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Antibacterial Efficacy of *Aleo vera* on the nail scrapping of woman in cotton field at Waranga in Nagpur District, India

Archana Meshram

Department of Zoology, Dr. Ambedkar College, Deekshabhoomi, Nagpur, MS, India
Email: drarchie1218@gmail.com

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Abstract

Due to the increasing development of antibiotic resistance, the emphasis of the present study is being given on the use of *Aloe* vera as a natural remedy for the inhibition of various infections. *Aloe vera* (Aloe barbadensis Miller), is reputed to have medicinal properties. For centuries, it has been used for an array of ailments such as mild fever, wounds and burns, gastrointestinal disorders, diabetes, sexual vitality and fertility problems to cancer, immune modulation, AIDS and various skin diseases. In this study, antibacterial activity of leaf and gel extracts of *A. vera* were tested against gram positive and gram negative skin infections isolates.

Keywords: Aloe vera, antimicrobial, antibiotics, nail scrapping, Waranga, Nagpur

1. Introduction

Aloe vera (L.) Burm.f. (Asphodelaceae) first published in Fl. Indica:83 in 1768 [1]. The native range of this species is N. Oman (Hajar Mountains). It is a succulent perennial and grows primarily in the desert or dry shrubland biome. It is has environmental uses and social uses, as a poison and a medicine and for food (science.kew.org/taxon). It is mostly made up of a huge variety of organic and inorganic components [2]. Because of its richness, this plant is frequently utilized as a medicinal herb [3]. It possesses antifungal, antioxidant, anticancer, and other properties [4 -8]. It also quickens the skins regrowth process after injury [9]. Aloe vera is also used in the food industry. The duration of food freshness increased, food spoilage was prevented, and the process of fat oxidation was reduced because of the antioxidant properties found in its leaves, flowers, and gel [9]. In the cosmetics, the Aloe vera plant is also used as a base for making creams, lotions, ointments, and facial cleansers. In the recent times, the Aloe vera plant has been used as a natural dye for absorbing light in the area of solar power [10-11].

Scientific studies have shown that a complex carbohydrate in ***Aloe vera,*** acemannan, combines antiviral properties, antibacterial action and also stimulates the immune system. Gel-based creams are effective when applied externally to skin burns and wounds. ***Aloe vera*** gel-based drinks have also proved useful for people suffering from mouth ulcers and peptic ulcers (unless they are drug-or-induced).

2. Material and Methods

2.1 Collection of Sample

The present study was carried out with the view of finding out Antibacterial properties of ***Aleo vera*** a medicinal herb. The samples were collected from nail scrapping of woman in cotton field at Waranga in Nagpur District.

The Samples were collected in sterilized glass bottle, having sterile saline solution and transferred to laboratory for screening of bacterial micro-flora present on the nails.

2.2 Analysis of Sample

Isolation of Micro-flora [12-14]

From the nails suspension samples were inoculated on nutrient agar plate by streak plate technique. The plates were inoculated at 37°C for 24 hours.

After incubation plates were observed for different colonies. The colonies showing different characteristics were selected and stored by streaking on nutrient agar slant.

Identification of isolated colonies

Identification of isolates were carried by gram reaction motility, selective media, cultural and biochemical characteristics.

Preparation of Aleo Vera extract

Preparation of plant material prior to extraction

Mature, healthy and fresh leaves of ***Aleo vera*** were washed with hot (40°C) water dissected longitudinally and the colorless parenchymatous tissue was scraped out. These tissue were air dried and homogenized to fine powder was stored in air tight bottle.

Preparation of plant extract:

The extracts of plant material were prepared as follows

i) Aqueous extraction:

For aqueous extraction 2gm air dried powder was mixed in 20mm distilled water and boiled for 6 hrs at intervals of 2 hrs. It was filtered through filter paper, and was concentrated to make the final volume, one-fourth of the original volume. Finally 2gm of material was extracted in 5ml of distilled water giving a concentration of 40mg/ 0.1ml . It was then autoclaved at 121°C and 15 lbs pressure and stored at 4°C.

ii) Solvent Extraction:

Two grams of air dried powder was placed in 20ml of ethanol in air tight glass bottle and then kept it for 24 hrs. After 24 hrs it was filtered with filter paper. The filtrate was collected and the solvent was evaporated to make the final volume one fourth of the original volume, giving a concentration of 40mg/0.1 ml. It was stored at 4°C in air tight bottle for further studies.

2.3 Antibacterial Assay [12-14]

The antibacterial assay was carried out as below

Preparation of Media

Nutrient agar and nutrient broth was prepared by adding 2.8 gm of nutrient agar and 0.65 gm of nutrient broth in 100 ml and 50ml of distilled water respectively. Petri plate and media was sterilized at 121°C and 15 lbs pressure for 15 min. After autoclaving the nutrient agar was poured in sterile Petri plate and was allowed to solidify.

Preparation of inoculation

For the standardization of inoculum 0.1 ml of culture was inoculated in 4.9 ml sterile nutrient broth it was incubated at 37°C for 3hrs, till its turbidity matches with 0.5 Mc-Farland standard.

Agar well diffusion method

In agar well diffusion method, 0.2 ml of bacterial inoculums was added on nutrient agar and spread with the help of sterile cotton swab. Wells were prepared with the help of sterile cork borer in the agar. The test plant extracts were added to the wall with the help of micro-pipette, 2ml of test sample was added in to the

well. The plates were labeled and kept in inhibition of bacterial strains were measured in (mm).

Composition of media used

Nutrient Agar	
Peptone	10gm
Beef/Meat extract	3gm
NaCl	5gm
Agar-agar	3gm
Distilled water	7.4
Nutrient Broth	
Peptone	10gm
Beef/Meat extract	3gm
NaCl	5gm
Distilled water	1000ml
pH	7.4

3. Results and Discussions

In the present study total 15 samples of nails scrapping were collected in April 2023 and analyzed for the isolation of bacterial flora.

Table 1: Analysis of nails samples

Sr.	Source Name	Age	District	Isolates
1	Khatubai	60	Nagpur	-
2	Lalita	40	Nagpur	+
3	Poonam	45	Nagpur	-
4	Parmila	35	Nagpur	+
5	Supriya	37	Nagpur	-
6	Maya	42	Nagpur	-
7	Rajeshwari	65	Nagpur	-
8	Sharda	40	Nagpur	+
9	Fhulwanti	45	Nagpur	+
10	Malabai	55	Nagpur	-
11	Usha	28	Nagpur	-
12	Anwari Begum	25	Nagpur	+
13	Rupkanta	52	Nagpur	-
14	Saraswati	54	Nagpur	+
15	Indu	56	Nagpur	-

From above total 15 sample 6 samples were found to be positive on nutrient agar plates, for presence of bacterial flora.

These 6 samples were selected and proceed further.
The colony character were observed from these samples on nutrient agar plates from each plates 2 colonies were selected and streaked on nutrient agar slant, and stored labeled.

Table 2.

Sr. No.	Source	Isolates
1	Lalitabai	A1 , A2
2	Parmilabai	B1 , B2
3	Sharda	C_1, C_2
4	Fhulwanti	D_1, D_2
5	Anvari Begum	E_1, E_2
6	Saraswati	F_1, F_2

These isolates were inoculated on selective media, these were cetrimide agar mannitol salt agar, Eosin methylene blue agar and incubate for 24 hours at 37°C.

After incubation the growth was found to be absent on the cetrimide agar which is selective for Pseudomonas species on EMB agar, in two isolates the colonies with green metallic sheen on mannitol salt agar isolate was grown. MSA agar is selective for *Staphylococcus aureus* and EMA agar is selective for *Escherichia coli.*

Table no. 3

Sr.No.	Selective Media	Isolates Inoculate	Result
1	Certimide agar	A_1	-
2	MSA agar	A_2	-
		B_1	-
		B_2	-
2	MSA agar	A_1	-
		A_2	+
		B_1	-
		B_2	-
4	EMB agar	A_1	-
		A_2	-
		B_1	-
		B_2	+

The two isolate B2 and A1 were further identified by gram staining and motility, catalase test and biochemical reactions.

Table 4: Identification of Bacteria Form nail Sample.

Sr.	Source	Isolated	characteristics						
			Gram negtive	Motility	Catalase test	Indole test	Methyl red	Vogus proskaur	Citrate test
1	Lalitabau	A_1	+	-	+	-	+	+	-
2	Formilabai	B_2	-	+	+	+	+	-	-

'+' :Positive Reaction **'-'**:Negative Reaction

Table 5 : Antimicrobial activity of ethanol extract of *Aleo vera* :-

Sr no.	Sources	Organism	Zone of inhibition(mm)
1	Leaf	E. Coli	18mm
2	Leaf	S. aureus	20mm

Table 6: Antimicrobial activity of aqueous extract of *Aloe vera* :-

Sr no.	Source	Organism	Zone of inhibition (mm)
1	Leaf	E.Coli	15mm
2	Leaf	T. aureus	17mm

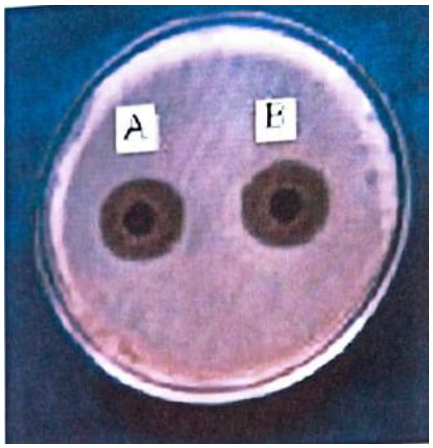

Fig. *E.Coli* grown on N.A. Plate with *Aloe vera* extract
A: Zone of Inhibition with aqueous extract of *Aloe vera*
B: Zone of Inhibition with Alcoholic extract of *Aloe vera*

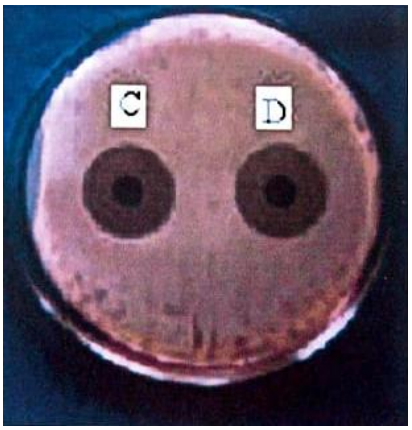

Fig. *S. aureus* grown on N.A. Plate with *Aloe vera* extract
A: Zone of Inhibition with aqueous extract of *Aloe vera*
B: Zone of Inhibition with Alcoholic extract of *Aloe vera*

From the above Characters the isolate were identified as A1 and B2 Which were found to be *Staphylococcus aurers* and *Escherichia coli.* respectively.

Antimicrobial activity of *Aloe vera* was analyzed by preparing the extract in two solvent, water and ethanol.
Antimicrobial activity of 2 extract of *Aloe vera* screened against two identified isolates namely *E. coli* and *S. aureus.*
Antimicrobial activity of ethanol extract of leaf of *Aleo vera* was screened against two isolated organisms i.e. *Escherichia coli* and *s. aureus*. The leave extract of plant gave 18mm of zone of inhibition against *Escherichia coli* and 20mm zone od inhibition against *Staphylocoeus aureus*.

Antimicrobial activity of aqueous extract o leaf of Aloe vera was screened against two isolated organism. *Eschierichia coli* and S. aureus the leave extract of plant gave 15mm zone of inhibition against *Escheriachia coli* and 17 mm zone of inhibition against *Staphiylocoeus aureus*.

Ethanolic Extractb of Aloe vera were found to be move effective than aqueous against isolated *Staphilocoeus aureus* and *Escherichia coli* of organism.

4. Discussion

Subramaniam *et al*. [15] studied on in vitro anti-bacterial and anti-fungal activities of extract of *aloe vera* leaf gel. In that anti-microbial activity of ethanolic extract of *aloe vera* gel were investigated against various common pathogenic method showed significant zone of inhibition against all the pathogens. On *E. coli*. Zone of inhibition on ethanolic extract was found more than 8 mm.

In present studied the ethanol of extract of leaves of *Aloe vera* showed the highest anti bacterial activity against *S. aureus* having zone of inhibition 20mm and *E. coli* it gives give zone of inhibition of 18mm.

Agarry *et al*. [16] studied an comparative activity of *Aloe vera* gel and leaf 8 mm that *Aloe vera,* were test against S. aureus, Psedomonas, aeruginosa, trichophynton nematagraphytes. Schoeleinii, Microsporium canis and Candida albicans. Ethanol was used for extraction of leaf for obtaining gel from it and anti-microbial effect measured by appearance of zone of inhibition Antimicrobial Suspectibilty test showed that both gel and leaf inhibition growth of S. aureus.

In the present work ethanol extract and aqueous extract was prepared of leaf of *Aloe vera*. The anti-microbial activity of these extract was screened against *E. coli* and *S. aureus*. In that ehtanoic extract of leaf of Aloe vera showed highest zone of inhibition than *E.coli*.

5. Conclusion

Sheep by-products offer immense biochemical potential, with applications ranging from food and agriculture to medicine and industry. Advanced analytical methods have enabled the characterization of these materials, uncovering novel uses and promoting sustainable practices. Future research should focus on optimizing utilization and addressing region-specific challenges to enhance the value of these resources.

Conflicts of interest: The author stated that no conflicts of interest.

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