NEAR EAST UNIVERSITY
INSTITUTE OF GRADUATE STUDIES
DEPARTMENT OF PHYTOTHERAPY

# SCREENING PHYTOCHEMICAL AND ANTIMICROBIAL ACTIVITY OF DIFFERENT EXTRACTS OF *ACACIA NILOTICA SSP NILOTICA*

**M.Sc. THESIS**

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**Nicosia**

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Thesis defence was held online. The Jury members declared their acceptance verbally which is recorded.

**Approval**

We certify that we have read the thesis submitted to the Institute of Graduate Studies of Near East University titled **Screening Phytochemical And Antimicrobial Activity of Different Extracts of *Acacia nilotica ssp Nilotica*** and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Educational Sciences.

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## Declaration

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

Noureldin Mohamed

14/5/2022

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## Abstract

**Screening Phytochemical and Antimicrobial Activity of Different Extracts of *Acacia nilotica ssp Nilotica***

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*Acacia nilotica* L (Fabaceae) natively known as (Babul or Kikar) The concentrate of *Acacia nilotica* with ethanol 70% shows the presence of different phytochemical parts and was touchy with *E.coli* gram-negative microorganisms 34mm dimer of restraint zone contrasted and Gentamicin, with gram-positive microbes *S. aureus* was 32mm dimer of restraint zone contrasting and Amikacin which was 23mm. The extractant of DW shows the presence of phytochemical yet was transitional responsiveness with *E.coli* 16mm dimer of hindrance zone contrasting and Gentamicin 22mm dimer of restraint zone, and more touchy with *P.aeruginosa* 27mm dimer contrasting and Gentamicin 23mm. The after effects of an antimicrobial examination show that the refined water and ethanolic 70% concentrates repressed the development of all microorganisms (indicated by the zone of hindrance). The outcomes give promising standard data to the possible utilization of these rough concentrates in drug advancement programs in the drug ventures.


***Key Words**: Acacia nilotica*, antimicrobial activity, phytochemical screening.

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# CHAPTER I

## Introduction

Microbial diseases are significant general medical conditions in created nations. Antibiotics are utilized to treat these contaminations. Because of the unpredictable utilization of business antibiotics, the frequency of numerous anti-infection opposition in human microbes is expanding. This has constrained researchers to look for new antimicrobial substances from different sources like therapeutic plants. *Acacia nilotica* is a significant multipurpose restorative plant used to treat different infections and is broadly disseminated all through the tropical and sub-tropical areas. It has a place with a family: Fabaceae; variety: *Acacia* and species: *nilotica*. *Acacia nilotica* is normally known as 'Algarad' in Sudan and has for quite some time been utilized for the treatment of certain sicknesses from days of yore. (Kathe W et al., 2005)

**Origin and distribution:**

The *Acacia nilotica* tree is found all over the world life India, Algeria, Angola, Botswana, Egypt, Ethiopia, Gambia, Ghana, Kenya, Libya, Mali, Nigeria, Senegal, Somalia, South Africa-Sudan, Tanzania, Uganda, Zambia, Zimbabwe, Oman, Saudi Arabia, Yemen, Iran, Iraq, Israel, Syria, Nepal, Pakistan. (Mann A, Umar et al., 2003)

**Plant description:**

*Acacia nilotica* is a solitary stemmed plant, that develops to 15-18 m in level and 2-3 m in breadth.

**Pods and Seeds:**

Pods are 7-15 cm long, green (when juvenile) or greenish dark (when mature), indehiscent, and profoundly choked between the seed giving a jewelry appearance. Seeds are 8-12 for every unit, packed and ovoid. (Iman H et al., 2007)

**Leaves:**

The leaves are bipinnate, pinnate 3-10 pairs, 1.3-3.8 cm long, leaflets 10-20 pairs, and 2-5mm (Blong T et al., 1992)

**Flowers:**

Flowers are globular heads, 1.2-1.5 cm in diameter of a bright golden yellow color.

**Stem:** Stems are usually dark to black colored, deep longitudinal fissured, grey-pinkish slash, exuding a reddish gum. (Brenan J. et al., 1983)

**Bark:**

The color of the bark is orange and/or green (young tree), but older trees have dark, rough bark and tend to lose their thorns. (Khan R et al., 2009)

**Thorns:**

Thorns are thin, straight, light grey exists in axillary pairs (usually 3-12), 5-7.5 cm long in young trees.

**Root:** Root is a brown colour in older and whitish in younger regions.

**Gum:**

The gum varies in colour from very pale yellowish brown to dark reddish brown depending on the quantity of tannins in the sample.

**Growth pattern and germination**

(Ali S.I 1969) *Acacia nilotica* is an exotic plant category found all through world and happens from ocean level to north of 2000 m elevation. Thorny Acacia sprouts in precipitation in the wet season. Yet, a few seeds might in any case sprout as long as 15 years after seed drop. Seedlings develop quickly close to water however more leisurely in open fields. It fills in normal yearly temperatures going from 15-28°C, being ice touchy when youthful and enduring everyday greatest temperatures of 50° C.

The mean most extreme temperature of the most blazing month is 25-42°C and the mean least temperature of the coldest month is 6-23°C. Babul plant lean towards dry circumstances. (Abdulrazek S. et al. 2000) This subspecies is normally found on soils with high earth content however may develop on profound sandy topsoil in areas of higher precipitation. It generally develops near streams on occasionally overwhelmed

waterway pads and endures saltiness well. Trees can blossom and organic produce a few years after germination, yet after high precipitation, it is all the more rapidly, generally among March and June. Cases are shaped among July and December. Most leaves fall among June and November, and seed cases drop from October to January. Seeds are exceptionally straight forward. The internal integument deteriorates totally and the Testa is framed by the external integument.

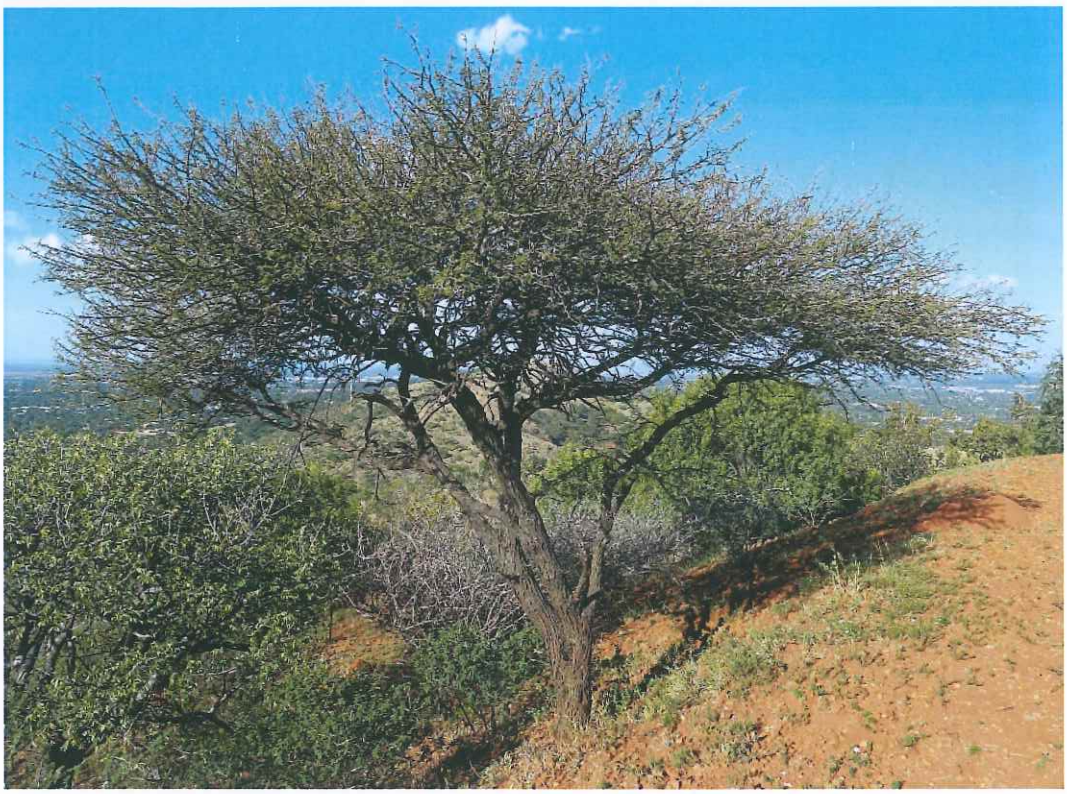

**Figure (1)** *Acacia nilotica* tree (Photo is taken from https://en.wikimedia.org/wiki/nilotica. )

**Figure (2):** *acacia nilotica* pods (Photo is taken from https://wildflowernursery.co.za/indigenous-plant-database/acacia-nilotica/)

**1.1 Chemical Constituents:**

(Seigler et al. 2003) Acacia species contains amines and alkaloids, glycosides, unsaturated fats, and seed oils, fluoroacetate, gums, nonprotein amino acids, terpenes, diterpenes, phytosterol and triterpene, saponins, hydrolysable tannins, flavonoids, and consolidated tannins. (Singh et al., 2008) The plant is a more extravagant wellspring of cysteine, methionine, threonine, lysine, tryptophan, potassium, phosphorus, magnesium, iron and manganese. The plant substance compounds incorporate diester, pentacosane dioic corrosive dihexadecyl ester and heptacosane 1, 2, 3-triol.

**Seeds:**

It contains phenolic compounds consisting of m-digallic acid, gallic acid, protocatechuic and ellagic acids, leucocyanidin, m-dig allic dimer 3,4,5,7-tetrahydroxy flavan-3-ol, oligomer 3,4,7-trihydroxy flavan 3,4-diol and 3,4,5,7-tetrahydroxy flavan-3-ol and (-) epicatechol. The mature seed also contains crude protein, crude fiber, crude fat, and carbohydrates.

**Fruit:**

also contains mucilage and saponins.

**Pods:** It contains gallic acid and condensed tannins.

**Leaf:**

It contains apigenin, 6-8-bis-D-glucoside, rutin, 8% digestive protein.

Relative levels of tannin in different parts of the plant are deseeded pods (50%), leaves (7.6%), bark (13.5%) and twigs (15.8%).

**Bark:**

(Chaubal R. Tambe et al., 2006) It contains tannin (12-20%), terpenoids, saponins and glycosides, Phlobetannin, gallic acid, protocatechuic acid pyrocatechol.

**Root:**

It contains octaconsanol, betulin, B-amyrin and B-sitosterol.

**Gum:**

It is composed of galactoaraban.

**1.2 Traditional Utilities:**

(Gupta R. et al., 1979) *Acacia nilotica* is a pioneer species and is economically used as a source of tannins, gums, timber, fuel, and fodder.

(Mahgiub S. et al., 1979) Babul plant is therapeutically used as anti-cancer, astringent, anti-oxidant, natriuretic, antispasmodic, diuretic, in intestinal pains and diarrhea, nerve stimulant, in cold, congestion, coughs, fever, hemorrhages, leucorrhea, ophthalmia and sclerosis.

**Seed:**

Seeds have antimalarial, antidiabetic, antihypertensive, and antispasmodic activities.

**Leaves and Pod:**

The leaves and pods are used as anti-inflammatory agents. The pods have molluscicidal and algicidal properties.

**Bark:**

It is used in the treatment of hemorrhages, cold, diarrhea, tuberculosis, and leprosy.

**Root:**

It is used as an aphrodisiac and the flowers for treating syphilis lesions.

**Gum:**

(Zourata L. et al., 2004) Gum obtained from the tree is pharmaceutically used as suspending and emulsifying agent and in the preparation of many formulations. Its resins repel insects and water.

**1.3 Pharmacological Activities:**

By using different chemical solvents for extraction, the different parts of *Acacia nilotica* were investigated for their pharmacological profile.

**1. Anti-plasmodial, Antibacterial, Antifungal, and Antiviral Activity**

(Alli L. et al.2011) Identified the more secure and subterranean insect plasmodial action of the watery root concentrate of *Acacia nilotica* against *Plasmodium berghei* in mice in 2011. Utilizing methanol and fluid concentrate of Acacia nilotica units uncovered antibacterial action against *Escherichia coli, Staphylococcus aureus, and Salmonella typhi*. Also, high antibacterial action against *Staphylococcus aureus, Escherichia coli, Proteus vulgaris, Proteus mirabilis, Salmonella paratyphi B, Klebsiella pneumonia* distinguished by Deshpande SN by utilizing of the petrol ether and ethanol concentrate of stem bark. (Kalaivani . Mathew et al., 2010) Likewise, the rough ethanolic extricates showed antimicrobial exercises against multidrug-safe (MDR) types of Escherichia coli and Klebsiella pneumoniae. (Singh R. et al., 1972) An acetyl acetic acid derivation bark separate showed antibacterial action against gram-positive microscopic organisms *Bacillus subtilis* and *Staphylococcus aureus* with least inhibitory focus upsides of 4 and 8 µg/mL, individually; and showed

powerless action with least inhibitory fixation values (16 and 33 µg/mL) against *Klebsiella pneumonia* and *Escherichia coli* individually Antifungal action was affirmed by utilizing of a fluid and methanol concentrate of *Acacia nilotica* units, which uncovered antifungal movement against *Candida albicans*, and *Aspergillus niger*. Similarly, (Khan R. et al 2007) uncovered the antifungal action of ethanolic separates against multidrug-safe (MDR) kinds of Candida. The concentrate of the leaves of the *Acacia* species displayed in vitro antiviral action against the Turnip mosaic infection.

**2. Antioxidant Activity**

(Kalaivani. et al. 2010) detected an active antioxidant compound (ethyl gallate) from the leaves ethanol extract of *Acacia nilotica* Wild. Ex. Del. Other antioxidant activities of *Acacia nilotica* detected from leaves ethanol extract and from 80% EtOH pods extract. The antioxidants kaempferol was isolated from the methanol extract of *Acacia nilotica* Del by (Rajbir S. et al., 2008). moreover, the antioxidant Umbelliferone was isolated from the methanol extract of the bark and leaves of *Acacia nilotica*. (Osman et al. 2011) described the antioxidant activity of the water extract of the bark.

**3. Cytotoxic and Hemolytic Activity**

(Kalaivani. et al. 2010) determined that the ethanol leaves extract of *Acacia nilotica* do not exert any hemolytic activity against rats and humans, and is non-toxic.

**4. Antidiarrheal Activity**

(Karitikar K et al. 2003) An aqueous extract of *Acacia nilotica* seeds showed activity against castor oil-induced diarrheal.

**5. Galactagogue Activity**

(Deshpande S et al. 2013) Galactagogue activity of *Acacia nilotica* recognized in the leaves aqueous extract of *Acacia nilotica* Adansonia when tested in the rat; the extract found to stimulate the synthesis and release of prolactin.

**6. Antimutagenic Activity**

(Banso A. et al. 2009) concluded that acetone extract of the bark powder of *Acacia nilotica* exhibited antimutagenic activity against direct-acting mutagens (4-nitro-

phenylenediamine (NPD) and sodium azide (NaN3)) and indirect-acting mutagens (2-aminofluorene (2-AF)) in tester strains of Salmonella typhimurium.

**7. Antibiotic activity:**

(Deshpande S et al. 2013) The plant extract showed potent antibiotic activity against four bacterial species: gram-positive; *Bacillus subtilis, Staphylococcus albus, Streptococcus faecalis*; gram-negative, *Escherichia coli* and two fungal species: *Candida albicans* and *Aspergillus flavus* examine by using paper disc diffusion method.

**8. Antimalarial activity:**

(Imam E et al. 2010) The root concentrates of *A. nilotica* were dynamic against *Plasmodium berghei* and *Plasmodium falciparum* in mice. In vitro Antimalarial movement against CQ-touchy (3D7) and CQ-safe (Dd2 and INDO) kinds of *P. falciparum* in culture utilizing the fluorescence-based SYBR. *A. nilotica* was accounted for with critical action and IC50 was viewed as 13µg/mL Crude methanolic concentrates of the base of *Acacia nilotic* Del. exhibited critical action against a chloroquine-touchy kind of *Plasmodium berghei* in mice. (Oladosu P, et al., 2007) Ethyl acetic acid derivation concentrates of *Acacia nilotica* have most noteworthy subterranean insect plasmodial action in vitro against *Plasmodium falciparum* 3D (chloroquine touchy) and Dd2 (chloroquine-safe and pyrimethamine delicate) organic entities.

**1.4 Justification:**

- *A.nilotica* is commonly found in Sudan.
- The plant is extensively used in Sudanese traditional medicine and therefore there is a need to benefit from this traditional background.

**1.5 Hypothesis:**

*A.nilotica* contain secondary metabolites and has antibacterial activity.

### 1.6 General objective:

Assess antimicrobial activity *of acacia nilotica*.

### 1.7 Specific objective:

- To extract fruit stuck of *A.nilotica.*
- To assess the antimicrobial activity of plant extract.
- To compare the antimicrobial activity of water and ethanolic extracts.

# CHAPTER II

## Materials and Methods

### 2.1 Materials:

The *Acacia nilotica* were collected on 23/3/2022 from Saudi Arabia in Riyadh city in April, 2022. Identification of the collected *Acacia nilotica* was done by Prof. Dr. Ammar Yousif. The sample are dried, prepared into herbarium samples, and kept at King Faisal Lab- 1990119).

### 2.2 Tests Microorganisms:

Various clinical isolates, Gram-negative bacteria (***Escherichia coli***) and gram-positive bacteria (***Staphylococcus aureus, pseudomonas aeruginosa***) will be obtained from the microbiology department.

### 2.3 Extraction method:

70 g of the plant sample was coarsely powdered using mortar and pestle. Coarsely sample was extracted with 70 % ethanol using Soxhlet extractor apparatus and water using water path. Extraction was carried out for about eight hours for till the color of solvent at the last siphoning time returned colorless. The solvent was evaporated under reduced pressure using rotary evaporator apparatus. Finally, the extract was allowed to air in Petri- dish till complete dryness, and the yield percentage was calculated as followed:

Weight of extract/weight of sample * 100

Then the extracts were kept in freeze 4C°.

### 2.4 Phytochemical screening methods:

**1- Alcohol extract**

Reducing sugar:

To 1 ml of extract 2 ml of water were added, then 20 drops of Fehling 1&2swere added brick red color indicates the presence of reducing sugar.

Alkaloids:

From the extract,20ml were dissipated, 10ml of 10 % HCL were added then 10% NH4 and oil ether was added, then ether was vanished 1.5 ml of 2% HCL was added. To 0.5 ml of arrangement 2-3 drops of Mayer's reagent were added, whitish-yellow hasten shows the presence of alkaloid.

Tannins:

To 1ml of concentrate 2ml of water were added, then 2-3 drops of 5% FeCL3were added. The blue/dark tone shows the presence of hydrolyzable tannins. what's more, green/dark shows the presence of consolidated tannins.

Saponin:

To 1 ml of extract 2 ml of water were added, persistent foam indicates the presence of saponin

Anthracene glycosides:

To 4ml of extract 2 ml of 25 % of ammonia solution were added, the pink color indicates the presence of anthracene.

Coumarins:

From the extract,5ml was vanished, 2 ml of warm water were added to the buildup, 2ml of arrangement were required 1 ml in each cylinder, to second cylinder 0.5 ml of 10% alkali arrangement were added, the presence of fluorescence in first cylinder and serious fluorescence in the second cylinder under UV-light demonstrates the presence of coumarins.

Flavanoids:

From extract ,3 mL was dissipated to dryness on a water shower, then, at that point, 1-2 ml of half CH3OH and 1 mL of 5% fluid potassium hydroxide arrangement were added. A dull yellow tone demonstrates the presence of flavonoids.

**2- Water extract**

Carbohydrates:

From extract2ml were evaporated, then iodine solution shall be added, blue or reddish blue color, indicate the presence of starch

Reducing sugar:

To 1 ml of extract 2 ml of water were added, then 20 drops of Fehling 1 were added, brick red color indicating the presence of reducing sugar.

Saponins:

To 1 ml of extract 2 ml of water were added, and persistent foam indicate the presence of saponin.

Tannins:

To 1 ml of extract 2 ml of water were added, 2-3 drops of 5% FeCL3were added. The blue/black color indicates hydrolysable tannins. and green/black indicate condensed tannins.

Alkaloids:

To 15ml of concentrate, 10% NH4, then petroleum ether, then, at that point, ether was evaporated,1.5 ml of 2% HCL were added. To 0.5 ml of arrangement 2-3 drops of Mayer's reagent were added, whitish-yellow accelerate demonstrates the presence of alkaloids.

Glycoside:

For recognition of glycoside, 30ml of concentrate were taken then 15ml 10% HCL was added then reflexed for 30 minutes and extracted with oil ether after that identification of the accompanying glycoside was finished.

Anthracene glycosides:

To 4ml of extract 2 ml of 25 % of ammonia solution were added, the pink color indicates the presence of anthracene.

Coumarins:

From extract, 5ml was evaporated, 2 ml of warm water were added to the residue, 2ml of solution were taken 1 ml in each tube, to second tube o.5 ml of 10% ammonia solution were added, appearance of fluorescence in first tube and intense fluorescence in the second tube under UV-light indicates the presence of coumarins.

Steroidal glycosides:

From the extract, 10mll were evaporated, 0.5 ml of acetic anhydride and 0.5 ml of chloroform were added to the residue and then the addition of 1ml conc H2SO4.

Triterpene glycosides:

From extract, 10ml was evaporated, 0.5 ml of acetic anhydride and 0.5 ml of chloroform were added to the residue and then the addition of 1ml conc H2SO4.

Flavanoids:

From extract, 3 mL were evaporated to dryness on a water bath, then 1-2 ml of 50% CH3OH and 1 mL of 5% aqueous potassium hydroxide solution were added. Dark yellow color indicates the presence of flavonoids.

**2.5 Antibacterial activity testing method:**

The antibacterial action of Plant still up in the air by agar cup technique. For this, a new (short-term) confined province of the microorganism was suspended in clean saline to get turbidity of 0.5 McFarland standard. 0.1 ml. of this suspension was spread aseptically on a sterile Muller Hinton agar medium. Then, at that point, the wells [8 mm. diameter] were exhausted by a sterile plug drill. 0.2 ml. of each concentrate [100 mg/ml in 10% DMSO was added to the wells. It was permitted to diffuse by saving in freeze for 20 minutes. After dispersion of concentrate, the plates will be brooded at 37 0c for 24 hours. Zones of hindrance were estimated in mm. for each concentrate.

**2.6 Solvents and reagents:**

1. Ethanol 70%
2. Distilled Water
3. Mayer's reagent
4. Fehling's reagent

**2.7 Glassware and instrument**

**Glassware:**

1-Conical flask

2-Beaker

3-Cotton Swap

4-Plate

5-Funnel

6-Pipette

7- Petri dish

8-Measuring cylinder

9- Test tube

10- Loop

11-Syringe

12-cylinder

13-filter paper

14-spateula

**2.8 Instruments:**

1-Water bath

2-Soxhlet

3- Balance

4- Flame

# CHAPTER III

# RESULTS

## 3.1. Result of phytochemical screening:

*Table (1): results of phytochemical screening of 96%ethanolic extract*

| **Chemical constituent** | ***A.niloticassp.Nilotica*** |
|---|---|
| Hydrolyzable tannins | + |
| Reducing sugar | + |
| Alkaloids | + |
| Flavonoids | + |
| Anthracene | - |
| Coumarins | + |
| Sterols | - |
| Triterpenes | - |

*Table (2): results of phytochemical screening of water extract*

| **Chemical constituent** | ***A.nilotica* ssp.*Nilotica*** |
|---|---|
| Carbohydrates | + |
| Saponin | + |
| Hydrolysable tannins | + |
| Reducing sugar | - |
| Alkaloids | - |
| Flavonoids | - |
| Anthracene | - |
| Coumarins | + |
| Sterols | - |
| Triterpenes | - |

### 3.2. Result of antimicrobial activity:

*Table (3): Results of antibacterial activity of 70% ethanolic extract of A.nilotica ssp.*

| Microorganisms | Mean diameter of inhibition zone(MDIZ) (mm) Ethanol extract | Mean diameter of inhibition zone(MDIZ) (mm)Gentamicin | Mean diameter of inhibition zone(MDIZ) (mm)Amikacin |
|---|---|---|---|
| ***E.coli*** | 34 | 22 | - |
| ***P.aeruginosa*** | 23 | 24 | - |
| ***S.aureus*** | 32 | - | 23 |

*Table (4): Results of antibacterial activity of Water extract of A.nilotica ssp.*

| Microorganisms | Mean diameter of inhibition zone(MDIZ) (mm)Water extract | Mean diameter of inhibition zone(MDIZ)(mm) Gentamicin | Mean diameter of inhibition zone(MDIZ)(mm) Amikacin |
|---|---|---|---|
| ***E.coli*** | 16 | 22 | - |
| ***P.aeruginosa*** | 27 | 23 | - |
| ***S.aureus*** | 23 | - | 30 |

**Mean diameter of inhibition zone (MDIZ) (mm) Gentamicin:**

MDIZ =**10**(Sensitive)

MDIZ =**7-9**(Intermediate)

MDIZ =**6**(Resistance)

**Mean diameter of inhibition zone (MDIZ) (mm)Amikacin:**

MDIZ =**17** (Sensitive)

MDIZ =**15-16** (Intermediate)

MDIZ = **14**(Resistance)

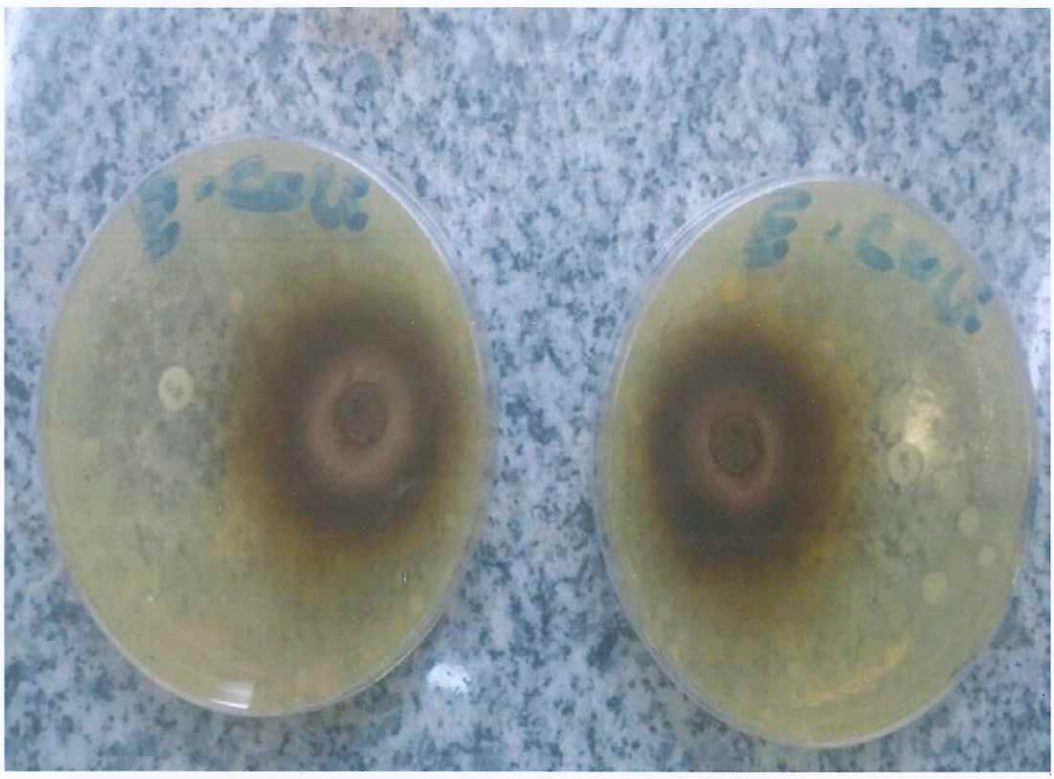

***Figure (3): Result of antibacterial activity of 70% Ethanolic extract of A.nilotica against E.coli.***

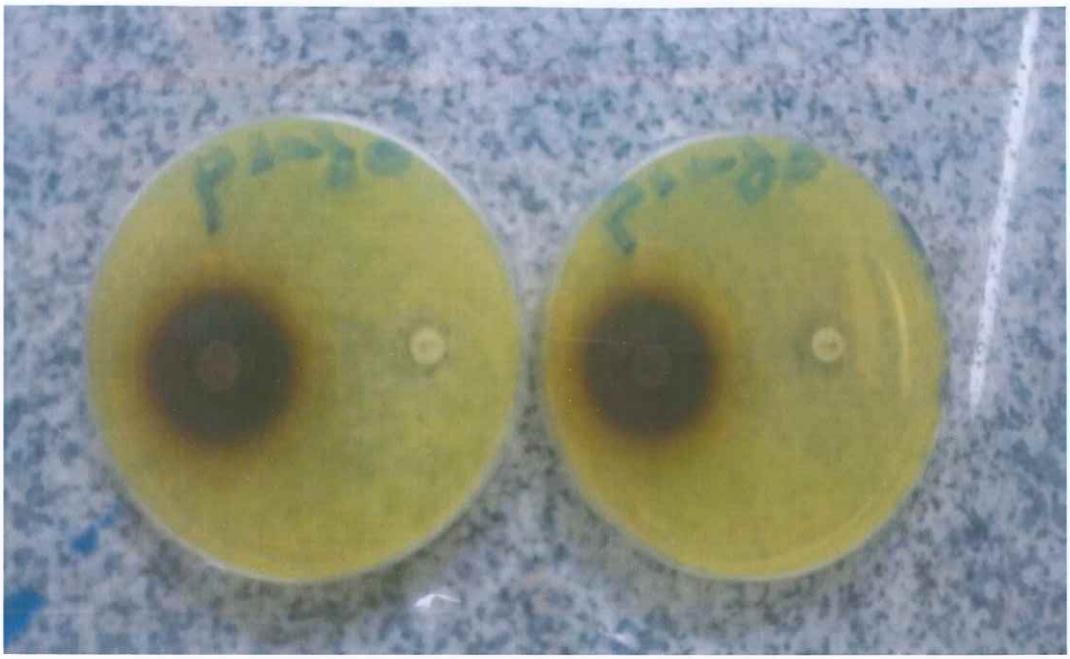

*Figure (4): Result of antibacterial activity of 70% Ethanolic extract of A.nilotica. against P.aeruginosa*

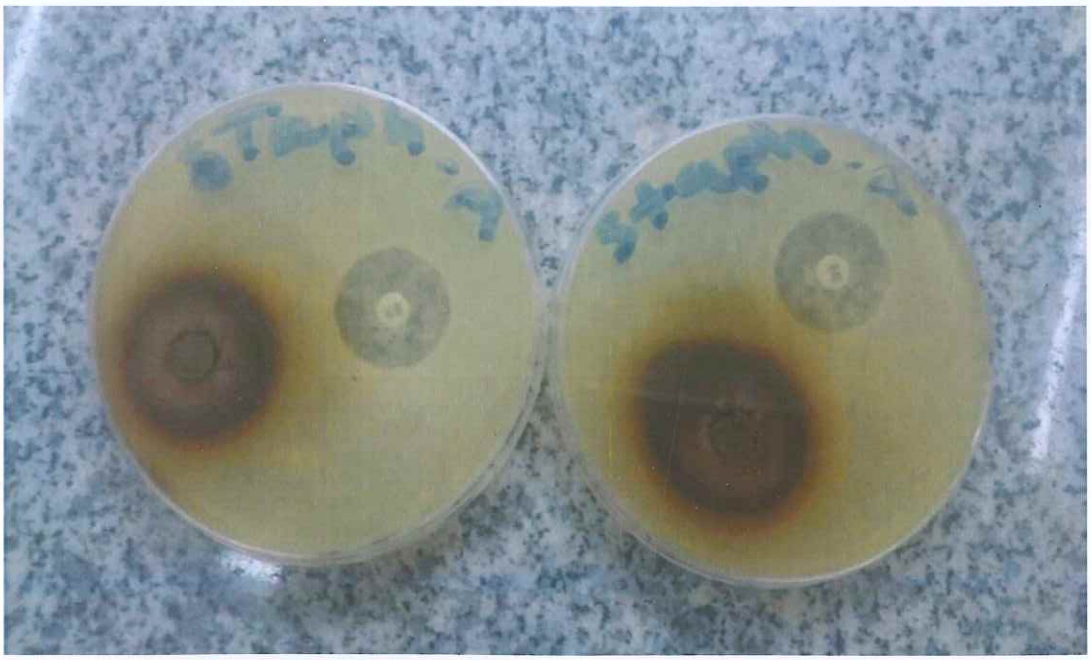

*Figure (5): Result of antibacterial activity of 70% Ethanolic extract of A.nilotica. against S.aureus*

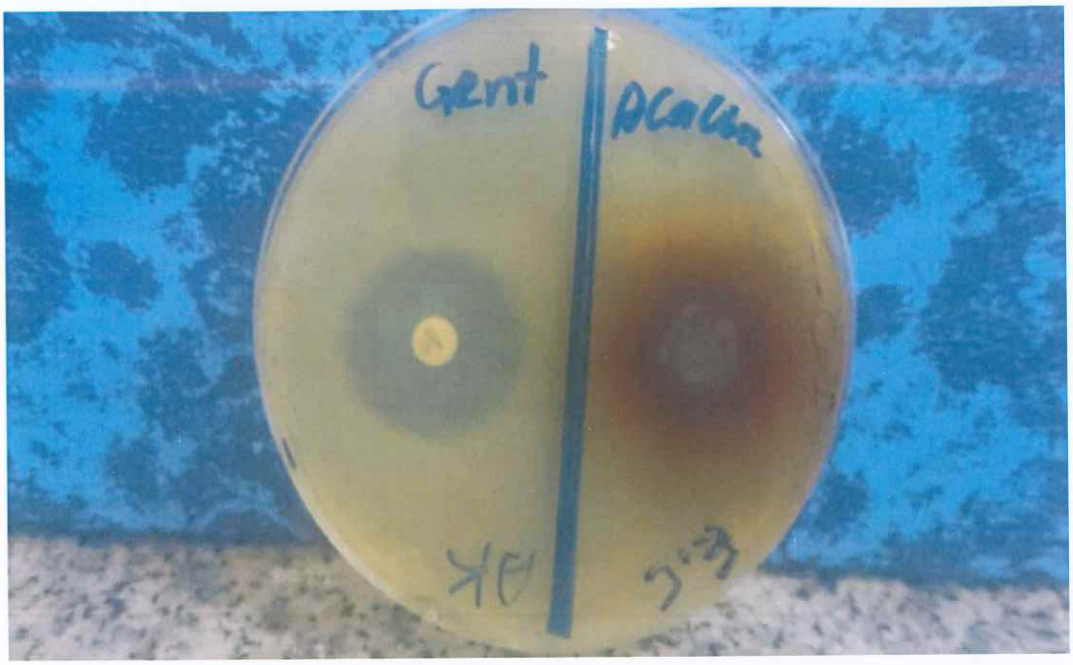


*Figure (6): Result of antibacterial activity of water extract of A.nilotica against E.coli*

*Figure (7): Result of antibacterial activity of water extract of A.nilotica against P.aeruginosa.*

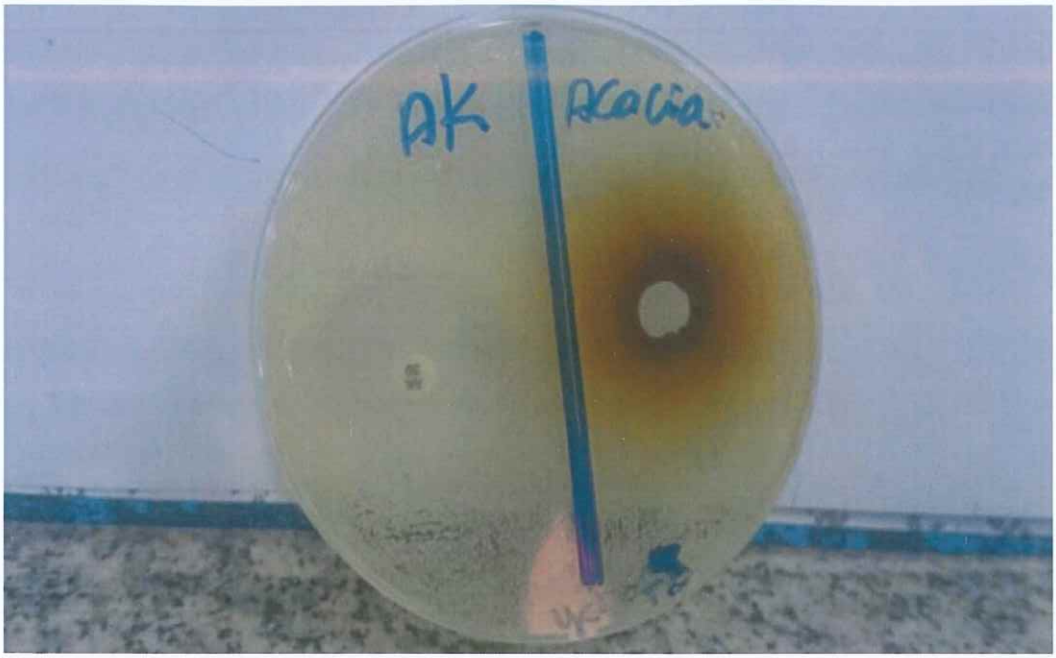


***Figure (8): Result of antibacterial activity of water extract of A.nilotica against S.aureus.***

# CHAPTER IV

## Findings and Discussion

Two solvents of various polarities (70% ethanol and water) were used in the extraction of *A.nilotica* fruit shuck.

70% ethanolic extracts showed good antibacterial activity against both Gram-positive and Gram-negative bacteria. The antibacterial activity of ethanolic extract of *A.nilotica* was found more sensitive than antibiotics (Gentamicin and Amikacin)

Water extracts showed antibacterial activity with more sensitivity against *p.aeruginosa* than *E.coli* and *s.aureus.*

According to lab results, 70% of ethanolic extract of *A.nilotica* have good antibacterial activity more than water extract.

(Eltegani et al, 2017). This study showed a few comparative and divergent outcomes by utilizing ethanol 70% and DW contrasted and my outcomes:

The extract of *Acacia nilotica* with ethanol 70% shows the presence of various phytochemical components and 20mm dimer of inhibition zone with gram-positive bacteria *S. aureus* and 27mm dimer of inhibition zone with gram-negative *E. coli.*

The extractant of DW shows the presence of phytochemical but it's less than ethanolic extraction, the antibacterial activity test was better than the ethanolic extract with 30mm dimer of inhibition zone with *S. aureus* and 25mm dimer of inhibition zone with *E. coli.*

In my study, the result shows that the extract of *Acacia nilotica* with ethanol 70% also presence of different phytochemicals and was sensitive with *E.coli* 34 mm dimer of inhibition zone.

The extract of *Acacia nilotica* with DW was intermediate with *E.coli* 16 mm dimer of inhibition zone and more sensitive with *S.aureus* 23 mm dimer of inhibition zone.

(Mujahed I. et al.2019). This study was established recently and they use methanol instead of ethanol to detect the antimicrobial activity here are some comparisons,

The methanol showed activity at 100% concentration against *Pseudomonas aeruginosa* and it was 23mm dimer of inhibition zone which is considered most sensitive between others, respectively as well as for *Staphylococcus aurous* 22mm and also for *E.coli* the inhibition zone was found 21mm. In general, ethanol 70% is more efficient antimicrobial than methanol.

Interestingly distilled water extract showed high activity against *Pseudomonas aeruginosa* at 28mm and against *E.coli* was found 20mm in the dimer of inhibition zone and both of them were considered more sensitive compared with my results using the distilled water.

In this study of (Ahmed S. et al. 2015) showed that, the ethanol extracts of the leaves of *A. nilotica* were screened for their antimicrobial activity against *E.coli* was found 25mm, against *Staphylococcus aureus* 27mm, and against *Pseudomonas aeruginosa* 28mm in the dimer of inhibition zone which is more sensitive in my results by using ethanol 70%.

# CHAPTER V

## 5.1 Conclusion and Recommendations:

According to the results of the present study, the literature review and based on the antibacterial assessment of this plant, it is advisable to pay more attention to this plant in the treatment of infections because *A.nilotica* has good antibacterial activity against different types of bacteria.

## 5.2 Recommendations for Further Research:

Further research should be done to assess activity against, fungi and viruses and made more research in vivo to determine the toxic dose of tissue or organs. standardization and characterization of crude extract plant should be done to the substance and purified the compound.

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## Appendices

**Abbreviation and Symbols:**

MDR: Multi Drug Resistance

NPD: Nitro- Phenylenediamine

AF: Amino-fluorene

MDIZ: Mean diameter of inhibition zone

WHO: World Health Organization

## NOUR TEZ

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BİRİNCİL KAYNAKLAR

| | | |
|---|---|---|
| 1 | Shama I.Y. Adam, Nesreen Alsanousi, Ahdaf M.A. Ahmed, Sahar Y. Ali, Maiada M. Abdallah, A.A. Anfal, Sara M. Hamed. "Evaluation of Toxicity and Anti-microbial Activity of Tribulus terrestris Fruits in Sudan", Asian Journal of Biological Sciences, 2019<br>Yayın | %1 |
| 2 | www.uicnmed.org<br>İnternet Kaynağı | %1 |
| 3 | m.scirp.org<br>İnternet Kaynağı | %1 |
| 4 | www.scipress.com<br>İnternet Kaynağı | %1 |
| 5 | C. Gencoglu, O. B. Tor, E. Cebeci, O. Yilmaz, A.N. Guven. "Assessment of the effect of hydroelectric power plants' governor settings on low frequency inter area oscillations", 'Institute of Electrical and Electronics Engineers (IEEE)', 2010<br>İnternet Kaynağı | %1 |

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|---|---|---|---|
| | | | |
| | | | |

| **Foreign Language Examination Grade#** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| YDS | ÜDS | IELTS | TOFEL IBT | TOEFL PBT | TOEFL CBT | FCE | CAE | CPE |
| | | 6 | | | | | | |
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| | Math | Equally weighted | Non-math |
|---|---|---|---|
| ALES Grade | | | |
| (Other) Grade | | | |

### Computer Knowledge

| Program | Use proficiency |
|---|---|
| Microsoft office (Word, Excel, Publisher…) | |