

## Evaluation of the effectivity of some organic extracts of *Aloe vera* against some Pathogenic bacteria

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### ABSTRACT

The aqueous, ethanol, chloroform , and acetone extracts of *Aloe vera* cortex leave were studied for their antimicrobial activity against two Gram-negative bacteria ( *Escherichia coli* and *Klebsiella pneumonia* ) and Gram-positive bacteria (*Staphylococcus aureus*) using agar well diffusion method. The extracts revealed different levels of antimicrobial activity against the tested bacterial pathogens. *St. aureus* was very sensitive to all types of extracts represent by a higher inhibition zone as (35.51mm) for acetone, (6.83 mm) for ethanol and (5.60 mm) for aqueous extract. On the other hand, chloroform extract showed lowered activity against *Escherichia coli* only and no activity against other bacteria were found. Used antibiotics against all bacteria compare with the best organic solvent which was acetone extract against all bacteria. It gave a better minimum inhibitory concentration (MIC) which was (12.5 mg/ml), (50 mg/ml), (25 mg/ml) against *Escherichia coli*, *staphylococcus aureus* and *klebsiella pneumonia*, respectively. The results showed that the best organic solvent for *Aloe vera* which revealed a higher antibacterial activity was acetone extraacts.

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قسم علوم الحياة ,كلية العلوم ,جامعة كربلاء ,العراق

الكلمات الافتتاحية: المذيبات العضوية. نبات الصبار. بكتريا القولون . بكتريا المكورات العنقودية. بكتريا ذات الرئة

### الخلاصة :

لقد تم دراسة المستخلص المائي والكحولي والكلوروفورم والاسيتون لنبات الصبار ضد بكتريا (*Escherichia coli*) مختلفة من الفعالية الحيوية ضد بكتريا قيد الدراسة وتميزت بكتريا *Staphylococcus aureus* و *Klebsiella pneumonia* باستخدام طريقة الحفر. اظهرت المستخلصات مستويات وقد تمثلت تلك الحساسية بوجود مناطق تثبيط عالية اذ كانت (35.51 mm) للاستون و (6.83 mm) للايثانول و (5.60 mm) للمستخلص المائي. من جهة اخرى اظهر مستخلص الكلوروفورم اقل فعالية ضد بكتريا *Escherichia coli* ولم تظهر اي فعالية ضد انواع بكتريا الاخرى في الدراسة. تم استعمال المضادات الحيوية كوسيلة مقارنة ضد افضل مستخلص عضوي والذي كان الاسيتون ضد انواع البكتريا قيد الدراسة , مستخلص الاسيتون أعطى اقل تركيز مثبط (MIC) والذي كان (12.5 mg/ml), (50mg/ml), (25mg/ml) ضد بكتريا *Escherichia coli* , *Staphylococcus aureus* , *Klebsiella pneumonia* , على التوالي. النتائج اوضحت ان افضل مستخلص عضوي لنبات الصبار والذي اظهر اعلى فعالية حيوية ضد البكتريا قيد الدراسة كان مستخلص الأسييتون.

## 1 . Introduction

The new trend of research on the preparation of plant extracts, which has been established to produce medical alternatives, based on medicinal efficacy plus is overcome on adverse side effects and resistance in the use of antibiotics, This resistance has encouraged researchers to use alternatives from low cost plant sources and loss of side effects. Different plant extracts have been found to have bacteriostatic and bactericidal for bacteria effected [1]. Medicinal plants are of great importance to the health of individuals. The classical medicinal plant-based medicine system continues to play its role in health care, with about 80 per cent of the world's population using common medicines for their primary health care [2]. According to World Health Organization, medicinal plants will become the most efficient source for a variety of treatments. Therefore, these plants should be investigated to study their properties, safety and efficacy [3]. Studies have shown that aloe vera is a family of Liliaceae. Has been medically active [4, 5]

The value of these plants lies in some chemical substances that produce a definite physiological action on the human body. Alkaloids, tannins, flavonoids, and phenolic compounds are the most important of bioactive constituents of plants [6]. Most of these plants contain many effective compounds so they are multi-purpose drugs at the same time. These compounds are simple phenols that have been effective in the presence of groups of hydroxyl. These groups are able to bind with enzymes and inhibit their effectiveness [7]. *A. vera* gel is used in the treatment of many diseases such as stomach ailments, skin infection, constipations, gastro-intestinal problems, radiations injury, inflammatory effect healing wounds ulcer of *A. vera*, burns, and diabetes [8]. *A. vera* has been widely used in the world through extracts and treatment of bacterial activities and antioxidants [9,10]. Antimicrobial against the extract *A. vera* gel has been well effective and inhibitory for the growth of *St.aureus*, *K.pnumonia* [11,12]. All components aloe vera leaf. Proposed have direct antibacterial properties include saponin and anthraquinones [13, 14]. while polysaccharides have been can be direct bacterial activity through processes phagocyte for white blood cell which destroy bacteria[11, 15]. Free molecules for radical scavenging such as phenolic compounds(flavonoids .proanthocyanidins ,coumarins,catechins, tannins etc.) nitrogen compounds(alkaloids,betalains,amines) terpenoid, ,vitamian carotenoids. All compounds found in medicinal plant [16,17]. *A.vera* was entered in pharmaceutical industry synthesis of topical products such as ointments , gel preparations and also in the development of capsules and tablets while enter in industry food from through used it as source of functional foods or parts of the compounds in other food products [18]. This study was conducted to determine the effectiveness of the biogeography of the *A. vera* leaf from locally kerbala/ Iraq and to identify the most effective plant extract against the bacterial species under the study and its possible use as an alternative medicine reduce unfortable side effect .

## 2. Collection of plant materials

The leaves were collected at tenth month for 2016 from Faculty of Agriculture Kerabala university \Iraq. It taken and put in a clean container and a knife was used to separate the cortex from the gel the cortex was air dried grinded and stored in plastic containers until used.

### Preparation of Plant Extracts

Weigh 15 gm of dried leaves and mixed with 100 ml ethanol, acetone, chloroform, each solvent in a concentration of 95% and aqueous using hot water until boil. The products were left for 24 hours after filtrated with filter papers Whitman paper No.1 and leave leachate dry at room temperature [19] Then the precipitate was scrapped and the weight of 0.1 g of powder was dissolved in 10 mL distilled water to be the concentration extracted 100 mg / ml.

### Experimental microorganism

The antibacterial activity was carried out using Gram negative strains are *Escherichia coli*, and *kelebsela pneumonia* Gram positive strain is *Staphylococcus aurus*. This species of bacteria were obtain from the department of biology, college of Science, Kerbela University and transport in slants of nutrient agar

#### Media preparation for bacteria (nutrient agar)

To determine the in vitro antimicrobial activities. The well diffusion method [20, 21] was used to assess the antibacterial activities of all Aloe Vera extracts against bacterial pathogens tested. Then five wells were made with the control of each using a sterile metal well. Fifty  $\mu\text{L}$  were added from each extract to each well. The control well was filled by 50  $\mu\text{L}$  distilled water. Plates were kept in an incubator at 37°C for 48 h.

### Testing the sensitivity of bacterial pathogens against antibiotics

Three types of antibiotics were used in the form of discs prepared by Al-Razi Company, as shown in Table (3), for testing the sensitivity of the bacterial pathogens .The tablets were left for 10 minutes to dry. Antibiotics tablets were then placed on the steel medium and incubated at the incubator at 37 ° C for 18-24 hours after which the inhibitory area was measured by the ruler.

### Determination of the Minimum Inhibitory Concentration (MIC)

The minimum inhibitory concentration (MIC) is the lower concentration giving Inhibitory activity and below which there is no further inhibition. It is therefore regarded as the concentration giving the lowest possible zones of inhibition Preparation of different concentrations of the effective extract acetone. A group of concentrations of the acetone extract was prepared to determine the least inhibitory concentration of the bacteria under the study. The concentrations are (50, 25, 12.5, 6.25) mg / ml

### 3 . Results

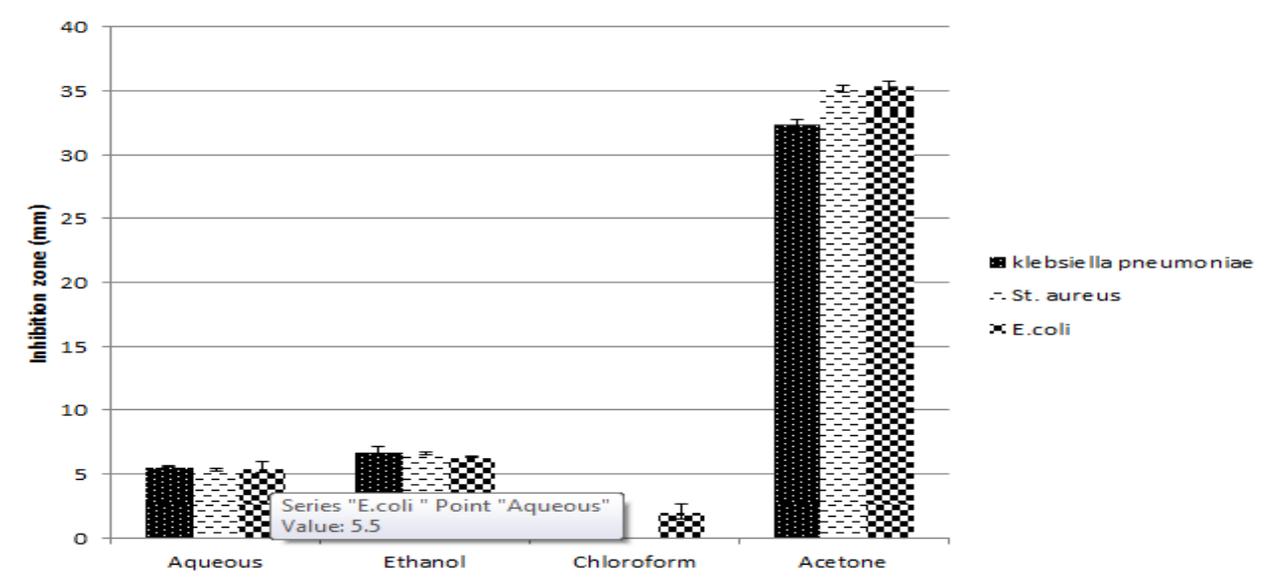


Figure (1) :Antimicrobial Activity of *Aloe vera* leave Extract inhibition zone (mm)

Figure (1) shows that the antibacterial activity of acetone extract was higher than other types of extracts which represented by a higher inhibition zone (35.16mm), (32.41mm) and (30.41mm) against , *St. aureus* , *E.coli* and *K. pneumonia.*, respectively .there were no significant differences between aqueous and ethanol extracts in term of antibacterial activity against *St. aureus*. Significant differences were found between aqueous and ethanol extracts against *K. pneumonia* and *E.coli*. A significant difference were higher between acetone extract and extract ethanol antibacterial activity against all bacteria in this study .A significant difference were higher between acetone extract and extract aqueous antibacterial activity against all bacteria in this study while chloroform extract gave inhibition zone (2.06 mm) against *E.coli* only no effect on *St. aureus* and *K. pneumonia*

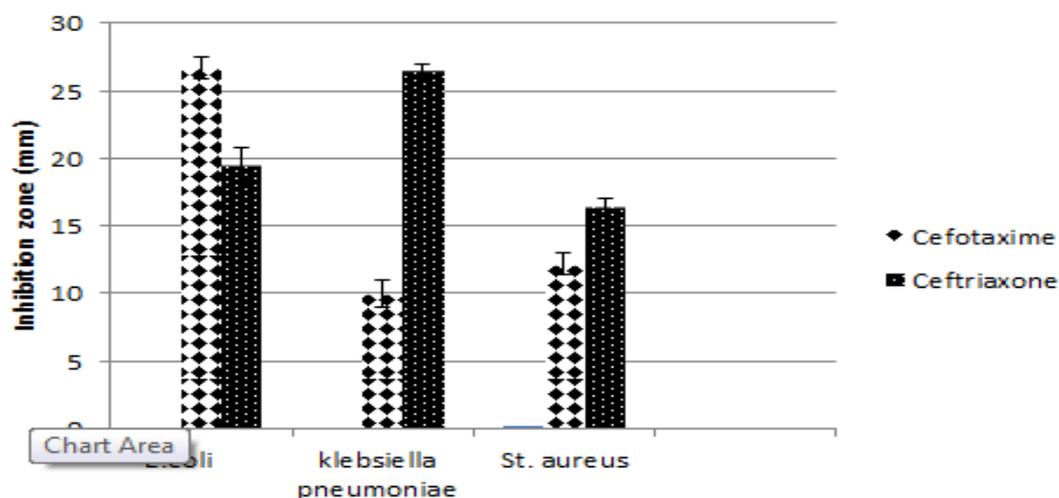


Figure (2): Microbial Activity of antibiotic inhibition zone (mm)

Figure ( 2) shows that the antibiotic cefotaxime gave higher inhibition zone against *E.coli* (26.6 mm) while it gave against *St.aureus* (12.16 mm) and *K.pneumonia* (10 mm). On the other hand, Ceftriaxone gave higher inhibition zone against *K.pneumonia*.(26.5 mm) while it gave against *E.coli*(19.3 mm)and *St.aureus* (16.5 mm).While ampicillin gave higher inhibition zone (19 mm)against *st. aureus* but failed to reveal an action against *E.coli* and *K.pneumonia* . Minimum inhibition of acetone extract of aloe vera in concentrations (12.5 mg/ml), (25 mg/ml) and (50 mg/ml) obtained inhibition zone as (5 mm), (4 mm) and (8 mm) when treated using *E.coli*, *k.pneumonia* and *St. aureus*, respectively.

#### 4 . Discussion

The results showed that all the organic solvents under use with crude of *Aloe Vera* gel revealed an inhibition or killing susceptibility against types bacteria except for chloroform, which did not had antibacterial activity against *K. pneumonia* and *St.aurause*

The acetone extract given the highest inhibition zones for all bacteria where the diameter of the inhibition was *St.aureus* at (35.19 mm), *E.coli* at (32.41 mm) and *K.pneumonia* at (30.41 mm) These results conformed the results of investigators on similar studies [9] Previous studies show that the presence of active compounds extracted from this plant prevents the growth of negative and positive bacteria [22]. The acetone solvent has been efficient in extracting and precipitation many biologically active compounds such as phenols, alkaloids, flavonoids and tannins [23] Also, The polarity of solvent is an important property and plays an important role in the extraction of some active compounds and sedimentation of a large number of active compounds, which is due to the efficiency of the solvent [24]. Furthermore, acetone extract given higher inhibition zone on positive bacteria compare with negative bacteria might be due to the more complex nature of the cell wall of Gram negative organisms as compared with Gram positive organisms. The positive bacterial cell wall of gram consists of a single layer. The negative bacterial cell wall of gram is multilayered and surrounded by the outer cell membrane [25].

Aqueous extracts and ethanol solvent were effective in inhibition of growth *E. coli*, *St.aureus*, and *K.pneumonia* less than acetone extract. The result is similar with of [26, 27].

Comforted with the [28].investigated the phytoconstituents and antimicrobial activity of aqueous, ethanol and acetone extracts of the *Alov. vera* gel against some human and plant pathogens. (MIC) of acetone extract of aloe vera in concentrations (12.5 mg/ml), (25 mg/ml) and (50 mg/ml) obtained inhibition zone as (5 mm), (4 mm) and (8 mm) when treated using *E.coli*, *K. pneumonia* and *St.aureus* , respectively. Lower MIC valves and higher zone of inhibition for all bacteria implies higher solubility of phtoconstituents in the acetone compared to the other solvents, use different solvents have various degrees of solubility for different phtoconstituents [29].

when using antibiotics to compare with the best extract of the *A. vera* the results showed that the antibiotic *cefotaxime* at concentration (10 mg ) given higher inhibition zone by use ager diffusion( 26.6 mm) ,(12.16 mm),(10 mm)against *E.col* ,*St.aureus* and *K. pneumonia*, respectively. While antibiotic *Ceftriaxone*at concentration (30 mm) given higher inhibition zone (26.5 mm),(19.33 mm).(16.5 mm)against *K.pneumonia* ,*E.coli* and *St.aureus* while was *Ampicillin* action with *St. aureus* given higher inhibition zone (12.16 mm) but failed with *E.coli* and *K.pneumonia*

Many plants contain potentially useful substances, which can be used as alternative chemotherapy euticagents. Large varieties of medicinal plants have been screened and many of them have been proven to possess antimicrobial or antifungal activity [30]. Moreover, Research and study on a change in chemical antibiotics is expensive and continues to be threatened by the side effect of safe, effective and inexpensive alternatives from medicinal plants [31]

## 5 . CONCLUSION

In this study, we conclude that the best organic extracts used with the *A. vera* Gel were the Acetone given antimicrobial activity represent by the higher inhibition zone against all bacteria. We recommend using medicinal plants instead of antibiotics and acetone with *A. vera* plant.

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