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Herbal gel formulation and evaluation using locally available plants

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Abstract
Herbal gel is a solid, jelly-like substance that can have properties ranging from soft and weak to hard and tough preparation. It is used topically for a variety of purposes, such as protectants, antiseptics, and antimicrobials. The herbal gel was made by combining *Azadirachta indica*, *Curcuma longa*, *Berberis aristata*, and *Rubia cordifolia*. *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Escherichia coli* were used as test subjects for the antibacterial activity. It was shown that the herbal gel had the strongest effect on *Staphylococcus aureus* (Hand bacteria). To fully understand the mechanism of action and to create a formulation that can be useful in the health sector, more research is required.

Keywords: Herbal gel, antimicrobials, antibacterial activity, polyherbal formulations

Introduction
Herbal medicine has been used for millennia and is being studied in some European and Asian nations. Great effort has been done that is beyond the comprehension and ability of the average person. The 21st century's technologically advanced lifestyle has given human misery a variety of titles. The best thing about using herbal medication is that it can be used by people of any age group and has no side effects or ineffective cures. Polyherbal formulations are defined as those that contain two or more herbs [1]. Numerous studies have been conducted with the extracts of Neem leaves (*Azadirachta indica* Family-Meliaceae) and extract of Turmeric rhizomes (*Curcuma longa* Family-Zingiberaceae) with the combination of many other herbal drugs like *Berberis aristata* (Family-Berberideceae) and *Rubia cordifolia* (Family-Rubiaceae) [2, 3]. Along with other dosage forms herbal drugs are also available in the form of gel which is a solid, jelly like material that can have properties ranging from soft & weak to hard & tough preparation used topically for several purposes e.g. as protectants, antiseptics, antimicrobials [4].
Topical application of gels at pathological sites offer great advantages in a faster release of drug directly to the site of action, independent of water solubility of the drug as compared to creams and ointments [5].
Therefore, our main goal is to create a herbal gel that is free of various chemicals and doesn't have a serious hazardous effect when applied to various sections of the body.

Methodology
Collection of crude drugs: - The crude drugs were collected from local market of Nuapada. Then they were properly identified and stored for further processing.
Extraction of crude drugs: - The collected crude drugs were properly washed & grinded to coarse powder. The powder crude drugs were extracted by Soxhelet extractor by using distilled water as solvent. The extraction process was done for 6 hrs at room temperature 100˚C.
Preparation of extract: - The extract obtained by above extraction procedure was evaporated by using hot plate to get solvent free extract. Then the extract was properly stored in desiccator for preparation of herbal gel.
Preparation of herbal gel: - The gel was prepared using the water extract of *Azadirachta indica*, *Curcuma longa*, *Berberis aristata* & *Rubia cordifolia*. The gel was prepared using Xanthan gum, Propylene glycol, Ethanol, Methyl paraben, Propyl paraben, EDTA & distilled water in a quantity sufficient to prepare 100 gm of gel in case of blank gel. Water required

for these formulations was divided into two parts. In one part the exact amount of extract was dissolve & to this, calculated quantity of propylene glycol 400 & ethanol were added. In another part, xanthan gum was dissolved & to this solution, methyl paraben, propyl paraben & EDTA were added. Both of these solutions were mixed in a beaker & tri-ethanolamine was added to the mixture drop wise to obtain the gel consistency. The same procedure was used for preparation of 5%. Herbal gel [6, 7].

Formulation	Xanthan gum (%)	Extract (%)	Propylene glycol (%)	Ethanol (%)	Methyl paraben (%)	Propyl paraben (%)	EDTA (%)	Water (%)
5% Herbal gel	0.5	5	4	3	0.2	0.02	0.03	600

Evaluation (Anti-microbial activity) of herbal gel

Bacteria used for the study

The bacterial strains of *Escherichia coli* (BKCP- 1), *Pseudomonas aeruginosa* (BKCP- 2), *Staphylococcus aureus* (BKCP- 3) were isolated from different environments of the college campus, samples diagnosed by staining, Culture character & biochemical properties.

Media used for the culture of bacteria

Media used for this study were procured from HI-MEDIA Company, Mumbai. Nutrient agar and broth, Mac Conkey agar and broth, Mannitol agar and broth were used as General media as well as selective media for respective bacterial strains.

Qualitative test

Disc diffusion

For this purpose, the bacterial lawn was made on Nutrient agar plates from 10^3 CFU/ml of respective bacterial cultures. The herbal gel impregnated paper discs (Whatman filter paper No 1) were put in triplicate to get concordant readings. The zones of inhibition depicted (if any) by the activity of drug were measured in mm.

Well diffusion method

For this purpose, the bacterial lawn was made on Nutrient agar plates from 10^3 CFU/ml of respective bacterial cultures. Then three wells (8mm) were made on the plate and to this the ointment was poured. The zones of inhibition depicted (if any) by the activity of drug were measured in mm. [18]

Result

The herbal gel showed best activity against hand bacteria having zone of inhibition of 15mm and less activity against Air bacteria having zone of inhibition of 13mm. The result was comparable with standard drug. Antibacterial activity of herbal gel reflected in table no-1 & Figure 1.

Antibacterial activity

Sl. No.	Bacteria	Zone of inhibition of gel 5% (in mm)	Zone of inhibition of standard drug
1	*S. aureus* (Hand bacteria)	15	24
2	*E. coli* (Water bacteria)	14	25
3	*P. aeruginosa* (Air bacteria)	13	20

Fig 1a: Standard drug (Cefixime)

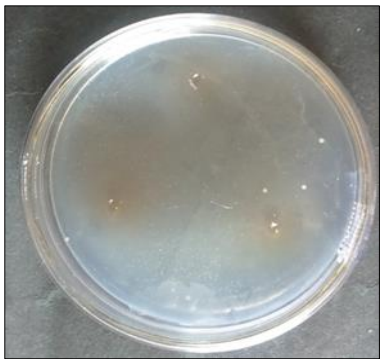

Fig 1b: *Staphylococcus aureus*

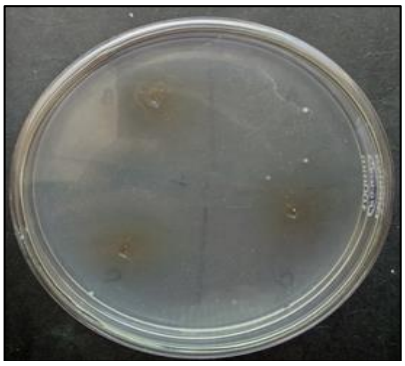

Fig 1c: *Escherichia coli*

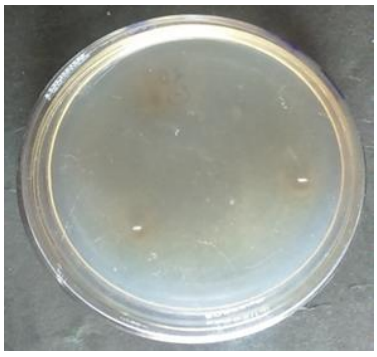

Fig 1d: *Pseudomonas aeruginosa*

Fig 1: Antimicrobial activity of Herbal gel

Conclusion

The herbal gel was prepared by taking *Azadirachta indica*, *Curcuma longa*, *Berberis aristata* & *Rubia cordifolia*. The antimicrobial activity was tested against *Escherichia coli*, *Pseudomonas aeruginosa* & *Staphylococcus aureus*. The herbal gel showed best activity against hand bacteria having zone of inhibition of 15mm and less activity against Air bacteria having zone of inhibition of 13mm. It was observed that the herbal gel showed best activity against *Staphylococcus aureus* (Hand bacteria). Further study is needed to explain the mechanism of action & need to prepare a formulation which can help in the health sector.

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