

Formulation and evaluation of antibacterial cream containing *Acacia auriculiformis* extract

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Abstract

Acacia auriculiformis ex Benth. belonging to family Fabaceae, is a straight, medium-sized, deciduous or evergreen tree, potentially accomplishing 30 m tallness, and is normally found in the roadsides and parks of India. The chemical constituents present in the leaves of *A. auriculiformis* possess various medicinal activities central nervous system depressant activity, antioxidant, antimicrobial, antimalarial, anti-filarial, cestocidal, antimutagenic, chemopreventive, spermicidal, wound healing, hepatoprotective and antidiabetic activity. In the present study, the antibacterial activity of ethanolic leaf extract was evaluated and cream containing the antibacterial extract was formulated. The leaves were dried, crushed and ethanolic extraction using soxhlet apparatus was performed. The extract was incorporated in w/o cream base. The cream containing antibacterial extract was evaluated for pH, viscosity, spreadability, emulsion type, irritancy and was compared with marketed formulation for physical characteristics. The in vitro antibacterial activity of *A. auriculiformis* extract and cream was evaluated using agar well diffusion method. The values of evaluated parameters were found to be pH-6.3, viscosity-85000 cp, spreadability-19gm cm/sec, emulsion w/o type, no irritancy. The cream was found to match the physical characteristics of marketed formulation. The antibacterial assay with standard drug and marketed antibacterial cream, showed that the activity of *A. auriculiformis* was superior amongst all the 3 samples. As *A. auriculiformis* proved to be active antibacterial agent, it can be concluded that the herbal cream containing *A. auriculiformis* extract can provide better remedy for topical infections. The herbal cream proves to be better as it has less side effects as compared to topical creams containing synthetic antibacterial agent.

Discussion

The antibacterial cream containing *Acacia auriculiformis* leaves extract was formulated and evaluated.

Extraction: The extraction of leaves extract by ethanolic soxhlet extraction yield 20% w/w extract. **Antibacterial activity:** The antibacterial activity of extract evaluated by agar well diffusion method proved to be effective against gram negative bacteria and the results were prominent compared to gentamicin.

Formulation and evaluation: Suitable batch of cream base F2 having desired viscosity was selected for final formulation of cream. The extract was added to the cream base and the cream was then evaluated for various physical parameters like appearance, pH, viscosity, spreadability, irritancy, homogeneity, washability, emulsion type, and antibacterial activity. The results of evaluation parameters of cream containing *A. auriculiformis* extract were found well within the limits as compared to marketed cream. The appearance was smooth semisolid, with pH suitable for skin application, consistency and spreadability suitable for uniform application. The cream does not show any irritation when applied to forearm. The cream got wash off easily and left no trace of oil on skin. The emulsion type detected by dye test was found to be w/o type of emulsion.

Antibacterial activity of *A. auriculiformis* cream: Finally the cream was evaluated for antibacterial activity in comparison to marketed herbal cream. The antibacterial activity of *A. auriculiformis* extract and cream was found more prominent as compared to marketed herbal cream.

The cream was kept at 45°C and 75% RH, and was found stable with no visible changes for 3 months.

Conclusion

Acacia auriculiformis leaves possess chemical constituent with potent medicinal activities. The leaves extract was used in the formulated cream which was then evaluated for physical and antibacterial characteristics. From the results obtained in the present work, it was observed that *A. auriculiformis* is an active antibacterial agent. It can be concluded that the herbal cream containing *A. auriculiformis* extract can provide better remedy for topical infections in comparison to the available antibacterial cream. The herbal cream proves to be better as it has less side effects as compared to topical creams containing synthetic antibacterial agent.

Introduction

Acacia auriculiformis ex Benth. belonging to family Fabaceae, is a straight, medium-sized, deciduous or evergreen tree, potentially accomplishing 30 m tallness, and is normally found in the roadsides and parks of India. The chemical constituents present in the leaves of *A. auriculiformis* possess flavonoids (Auriculiside) and triterpenoid saponin glycosides (acaciasides-acaciaside A & B) which are responsible for various medicinal activities like central nervous system depressant activity, antioxidant, antimicrobial, antimalarial, anti-filarial, cestocidal, antimutagenic, chemopreventive, spermicidal, wound healing, hepatoprotective and antidiabetic activity. Antibacterial activity of *A. auriculiformis* against bacteria like *Staphylococcus aureus*, *Escherichia coli*, *Proteus vulgaris* and *Salmonella typhi* was found to be prominent with maximum activity against *Staphylococcus aureus* (coagulate positive) only. The extracts using different solvents shows effectiveness against different types of organisms. The antioxidant activity also improves the skin renewal thus benefitting the infected wound.

The present study aims to use this antibacterial activity in topical cream that will be helpful to cure various topical infections and will reduce the side effects caused due to synthetic drugs. The cream formulated is evaluated for physical characteristics and antibacterial activity in comparison to the marketed herbal cream. The herbal extract with antibacterial and antioxidant activity is also helpful for better skin renewal and wound healing.

Materials and methods

Materials: Leaves of *Acacia auriculiformis* collected from the campus of Kamla Nehru College of Pharmacy Butibori, Nagpur. Olive oil was purchased from Loba chemie, Bees wax from Biocon Scientific, Mineral oil purchased from Visual Chem, Amaranth Dye from Burgoyne, BURBIDGES &co., Nutrient agar was purchased from Hi media, Gentamicin as gift Sample from ZIM lab Kalmeshwar.

Methods:

Extraction: The *Acacia auriculiformis* leaves extract was prepared by soxhlet apparatus using ethanol as solvent. % yield of extract was determined

Antibacterial Activity:

Antibacterial activity of leaves extract in 0.5 % and 1 % concentration with gentamicin standard was evaluated using agar well diffusion method with incubation at 37°C for 24 hrs and zone of inhibition was observed.

Formulation of cream:

Olive oil, mineral oil was mixed with beeswax and propyl paraben by heating to form oil phase. Methyl paraben was dissolved in sufficient water to form water phase. The mixture was then boiled in water bath up to 60 -70°C. Oil phase was added to water phase with trituration. The formula is given in table 1

Table 1: Formulation of cream bases

Formulation	F1	F2	F3
Olive oil	10	20	25
Bees wax	2.8	6.5	7
Mineral oil	50	50	50
Methyl paraben	0.1	0.1	0.1
Propyl paraben	0.01	0.01	0.01
Water	0.5	0.5	0.5

F2 batch was selected on the basis of consistency and 1% extract was added to the formula F2. The cream was then evaluated for appearance, pH, viscosity, spreadability, irritancy, homogeneity, washability, emulsion type, and antibacterial activity. The results were compared with the marketed herbal cream.

Results

Percentage Yield of the Extract: The percentage yield of the ethanol extract obtained from powdered dried leaves of *A. auriculiformis* was 20 %w/w.

Antibacterial activity of extract: The results of antibacterial activity evaluation is shown in table 2 and figure 1.

Table 2: Antibacterial activity of *A. auriculiformis* extract

Sample	0.5% <i>A. auriculiformis</i> Extract	1% <i>A. auriculiformis</i> Extract	10µg/ml gentamicin
Zone of inhibition (mm)	5mm	18mm	20mm



Fig. 1: Zone of inhibition *A. auriculiformis* Extract

Formulation and evaluation: The formulation of 3 batches of cream base were done and evaluated for viscosity in comparison to marketed formulation. The table 3 shows viscosity values of 3 batches of cream base. Batch f2 was selected as final formulation and added with 1% *A. auriculiformis* extract.

Table 3: Viscosity of cream bases

Batch	F1	F2	F3	Marketed sample
Viscosity	3000cp	8000cp	20000cp	9500cp

The final cream containing *A. auriculiformis* extract was evaluated for appearance, pH, viscosity, spreadability, irritancy, homogeneity, washability, emulsion type. The results are given in table 4. fig 2 and fig 3.

Table 4: Evaluation of *A. auriculiformis* cream

Appearance	pH	Viscosity	Spreadability	Irritancy	Homogeneity	Washability	Emulsion type
Cream white smooth semisolid	6.5	7500cp	Good	Not found	Good	Good	w/o



Fig. 2: Spreadability

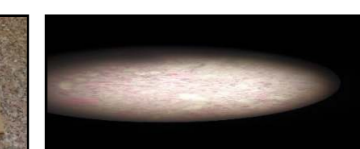


Fig. 3: Dye test for emulsion type

Antibacterial activity of *A. auriculiformis* cream: The *A. auriculiformis* cream was evaluated for antibacterial activity using agar well diffusion method and the zone of inhibition was measured. The results are shown in table 5 and figure 4.

Table 5: Antibacterial activity of *A. auriculiformis* cream

Sample	1% extract	Cream 1% solution	Gentamicin	Marketed
Zone of inhibition	18mm	17 mm	20mm	10mm

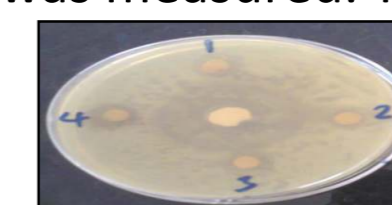


Fig 4: Zone of inhibition of *A. auriculiformis* cream

The cream was found stable over the period of 3 months when kept at accelerated temperature and humidity.

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