

Antimicrobial Activity of Medicinal Plants against Pathogenic Bacteria

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Abstract— The study has successfully evaluated the potentiality of medicinal plants against some pathogenic bacteria. In this study, the effectiveness of Tulsi, Aloevera, Adulsa, and Nimby has clearly observed against the growth of E.coli and S.aureus. The bacterial strain of E.coli sometimes shows pathogenicity and leads to the formation of vomiting, and diarrhea. In that case, utilisation of aloe Vera and tulsi can reduce the growth of bacteria. On the other hand, it can be observed that S. aureus can spread disease by infecting the human skin. The extracts from these plant products are highly effective on these bacterial organisms and shows anti microbial properties.

Keywords: Tulsi, S.aureus, Nimbu, Adulsa, E.coli, Aloe vera.

I. INTRODUCTION

Antimicrobial agents are extremely essential for decreasing the effect of infectious disease, hence it helps in reducing the global burden. The demand for medicinal plants has been enhancing due to its resistance power against multiple severe diseases such as respiratory issues, cardiovascular problems, skin disorders, and urinary problems. The study is going to shed light on the antimicrobial activities of some medicinal plants against some pathogenic bacteria. For this study, the adverse effect of E.coli and S aureus will be discussed further. On the other hand, for this study “aloe vera”, “Nimbu”, “Tulas” and “Adulsa” medicinal plants have been selected to observe the antimicrobial effects on selected organisms [1]. Nowadays, bacteria have been developing a special type of viral strain that can easily resist the effect of drugs. As a result, it becomes one of the threatening issues of public health, and sometimes effective antimicrobial agents can not be found to build resistance against such bacteria. The study is going to further discuss about the way of reacting these medicinal plants against E.coli and S aureus.

II. LITERATURE REVIEW

Overview of E.coli and S aureus

E. coli can be known as a gram-positive bacteria and the structure of the bacteria is rod-shaped. The outer surface of the body of E.coli consists of lipopolysaccharides, Fimbriae, and a peptidoglycan layer. The bacteria E.coli can easily survive in the stress condition and they can also transfer bacterial strains to other bacterial organisms. The bacteria E.coli is made up of only one chromosome with a potential coding sequence of 4,600 kb, about 4,300kb [2]. The bacteria E.coli is mainly denoted in the intestine of individuals and animals, hence these bacteria can cause the disease diarrhea. However, some strains of E.pli bacteria can cause server

stomach pain, cramps, and vomiting.

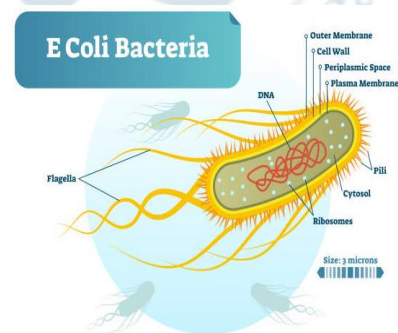


Figure 1: E. coli
Source: [2]

On the other hand, Staphylococcus aureus is another gram-positive bacteria that is spherical in shape. The bacteria S.aureus can be found on the skin and the upper part of the respiratory tract region. Therefore, the bacteria S. aureus are capable to spread infections and as a result the emergence of skin disease to the individual’s body [3]. Apart from that, it can cause, infections in the respiratory tract known as sinusitis, and also food poisoning. Therefore, it can be observed that S.aureus can be considered one of the virulent pathogens that cause the death of individuals.

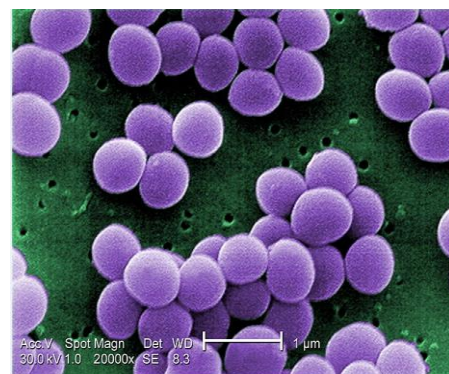


Figure 2: S.aureus bacteria
Source:[3]

Antimicrobial activity of Aloe vera and Adulsa on E.coli

Aloe vera can be considered as one of the essential medicinal plants that contain the characteristics of a wide range of therapeutic applications. The plant aloe vera mainly originated from the African continent, however, in recent years it can be found all over Asian continents. The usage of aloe vera is effective in reducing gut microflora, hematological disease, and carcass. There are near about 360 aloe vera plant species can be found throughout the world. Due to its antimicrobial and healing properties, aloe vera is mostly used to treat sunburns, inflammation and any type of skin disease. On the other hand, it can be observed that E.coli bacteria specifically transmit to the human's body through the food chain and leads to the formation of multiple diseases [4]. The gel extracted from the leaves of aloe vera is highly effective on any type of skin inflammation. Apart from that, aloe vera gel contains the characteristics of "anti-microbial" properties and "immune boosting" properties.

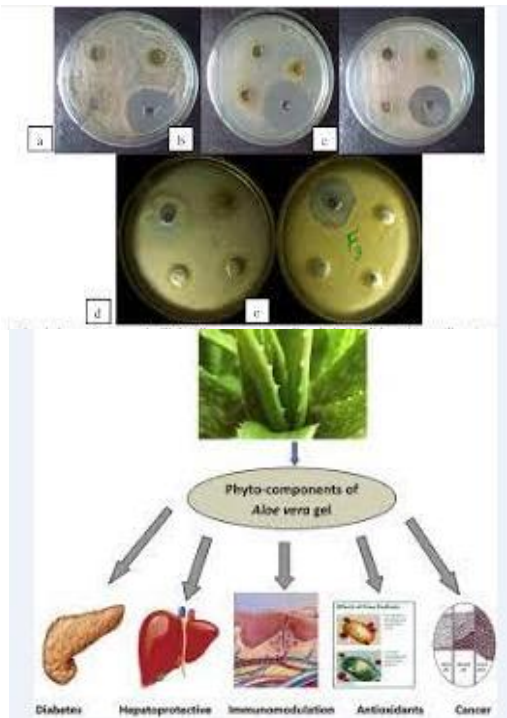


Figure 3: Antimicrobial Activities of aloe vera
Source: [4]

The medicinal plant Adulsa is also known as Adhaoda Vascica and materials extracted from this plant are generally used to treat many infectious diseases. The plant Adulsa is mainly found in the Indian subcontinent and it is a shrub with green leaves which have been utilising as important ayurvedic medicine. The bacteria E.coli contain a vicious toxin such as Shiga and it is mainly responsible for damaging cells present inside the intestine [5]. Therefore, the herbal drug obtained from the plant Adulsa can hinder the growth of E.coli bacteria inside the body. Apart from that, Adulsa plant is effective in treating multiple disorders such as heart issues, bronchitis, vomiting, fever, tuberculosis, and lung disorder.

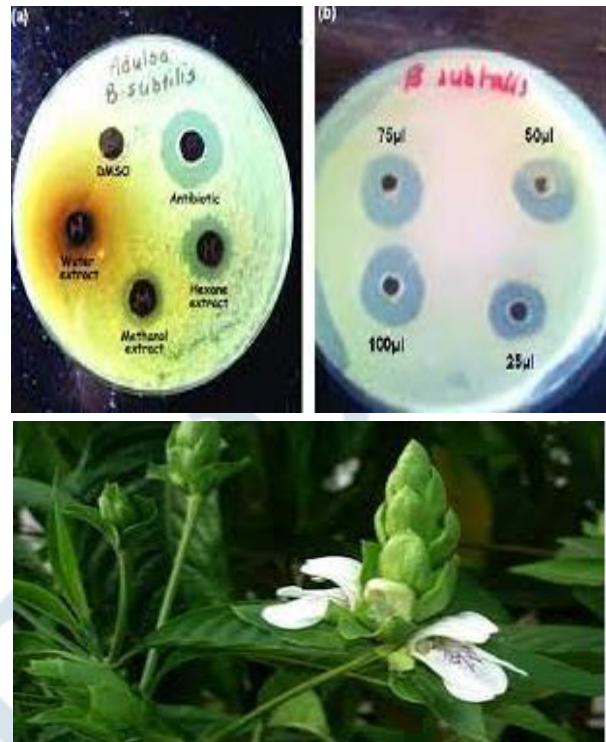


Figure4: Anti microbial activity of Adulsa
Source: [5]

Antimicrobial activity of Nimbu and Tulas on S. aureus

Medicinal plants have been playing a significant role for maintaining human health and have also been responsible for proving medicinal benefits for a long period of time. Bacteria such as S. aureus have the capability to transmit through the body and gradually form drug resistance capability [14]. In this context, it can be observed that lemon is an essential plant, which has been utilising as medicine and belongs to the family Rutaceae. The fundamental substance present in the plant lemon is alkaloids and it can prevent cancer. The bacteria S.aureus generally causes infections such as cellulitis, furuncles, and abscess in the individual's body, which can convert into a serious injury [6]. In addition, it can be stated that the "citrous flavinoid" present in lemon has a wide spectrum of treating anti-fungal, antibacterial and anti viral activities.





Figure 5: Anti-microbial activity of Nimbu
Source: [6]

In this recent years, scientists from different parts of the country have been evaluating that the durability of antimicrobial drugs is limited because bacteria continuously change resistance power against drugs. Therefore the oils obtained from the plant Tulsi have antimicrobial characteristics. Hence the oils extracted from Tulsi can be used at the rate of 2.2% to 4.5% and it can inhibit the growth of bacteria *S. aureus* [7]. Therefore, the roots leaves, stems, and flowers of the plant *Ocimum sanctum* can be used as a medicinal perspective. The extracts from the tulsi plant can cure headaches, inflammation, heart issues, and cold.



Figure 6: Tulsi plant
Source: [7]

III. MATERIAL AND METHOD

In this context, aloe vera gel was extracted from the aloe vera plant, and then it was completely dried at a temperature of 70 degree C at least for 24 hours. After that, the oven-dried gel was kept in 80% ethanol in a shaker at least for 24 hours. After that, evaporation of the substance has done at a temperature of 80 degree C for 24 hours. On the other hand, the samples of the gastrointestinal tract product were collected to obtain *E.coli* [8]. Previously, a total 10 ml of Buffered peptone water has been taken and mixed with gastrointestinal content, and then the mixture was properly incubated at the temperature of 37 degrees C, at least for 18 to 24 hours. After the presumption of *E.coli*, then it was purified into trypticase Soy Agar and then incubated at 37 degree C for 24 hours.

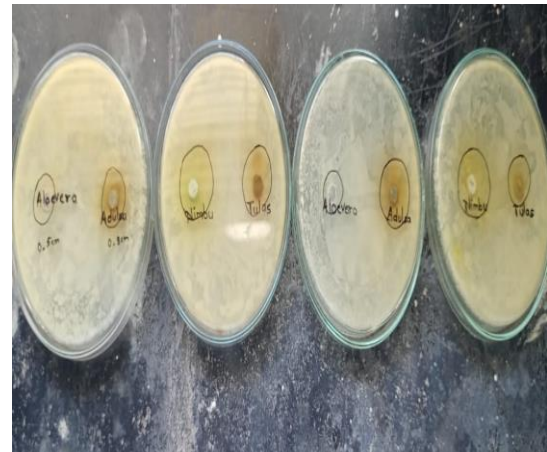


Figure 7: Procedures at Laboratory
Source: [8]

For this study, Adulsa leaves were collected from the leaves of that plant. There were near about 50 gm of green leaves of Adulsa plant were gathered from the stem of the Adulsa plant. Those previously collected leaves were washed in normal water and the deionized water was used to rinse further those collected leaves. It was also noticed that no foreign particles were left in the leaves [13]. After washing those leaves properly, it was kept for the entire night in the deionized water solution. Then the equipment mechanical grinder was used to make the power of those leaves. Additionally, some other chemicals such as hexane, methanol and chloroform were used in 500 gm of hexene and methanol [9]. After obtaining the extracts, it was taken to filter under the vacuum through "No 1 filter paper". In the case, of preparing bacterial medium, nutrient agar was one of the best mediums that have been used for the study. Then sterilization of that media was done in the autoclaving equipment under 120 degree C at least for 20 min.

IV. DISCUSSION

The Bacteria *E.coli* was mainly obtained from the part of the gastrointestinal tract of animals and it can be considered one of the natural characteristics of bacterial microorganisms. However, issues can be detected if there are a large number of *E.coli* bacteria present in the gut of a human being. The pathogenic strain of *E.coli*. Can cause several infections in the intestine of humans. The study demonstrates that the bacteria *E.coli* can tolerate susceptibility and resistance is 45.8%. Therefore, with the help of the disc diffusion method, the bacteria *E.coli* was separated from the gastrointestinal tract and from the result of the study it can be said that aloe vera gel has anti-microbial activity [10]. For this study, *E.coli* bacteria were kept in the aloe vera gel in the concentration of 50 mg/ml and 200 mg/ml.

The study showed that usage of high concentrations of tulsi oil can prohibit the growth of *S. aureus* bacteria. After examining the bacterial strains it can be observed that, the oil has the property to hinder the growth of *S. aureus* and *E.coli* bacteria. The previous studies also depict that a lower rate of

bacteria growth can be observed after treatment with tulsi oil and the concentration used for the study was 2.23% and 4.50% [11]. The E.coli and S.aureus bacterial growth was hindered by the rate of 17.99% and 13.03% respectively. On the other hand, the study also helps to know that, the compounds present in the lemon can be significantly effective on bacteria. Those components are Corydaline alkaloids, polyacetylene, hypericin, and pseudohypericin [12]. Limonoids and its extracts are capable of treating bacterial disease and have also been used as a medicine for decades.

V. CONCLUSION

The study has successfully demonstrated the role of medicinal plants in some bacterial growth. It can be observed that bacterial strains are highly adaptive in nature, and they can alter their DNA materials to build resistance against drugs. Therefore, it become a global burden for the entire world. The study successfully illustrated the effectiveness of aloe vera, tulsi, Adulsa, and Nimbu plant products on S. aureus and E.coli. From this study, it can be noticed that the presence of medicinal plants can hinder the growth of bacteria, hence these plant products can be further utilised to treat skin issues, infections, and inflammations.

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