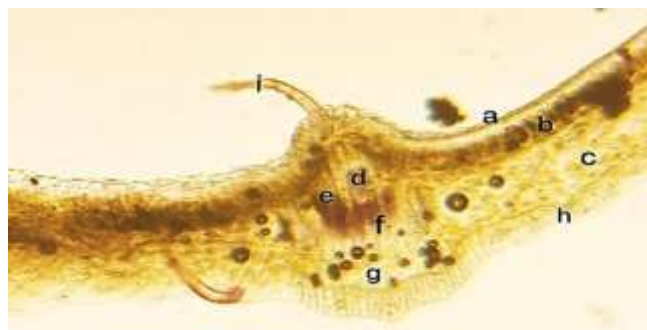


Fig 4: TS of *Naregamia alata*

TS of *Naregamia alata* include:

- Upper epidermis: Consist of single layer of elongated and compactly arranged cell.
- Palisade: Elongated tightly packed cells seen beneath upper epidermis.
- Mesophyll: Loosely arranged cells between epidermal layers, spongy in nature.
- Vascular bundle: Contains cells that appear to be xylem and phloem. The purple or violet

color is often due to the specific stain saffranin used in microscopy.

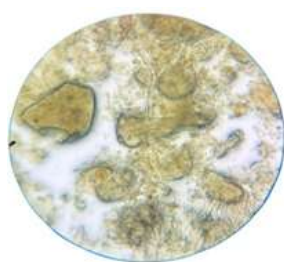
- e. Xylem: Radially arranged cells towards centre, for water transport.
- f. Phloem: Seen around xylem, for food transport.
- g. Collenchyma cells: Unevenly thickened, mainly at corner, thickening due to cellulose and pectin.

h. Lower epidermis: Outermost single layer on the lower surface of leaves.

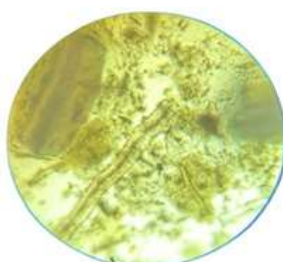
- i. Trichomes: Unicellular, elongated, curved structure, thick walled and tapering towards the tip.

Powder microscopy

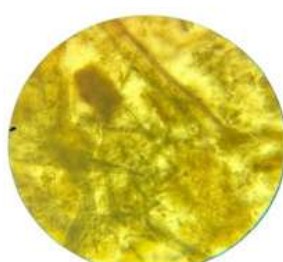
The leaves of *Naregamia alata* were powdered and stained with phloroglucinol and dilute HCl, then observed under microscope.



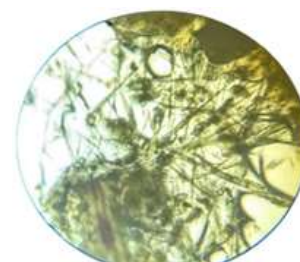
(a) Stone cells



(b) Fibre



(c) Trichome fragments



(d) Oil globules

Fig 5: Powder microscopy of leaves of *Naregamia alata*

Phytochemical studies

10g of powdered leaves of *Naregamia alata* was subjected to hydro alcoholic extraction.

Table 3: Phytochemical screening of *Naregamia alata* leaf extract

SR. NO	QUALITATIVE TEST	HYDRO ALCOHOLIC EXTRACT
1	TEST FOR ALKALOIDS	
	Dragendorff's test	+
	Wagner's test	+
	Hager's test	+
	Mayers's test	+
2	TEST FOR FLAVONOIDS	
	Shinoda test	+
	Alkaline reagent test	-
3	TEST FOR CARBOHYDRATES	
	Molisch's test	+
	Fehling's test	+
	Barfoed's test	+
4	TEST FOR POLYPHENOLS	
	Ferric chloride test	+

	Lead acetate test	+
5	TEST FOR TANNINS	
	Bromine water test	+

Preparation of polyherbal powder

25g of *Naregamia alata* based polyherbal powder was prepared by mixing *Naregamia alata*,

Azadirachta indica and *Curcuma longa* in powdered form.



Fig 6: Formulation of polyherbal powder

Standardization of polyherbal powder

Organoleptic evaluation

Table 4: Organoleptic evaluation

PARAMETERS	OBSERVATIONS
Color	Green
Odor	Pungent, Aromatic
Taste	Bitter
Texture	Coarse

Physicochemical evaluation

Table 5: Physicochemical evaluation

PARAMETERS	OBSERVATIONS
Moisture content	1.05%w/w
Ash value	
Total ash	6.42%w/w
Acid insoluble ash	2.41%w/w
Water soluble ash	0.1%w/w
pH	8.0
Extractive value	
Alcohol soluble extractive value	16%w/w
Water soluble extractive value	20%w/w

Particle size and flow properties

Table 6: Particle size and flow properties

PARAMETERS	OBSERVATIONS
Angle of repose	29.85°

Bulk density	0.43
Tapped density	0.5
Carr's index	14
Hausner's ratio	1.16

The study shows that the prepared polyherbal powder formulation have a good flow property.

Thin Layer Chromatography

TLC analysis of hydroalcoholic extracts of *Curcuma longa*, *Naregamia alata*, and *Azadirachta indica* was performed using ethanol:water (1:9) solvent system revealed Rf values of 0.79, 0.837 and 0.89 respectively. Comparison with standard curcumin (Rf 0.923) indicates that *Curcuma longa* and *Naregamia alata* contain curcumin-like polyphenolic compounds with slightly higher polarity, whereas *Naregamia alata* extract contains compounds with nearly identical polarity to curcumin, likely curcumin-like polyphenols or moderately polar flavonoids. These results confirm the presence of flavonoid and phenolic constituents in all extracts.

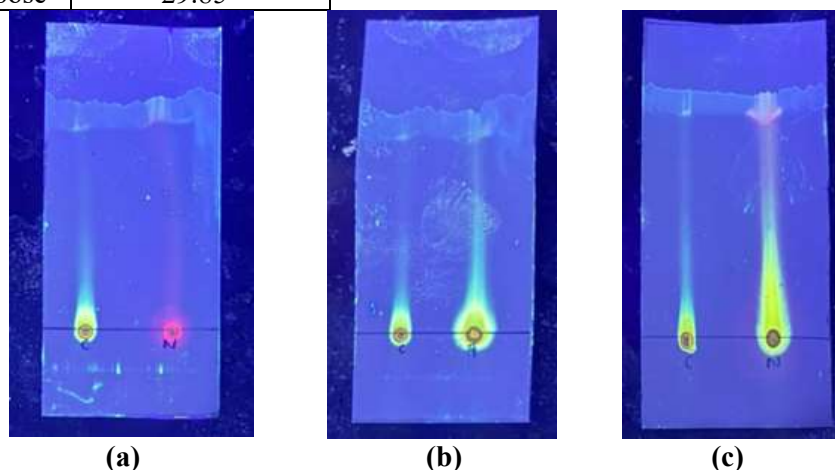


Fig 7: TLC chromatogram of (a)*Naregamia alata* (b)*Curcuma longa* (c)*Azadirachta indica*

In-vitro Antimicrobial activity

Table 7: Determination of antimicrobial activity

SAMPLE	ZONE OF INHIBITION (mm)
Polyherbal powder extract	23
Control (Water)	0
Standard (Ciprofloxacin)	24



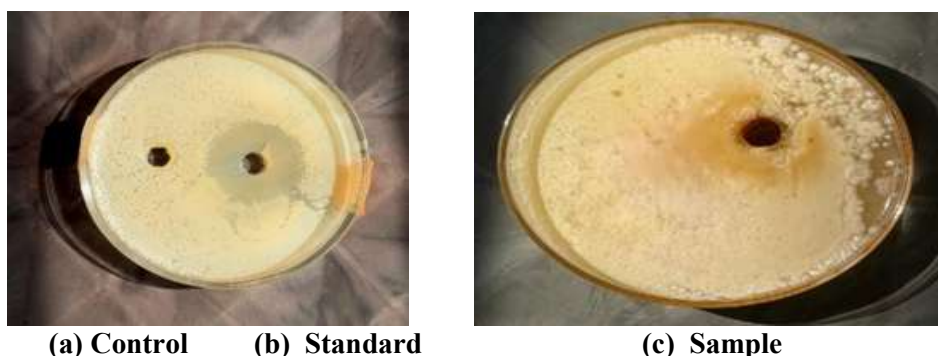


Fig 8: Zone of inhibition of antimicrobial activity of *Naregamia alata* based polyherbal powder extract

Polyherbal powder-milk interaction study

Organoleptic and immediate-use observation study

The polyherbal powder was mixed with warm milk at the recommended dose and observed at 15 and 30 minutes. No curdling, precipitation, foul odor, or abnormal color change was noted. The mixture retained a uniform yellow color, attributed to turmeric, indicating acceptable organoleptic properties and suitability for immediate consumption.

pH stability study

The aqueous extract of the polyherbal powder showed a pH of ~8.0, while milk had a pH of ~6.5. The pH of the mixture remained ~8.0, suggesting no interaction and demonstrating good buffering capacity and pH stability.

Short-term stability study

The polyherbal powder–milk mixture was observed over 1 hour for changes in color, odor, and phase separation. No visible instability or undesirable changes were detected, confirming stability within the normal consumption period.

Centrifugation study:

Milk and the polyherbal powder–milk mixture were centrifuged at 4000 rpm for 10 minutes. No

difference in precipitate formation was observed between samples, indicating absence of interaction and confirming physical compatibility.

CONCLUSION

The study successfully developed and standardized a *Naregamia alata*-based polyherbal powder with good physicochemical properties and confirmed presence of bioactive compounds. The formulation demonstrated significant antimicrobial activity and showed compatibility with milk without any instability.

Overall, the findings suggest that the formulation is safe, stable, and has potential as an effective herbal remedy for scabies management.

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