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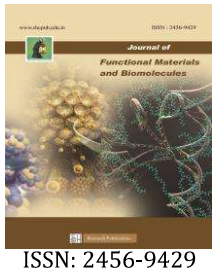

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EXAMINATION OF PHYTOCHEMICAL ANALYSIS AND ANTI-BACTERIAL ACTIVITY OF ALOE VERA LEAF EXTRACT

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Abstract

The medicinal plants represent an enormous reservoir of potential phytochemical compounds that could be useful as an alternative to allopathic drugs and are being used to develop Pharma drugs. *Aloe vera* has medicinal properties for the effective management of several ailments including Hepatitis. The present investigation was aimed to focus on the screening of phytochemical constituents. And additionally antibacterial activity of Aloe vera in methanolic extracts. The main objective of the present work to established the preliminary phytochemical analysis and *in vitro* antibacterial activity of methanol extract of *Aloe vera.* Furthermore, the presence of these phytochemicals in *Aloe vera* can act as the therapeutic agents and they are responsible for antibacterial activity.

Keywords: Phytochemicals, Aloe vera, DMSO and antibacterial agents.

1 Introduction

The current approach is moving more towards sustainable solutions, which can be observed in consumers' demand and acceptability for eco-friendly products. Local care of vein harvest sites and control of pain in patients undergoing surgery are the important duties of nurses as a member of the treatment team [1, 2]. Despite extensive improvements in wound dressings, care, and pharmacological and non-pharmacological agents controlling pain, more studies are still needed for pain control, accelerating surgical wound healing, and reducing complications. Added herbs to the dressings have led to the use of their antibacterial, anti-inflammatory, and antioxidant effects, which are helpful in wound contraction, angiogenesis, and epithelialization [3]. Aloe vera is one of these medicinal plants found in various countries, including Iran. Laboratory studies have shown that aloe vera has various effects, such as inhibiting thromboxane (a repair inhibitor), inhibiting histamine production (reducing itching and skin irritation), strengthening the immune system, and producing cytokines, increasing and changing collagen composition, improving wound healing, and decreasing local pain[4]. Plant-based sources such as edible coatings could be the best solution. Plant-based sources have been used as an extract or essential oil, requiring lengthy and costly downstream processing after getting the crude extract. Therefore, extensive research is going on to find excellent source material, that can be used alone or in combination with other edible coatings, and it emerged as an advantage for fresh produce industries as they have upraised the market value of their products by increasing their product validity. Since this approach protects fresh produce from external and internal injuries, provides safety, increases shelf life, and maintains quality, it is extensively utilized in food industries [5]. The term edible films and coatings are generally used interchangeably by many researchers.

However, there is a technical distinction between both terms. Edible coatings are hydrocolloids that can be applied to the product using different techniques such as dipping, brushing, and spraying, upon drying they form a film around the product, whereas edible films are first de-

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veloped into films using the liquid coating material and then adhere to the product surface [6]. The primary mechanism of action of edible films and coatings is to develop a thin layer or semi-permeable barrier around the product to minimize its contact with the external environment. This will subsequently create a protective and modified atmosphere around the fresh produce, which can preserve its freshness for a long time [7]. If the film develops a very thick or extremely thin layer on a product surface, it may produce undesired results. An important criterion used to develop optimum coating and films considers several parameters such as economic reliability, mechanical properties, thermal stability, sensory properties, and barrier properties [8]. All these parameters are greatly influenced by the molecular weight and concentration of the material, the type of solvent used to prepare the coating, pH, temperature, and additives used. Therefore, this is challenging to formulate a coating or develop a film with the desired characteristics. Several materials have been characterized for their film-forming abilities, including lipids (waxes or oils), proteins (gelatin or whey protein), biopolymers (alginate or chitosan), and carbohydrates (starches or cellulose derivatives) [9]. Each material has a unique composition and function. Among these materials, Chitosan (β-(1–4)-2-acetamido-D glucose and β-(1–4)-2-amino-D-glucose units) is the most widely practiced biopolymer in films and coatings-making processes. Its inert and biodegradable nature and antimicrobial and antioxidant properties make it superior among other coating materials [10]. The main objective of our study was to identify any phytochemicals in the *aloe vera* plants collected in the Tirupattur area of Tamil Nadu, India, and to determine whether or not these plants have antibacterial properties.

2. Experimental Sections

2.1 Reagents and Chemicals

Ethonolic ethyl alcohol Drug resistant clinical strain of *Escherichia coli*, and *Staphylococcus aureus* were obtained from the Department of Biochemistry, Sacred Heart College (Autonomous), Tirupattur, Tamilnadu, India.

2.2 Study area

The study area was Annandapatti, Tirupattur district, tamilnadu, India Aloe barbadensis Miller has huge leaves that are 15-25 cm long and 10-14cm wide, with an avoid form with a high glossy texture having feather touch.

2.3 Collection and preparation of sample

Collection of Aloe barbadensis Miller preparation of extract the plant dry for the week. After a week the dried plants are ground into fine powder then stored in an airtight container. For preparing the ethanolic extract 10 grams of the powder of plant was mixed with 100 ml of Ethanolic in 1:10 ratio for 5 to 6 hours in soxhlet. After 6 hours the contents are filtered through whatman no, 1 filter paper. Then the filtrate was collected separately for further activities [11].

2.4 Extraction

From the dried area collection of Aloe barbadensis Miller were grinded by using a masternpistal, after the mashed soil, 10 grams of were dissolved by using 100ml of ethanol in the beaker in the presence of Soxhlet apparatus separately. From the obtained extracts of contents were filtered through the whatman no. 1 filter paper, filtrates were then concentrated in a rotary evaporator, which they are used for further studies (figure 1).

The concentrated extracts were then allowed to dry completely for two or three days at room temperature. After the botanical extracts had dried, they were stored in sterile bottles until needed again.

Figure 1: Collection and Extraction of Aloe vera

2.5. Preliminary Phytochemical Screening

The ethanolic extract of *Aloe vera* solutions were assessed for the existence of the phytochemical analysis by using the following standard methods [12].

1. Detection of Alkaloids

Mayer's test

The extract underwent treatment with Mayer's reagent. The presence of alkaloids is indicated by the formation of a yellow cream precipitate.

Wagner s test

The extract was treated with Wagner s reagent. Formation of brown/reddish brown precipitate indicates the presence of alkaloids.

2. Detection of Flavonoids

Lead acetate test

Extracts were treated with few drops of lead acetate solution. Formation of yellow color precipitate indicates the presence of flavonoids.

Sulphuric acid test

Extracts were treated with few drops of H_2SO_4. Formation of orange colour indicates the presence of flavonoids.

3. Detection of Steroids

Two ml of acetic anhydride was added to five ml of the extract and then added each with two ml of H_2SO_4. The color was changed from violet to blue or green indicates the presence of steroids

4. Detection of Terpenoids

Salkowski s Test

The extract was combined with chloroform at a ratio of 5 ml to 2 ml, and then 3 ml of concentrated H_2SO_4 was added slowly to create a distinct layer. The presence of terpenoids is indicated by a reddish brown color on the inner surface.

5. Detection of Phenols

Ferric chloride test

10ml of the extract was treated with few drops of ferric chloride solution. Formation of bluish black colour indicates the presence of phenol.

Lead acetate test

10 ml of the extract was treated with few drops of lead acetate solution. Formation of yellow colour precipitate indicates the presence of phenol.

6. Detection of Saponins

About 0.5ml of the extracts was shaken with five ml of distilled water. Formation of frothing (appearance of creamy of small bubbles) shows the presence of saponins.

7. Detection of Tannins

After dissolving a little amount of extract in water, it was heated on a water bath. Following filtering, ferric chloride was added to the resulting mixture. The result was a shade of dark green. The presence of tannins is indicated by it.

8. Detection of Carbohydrates

0.5ml extracts were dissolved individually in five ml distilled water and filtered. The filtrate was used to test the presence of carbohydrates.

2.6 Anti-bacterial activity

Aloe vera extracts prepared from methanol were examined for their antibacterial capabilities. Four distinct bacterial strains were used to assess prepared sample antibacterial capabilities. To prepare this nutrition agar medium, 2.5 grams of nutrient agar were mixed with 100 milliliters of distilled water and autoclaved at 37 degrees Celsius for 24 hours. Apply the bacteria to the petri dish by means of the inoculation wire loop. The discs were made using grade 1 filter paper, which is the maximum level of purity. On infected agar plates, the discs were washed with 10, 20, and 30% w/v *Aloe vera* extracts. The next step was to incubate the plates at 37 degrees Celsius for a whole day. The antibacterial activity was determined by comparing the zone of inhibition to that of streptomycin, a commercial antibiotic, which served as a positive control. We tested every single extract and every single dose that could be administered [13-15].

3. Results and Discussion

3.1. The Preliminary Phytochemical Analysis of methanolic extract

From the figure 1 showed that the preliminary phytochemical screening of methanolic extract of plant source

showed the presence of carbohydrates, flavonoids, steroids, terpenoids, tannins, quinones and the absence of phenols saponins and glycosides were respectively [16]. The Table 1 shows the Preliminary Phytochemical Analysis methanolic extract of *Aloe vera* as follows,

Table1: phytochemical constituents of aloe barbadensis miller

S. No.	Phytochemicals	Methanolic extract Aloe Barbadenisis Miller
1	Carbohydrate	+
2	Tannin	+
3	Saponin	+
4	Alkaloids	_
5	Flavonoids	+
6	Glycosidase	+
7	Quinine	_
8	Phenol	+
9	Trepenoids	+
10	Steroids	+

Figure 2: Phytochemical analysis of Aloe vera

3.2 Antibacterial activity

The mean of anti-bacterial activity is defined as the method used to eradicated or protect from disease casease causing microorganism. for this diversity of microbial agents was performed this anti-microbial activity can the anti-bacterial it is a common method using agar well diffusion technique the potential of aloe barbadensis miller anti-bacterial agent done using agar well diffusion method [17-19]. The aloe barbadensis anti-bacterial gram positive & gram negative Bactria *staphylococcus aureus* are gram positive bacteria &Escherichia coli are gram negative bacteria for this experimental research work. In quantities of 50,100,150, DMSO was used as a negative control the zone of inhibition of Aloe barbadensis miller (Table 2).

The antibacterial activity of the test compound was evaluated against *Escherichia coli* and *Staphylococcus aureus* at concentrations of 50 µg/ml, 100 µg/ml, and 150 µg/ml, using the agar well diffusion method. DMSO served as the negative control and exhibited no zone of inhibition, confirming its lack of antimicrobial effect. Gentamicin (18 mm) was used as the positive control for comparison. Against *Escherichia coli*, the test compound exhibited moderate antibacterial activity, with zones of inhibition measuring 19 mm at 50 µg/ml, 20 mm at 100 µg/ml, and 22 mm at 150 µg/ml. interestingly, the zone size slightly decreased with increasing concentration, suggesting possible compound saturation or bacterial adaptation at higher concentrations. In contrast, significant antibacterial activity was observed against *Staphylococcus aureus*, with zones of inhibition measuring 20 mm, 24 mm, and 26 mm at 50 µg/ml, 100 µg/ml, and 150 µg/ml, respectively (figure 3). The compound showed greater inhibition than the standard drug Gentamicin, particularly at higher concentrations, indicating a strong potential against Gram-positive bacteria [20-22].

Table 2: Anti-bacterial activity of aloe barbadensis miller

S.no.	Organisms	NC DMSO	PC	Zone of inhibition		
1	*Escherichia coli*	Nil	(Gen) 18 (mm)	19	20	22
2	*Staphylococccus aureus*	Nil	(Gen) 18 mm	20	24	26

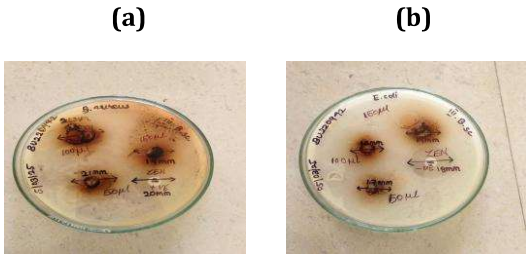

Figure 3: Anti-bacterial activity of aloe barbadensis miller.

4. Conclusion

The investigation into the phytochemical and antibacterial properties of Aloe barbadensis Miller (Aloe vera) revealed promising results that support its medicinal potential. Phytochemical analysis confirmed the presence of key bioactive compounds such as alkaloids, flavonoids, tannins, saponins, and phenolic compounds, which are known for their antimicrobial, antioxidant, and anti-inflammatory effects.

The antibacterial assessment demonstrated that Aloe vera extracts exhibited considerable inhibitory activity against both Gram-positive and Gram-negative bacterial strains. This suggests its potential for treating a wide range of bacterial infections. The effectiveness varied based on the type of extract (e.g., ethanol, methanol, or aqueous) and the bacterial strain tested, indicating that solvent selection plays a crucial role in enhancing bioactive compound extraction.

These results validate the traditional use of Aloe vera in wound healing, skin care, and infection management. Its natural antibacterial properties offer a promising alternative to synthetic antibiotics, particularly in addressing antibiotic resistance concerns. However, further studies involving detailed mechanisms of action, toxicity assessments, and clinical trials are necessary to confirm its safety and efficacy for therapeutic use. Overall, Aloe barbadensis Miller holds significant potential as a natural, effective antibacterial agent with applications in pharmaceutical, cosmetic, and healthcare industries.

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Conflict of Interest: Nil

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