



MORPHOLOGIC EVALUATION, FORMULATION AND ANTIMICROBIAL EFFECT OF GEL FORMULATIONS PREPARED FROM ETHANOLIC AND AQUEOUS EXTRACT OF AZADIRACHTA INDICA LINN

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Abstract

Chronic skin conditions may cause systemic infections. Infectious skin agents may spread via mucosal membranes or skin abrasions. Regional variances in bacteria, antibiotic resistance, and human immune responses make treating critical illnesses challenging. Chronic skin conditions may enhance microbe sensitivity. The aim of the research is to assess the Antimicrobial effect of gel formulations prepared from ethanolic and aqueous extract of *Azadirachta indica* Linn., commonly known as Neem, extract was tested against *Candida albicans*, *E.coli*, *B.subtilis*, and *S.aureus* which are the common bacteria causing skin diseases by agar well diffusion method. The formulation numbering F3E, were found most effective among the twelve formulations prepared by using 4% concentration of ethanolic extracts of the plants and formulations numbering F3A, were also found most effective among twelve formulations prepared by using the 4% concentration of aqueous extract of the plants. *Azadirachta indica* Linn contain phytochemicals, which have therapeutic potential. Ethno-medical usage has shown that plants may heal several skin diseases. The use of plant species *Azadirachta indica* Linn and their phytoconstituents to treat various skin illnesses is growing.

Keywords- *Azadirachta indica* Linn, Neem, Antimicrobial effect, Gel formulations, extract

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Introduction

Chronic skin conditions may enhance microbe sensitivity. Accessible, practical, long-lasting, and side-effect-free medications are in demand (Jadhav et al., 2023). The early disease needs antibiotics, source control, and immediate treatment (Baby et al., 2022).

Medicinal plants contain phytochemicals, which have therapeutic potential. Ethno-medical usage has shown that plants may heal several diseases (Sharma, 2023). Scientific studies improved and generalized several applications. The use of plant species and their phytoconstituents to treat various illnesses is growing. Every scientific investigation creates new evidence, which speeds up research (Munir et al., 2021)

Poor hygiene in developing countries may cause skin diseases (Shukla et al., 2023). Even in wealthy countries with great cleanliness, viral, bacterial, and fungal skin disorders are common. According to research, skin infections cause 42–65% of all skin morbidity. Since many pathogenic

microorganisms are acquiring resistance to synthetic drugs, which are connected to significant adverse drug reactions and systemic toxicities, discovering alternative sources of antibiotics is a global challenge (Nameera et al., 2023). Using novel molecules independent of existing synthetic antimicrobials is one way to prevent antibiotic resistance. New antimicrobial treatments have stagnated in the last ten years while the opposition has grown (Haji et al., 2023). The purpose of the investigation is to assess the Antimicrobial effect of gel formulations prepared from ethanolic and aqueous extract of *Azadirachta indica* Linn.

Material and method:

Material and method must include study design, data collection and data analysis

Morphologic Evaluation: After authentication all plants are subjected for morphological parameters like colour, odour, taste, size and shape etc.



Figure 1: Shade dried leaves of *Azadirachta indica* Linn (Neem).

Extraction:

The air-dried powdered leaves (500g) of *Azadirachta indica* extracted with ethanol (95%v/v) and concentrated on water bath to get ethanol extract (32%).

Antimicrobial effect of plant extracts under study:

Azadirachta indica Linn extract was tested against *Candida albicans*, *E.coli*, *B.subtilis*, and *S.aureus* which are the common bacteria causing skin diseases by agar well diffusion method. The extracts were prepared using 10% DMSO as a solvent. *E.coli*, *B.subtilis*, *S.aureus* was incubated on nutrient agar plates at 37°C for 48 hrs. under aerobic conditions. The antimicrobial activity of

these plant extract (Aqueous and Ethanol) was determined against *Candida albicans*, *E.coli*, *B.subtilis*, *S.aureus* at Three different concentrations of each extract by the agar well diffusion method.

Development of single herbal gel formulations:

Total two formulations of individual herbal gel formulations were prepared.

Herbal gel formulations from aqueous extracts of *Azadirachta indica* Linn plants (F1A, F2A, F3A) and ethanol extracts (F1E, F2E, F3E) were tested for physicochemical properties and antimicrobial activity against *S.aureus*, *E.coli*, *B.subtilis*, and *C.albicans*. The process includes: In a big beaker, 1 gram carbopol 940 was mixed with 50 ml pure

water. The carbopol 934 beaker was left to swell for 30 minutes. The mixture is stirred for 30 minutes at 1200 rpm using a mechanical stirrer. In one beaker, put 2 ml of propylene glycol and the needed amount of plant extract. In another, add the specified amounts of propyl and methyl paraben and stir

well. After dispersing carbopol, extract and preservative solutions were added while stirring and distilled water was added to 100 ml. The formulas were drop-by-drop adjusted with triethanolamine to achieve the desired skin pH and gel consistency.

Table 1: *Azadirachta indica* Linn ethanolic extract gel formulations:

Ingredients	Formulation code, Quantity taken per 100 grams		
	F1NE	F2NE	F3NE
Carbopol-940	1%	1%	1%
Propylene glycol 400	4%	4%	4%
Triethanolamine	q.s	q.s	q.s
Dist. Water	q.s 100	q.s 100	q.s 100
Methyl paraben	0.2%	0.2%	0.2%
Propyl paraben	0.02%	0.02%	0.02%
<i>Azadirachta indica</i> ethanol Extract	2%	3%	4%

Table 2: *Azadirachta indica* Linn aqueous extracts gel formulations:

Ingredients	Formulation code, Quantity taken per 100 grams		
	F1NA	F2NA	F3NA
Carbopol-940	1%	1%	1%
Propylene glycol 400	4%	4%	4%
Triethanolamine	q.s	q.s	q.s
Dist. Water	q.s 100	q.s 100	q.s 100
Methyl paraben	0.2%	0.2%	0.2%
Propyl paraben	0.02%	0.02%	0.02%
<i>Azadirachta indica</i> Aqueous Extract	2%	3%	4%

1. Result and Discussion

Table 3 - Morphologic evaluation of the observations recorded

Sr. No.	Characters	<i>Azadirachta indica</i> Linn
1.	Colour	Dark green
2.	Odour	Typical, Characteristics
3.	Taste	Intensely Bitter
4.	Size	1-3 cm in diameter, 2- 8cm in length
5.	Shape	Lanceolate
6.	Extra features	Compound

Design of formulation: *Azadirachta indica* Linn plant extracts were used for development of topical herbal formulations. The concentrations used for both the aqueous and ethanol extract were ranging

from 2%, 3% and 4% were carbopol 940 (1%), Propylene glycol (4%), Triethanolamine (q.s) Methyl paraben (0.2%), Propyl paraben (0.02%) are the excipients.

Table 4-Antimicrobial effect of gel formulations prepared from ethanolic extract of *Azadirachta indica* Linn

Formulation	Conc. mg/ml	Zone of inhibitions in mm (<i>Azadirachta indica</i> Linn)			
		<i>S.aureus</i>	<i>E.coli</i>	<i>B.subtilis</i>	<i>C.albicans</i>
F1 E (2%)	100mg/ml	36.7±0.04	13.2±0.05	11.5±0.02	10.5±0.01
	200mg/ml	38.8±0.09	15.9±0.06	12.9±0.07	11.8±0.02
	300mg/ml	40.2±0.02	16±0.01	14.2±0.02	12.0±0.02
F2 E (3%)	100mg/ml	37.0±0.03	11.3±0.05	12.7±0.05	11.7±0.02
	200mg/ml	39.6±0.04	14.9±0.31	14.7±0.2	12.3±0.03
	300mg/ml	42.0±0.02	17.5±0.06	15.0±0.02	13.1±0.01
F3 E (4%)	100mg/ml	38.9±0.02	15.6±0.02	13.8±0.01	11.0±0.05
	200mg/ml	40.6±0.05	16.9±0.03	14.3±0.03	12.07±0.01
	300mg/ml	43.1±0.03	18.1±0.07	15.5±0.02	13.0±0.03

Azadirachta indica Ethanol extract formulations

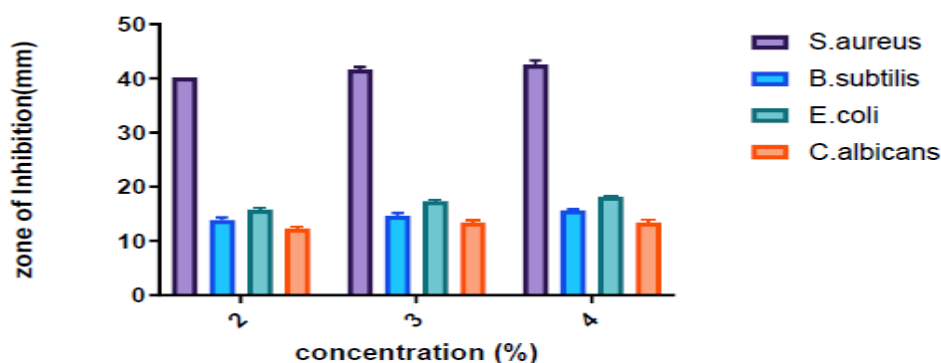


Figure 2: Antimicrobial effect of gel formulations prepared from ethanolic extract of *Azadirachta indica* Linn

Table 5: Antimicrobial effect of gel formulations prepared from aqueous extract of *Azadirachta indica* Linn

Formulation	Conc. mg/ml	Zone of inhibitions in mm (<i>Azadirachta indica</i> Linn)			
		S.aureus	E.coli	B.subtilis	C.albicans
F1 A (2%)	100	15.7±0.04	3.2±0.05	5.5±0.02	5.5±0.01
	200	16.8±0.09	5.9±0.06	6.9±0.07	6.8±0.02
	300	18.2±0.03	6.2±0.02	8.2±0.04	7.8±0.06
F2 A (3%)	100	28.0±0.03	5.3±0.05	6.7±0.05	6.7±0.02
	200	30.6±0.04	5.9±0.31	7.7±0.2	7.3±0.03
	300	32.1 ±0.01	7.4±0.01	8.6±0.01	8.2±0.6
F3 A (4%)	100	31.9±0.02	5.6±0.02	7.8±0.01	6.0±0.04
	200	32.6±0.05	6.9±0.03	8.3±0.03	7.07±0.02
	300	34.5±0.02	7.1±0.01	9.8±0.02	9.2±0.02

Azadirachta indica Aqueous extract formulations

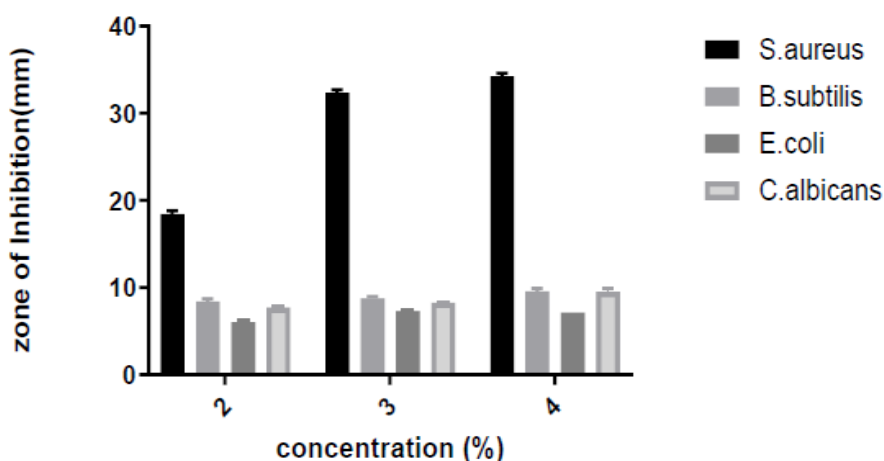


Figure 3- Antimicrobial effect of gel formulations prepared from aqueous extract of *Azadirachta indica* Linn

Anti microbial effect of plant extracts under study were assessed by using agar well diffusion method. Greater zone of inhibition exhibited by the ethanol extracts of all plants at concentration of 300 mg/mL as compared to aqueous extracts. Hence antimicrobial activity shown by the ethanol extracts is greater than aqueous extract. The antimicrobial

effect of single gel formulations were also assessed against four pathogens namely *Staphylococcus aureus*, *candida albicans*, *Escheria coli* and *Bacillus subtilis*. Results suggest that ethanol extract formulations were showing better activity as compare to aqueous extract formulations. The formulation numbering F3E was found most

effective among the 9 formulations prepared by using 4% concentration of ethanolic extracts of the plants and formulations numbering F3A was also found most effective among 9 formulations prepared by using the 4% concentration of aqueous extract of the plants.

Conclusion:

Azadirachta indica Linn gel formulations are effective in the treatment of bacterial skin diseases caused by *Staphylococcus aureus*, *Candida albicans*, *Escherichia coli* and *Bacillus subtilis*. Both aqueous as well as ethanolic extract of the *Azadirachta indica* Linn showing promising antimicrobial effect during the in-vitro antimicrobial study conducted on skin diseases causing microorganisms selected for present study.

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