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Antimicrobial Activity of Some Plant Extracts against Some Bacterial Strains

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Abstract: ***The research aimed to study the inhibitory effect of alcoholic extracts (ethanol) of some plants on the growth of some bacteria, where Four types of bacteria were selected to test their sensitivity against the extracts and compare them with the antibiotic sensitivity test for them so that alternatives to plant extracts can be found, reduce human resistance to treatments and find alternative treatments Safe and cheap, as two types of Gram-positive bacteria were selected Staphylococcus epidermids, Staphylococcus aureus and two types of Gram-negative bacteria Escherichia coli, Proteus mirabilis. Selected from plants (Juniperus phoenicea, Salvia rosmarinus, Thymus serpyllum, Allium sativum). Sensitivity test was conducted by tablet method, where the tablets were saturated with plant extracts and tested. The results of the extracts showed a clear discrepancy in their effect on bacteria, as they had the strongest effect on Gram-positive bacteria, as Gram-positive bacteria were affected by the four types of extracts, while Gram-negative bacteria had the effect in only three types, and the extract that gave the highest anti-bacterial area was Juniperusphoenicea. Between 12-13 mm on positive bacteria. Also, the sensitivity of S. epidermidis to extracts was the highest, followed by S. aureus, then P. mirabilis, and finally E. coli was the least effective for the extracts. Also used antibiotics following vital to test the susceptibility with bacteria (Erythromycin 30m cg, Gentamicin 10m cg, Amoxillin / calvulanic acid 20/10, levofloxacin 5m cg, Ciprofloxacin 5m cg) has had a significant impact on the bacteria except (Amoxicilin) where he did not give effect to S. aureus, S. epidermidis, E. coli, and its effect was limited to P. mirabilis.***

Keywords: plant extracts, antibiotics, gram-positive bacteria, gram-negative bacteria

1.Introduction

The use of antibiotics had an important role in the treatment of bacterial infections for many years, but many problems appeared in their use, such as the emergence of resistant strains, where in the late century studies proved that they can acquire resistance to antibiotics or active active ingredients after several generations, due to the transmission of genes Resistance genes among them, and thus is the main reason for the emergence of drug-resistant strains (Uwaezoke & Aririatu, 2004), the increase in the use of antibiotics has led to a worrying matter, as it is considered.

Antibiotic resistance is a serious threat to human and animal welfare in the future, and increasing levels of antibiotics or antibiotic-resistant bacteria in the environment can lead to an increase in the number of drug-resistant infections alike (Dantaset al., 2011). Where a large part of antibiotics are used every year all over the world for non-therapeutic purposes by adding them in animal production farms as growth stimulants and not to treat infections, and from this the addition of antibiotics to animal diets as a means to stimulate growth has become a global practice. The basis of the growth-stimulating effect of antibiotics is not clearly known, but it is assumed that the microorganisms present in animal feed consume a large part of the nutrients in their feed, as they inhibit the absorption process from and produce toxins that have a negative impact on the health of animals. Thus, the intensive and unconscious use of antibiotics in animal diets leads to the emergence of strains that are resistant to the action of antibiotics, and when consuming animal products contaminated with antibiotic residues, and as a result of repeated intake of these antibiotics through food leads to the microbes that are pathogenic to humans have resistance against them and thus when infecting humans with microbes. And when he takes antibiotics for treatment, he does not respond to treatment as a result of the microbes acquiring resistance against these antibiotics (Fawzi Ismail, 2018).

As the excessive use of antibiotics has led to the increasing rate of development of resistance to it and its spread throughout the world. It is estimated that about 200, 000 to 250, 000 tons of antibiotics are produced and consumed annually worldwide (O'Neill, 2016). And that about 70% of these antibiotics are consumed by animals and 30% are consumed by humans. Most of the antibiotics consumed by humans and animals are excreted through urine and feces and enter sewage networks, thus polluting the environment. On the other hand, the commensal bacteria in the human and animal body when exposed to antibiotics will also develop resistance to these antibiotics, and worse, the antibiotic-resistant bacteria can spread to other people and the environment. (Boeckelet al., 2015).

Which has increased the interest in recent years in medicinal plants and herbs by using them as a main source for the production of medicinal drugs or as a source of active substances that are included in the composition of the drug. Many studies have dealt with the effect of plant extracts on the growth of microorganisms. Where many plants were found to have an inhibitory activity against pathogens with their active compounds and components after extraction and purification, in addition to their lack of side effects and the inability of bacteria to find resistance to them (Al-Sayed 2004). The efficiency of these extracts

varies according to the method of their extraction, the type of solvent used, and the test microorganism (Al-Zubaidi, 2005). In view of the problems resulting from the use of traditional antibiotics, the world turned to plant extracts because of their medicinal benefits, ease of access and low cost, as they became known as alternative medicine in the late nineties of the last century (Eisenberg et al., 1993).

Plants are a source of basic materials that have a role in medicine, and from here the world began to return to medicine and use plants and herbs that have medical importance due to their active chemical and biological components that have physiological effects.

It is clear on the human body and increases the strengthening of immunity (2010, Shrivastava & Leelavathi), where the effectiveness of plant extracts of medicinal and aromatic plants is due to the fact that they contain active substances that affect disease-causing microbes. It gives plants aromas such as tannins, glycosides, alkaloids, terpenoids, ketones responsible for pigments in plants and other active substances (El-Kamali & El-Amir, 2010). Some of these compounds were first isolated from natural sources but have been modified to improve their efficacy (Davies & Davies, 2010). This study is of special importance because the bacteria that were selected are pathogenic and known for their ability to resist most antibiotics, represented by the formation of the biofilm layer on the bacterial colonies (Indrayanet al., 2002). As a defense against chemical disinfectants, antibiotics, phagocytes, and immune systems, Gram negative bacteria are often more resistant to antibiotics than Gram positive bacteria due to the presence of a layer of polysaccharides-lipopolysaccharide in the outer membrane of bacteria, but it is permanently healthy (Vukovicet al., 2007). In this study, a comparison is made between antibiotics and some plant extracts on Gram-positive and Gram-negative bacteria.

Gram-positive bacteria

Staphylococcus aureus is a Gram-positive bacterium that occurs naturally in the mucous membranes of humans and animals and is one of the main causes of human infection of the skin, soft tissues, bones, joints, abscesses, as well as natural heart valves (Karlowsky et al., 2003). MRSA was first identified in the 1960s (Barber, 1961). It is a multi-resistant strain that has been documented worldwide showing increased resistance to different classes of antimicrobials (Ness, 2010).

Staphylococcus epidermidis is a type of bacteria belonging to the genus Staphylococcus epidermidis of the family Staphylococcus epidermidis, which are non-motile, non-spore-building cocci, usually arranged in the form of clusters, Gram-positive, found on the skin and mucous membranes of humans and many animals, as well as They are present in the surrounding environment and even on food. It was discovered by the French scientist Louis Pasteur in the year 1880. The number of its species is currently about twenty or more, and it causes skin infections such as paronychia and impetigo (Schleifer & Kloos, 1975).

Gram-negative bacteria

Proteus mirabilis is one of the most important species of the genus Proteus, which is a facultative anaerobic Gram-negative bacillus of the Enterobacteriaceae family, which is naturally present in the organ.

The digestive system of humans and some animals, as it is found in polluted soil and water (Michael et al., 2011), was first discovered in 1885 by Hauser, who isolated it for the first time from feces, sewage, and decomposing organic matter, and called it pleomorphism because it has the phenomenon of Pleomorphism (O'hara). et al., 2000).

Escherichia coli, which are gram-negative bacilli belonging to the Enterobacteriaceae family, are naturally present in the intestine, but they are opportunistic bacteria that can be pathogenic if appropriate conditions are provided (El Batawi, 1978), where the most common species of the intestinal family in juveniles Urinary tract infections, as they cause inflammation of the intestines and bile ducts, diarrhea and meningitis in children (Ross, 1986), were discovered by the German-Austrian pediatrician Theodor Escherich in 1919 and named after him.

2.Materials and Methods

1. Samples:

Wild samples were collected from the green mountain regions in eastern Libya (Phoenician juniperus phoenicea, rosemary Salvia rosmarinus, wild thyme Thymusserpyllum). Garlic cloves (Allium sativum) were also taken, where the drying process relied on spreading the fruits on a dry level surface to ensure air entry. And it is in the shade because this means maintaining the proportion of volatile oils, taking into account the stirring of plants from time to time to ensure good drying and to prevent the fermentation of the plant in the event of moisture, then we grind the samples coarsely and keep them in clean, dry bags in the refrigerator for use in studies, and garlic was cut into small pieces And dry it in the same way.

2. Preparation of alcoholic plant extracts:

Then 100 grams of prepared samples were taken and placed in 400 ml of ethanol for 48 hours, then filtered and concentrated by a rotary evaporation device at a temperature not exceeding 40 C to obtain the concentrated extract. Store at a temperature of 20°C until use Figure (1, 2).

Figure 1: shows the extracts before concentration

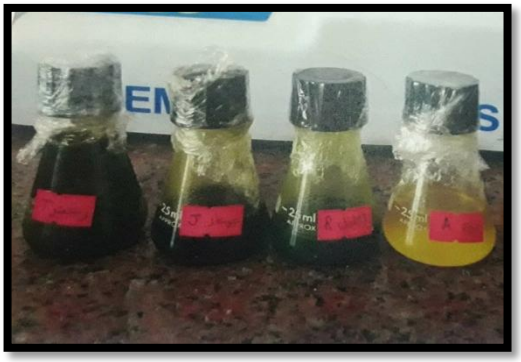

Figure 2: shows the extracts after concentration

3. Preparation of the bacteria under test:

The bacterial species used in the study were obtained by well-known microbiology laboratories. They were grown by graphing method on Nutrient agar medium (APHA and WEF., 2000). After obtaining pure single colonies, they are directly tested.

4. Sensitivity test for extracts:

In testing the sensitivity of bacteria to plant extract, the method of disc diffusion assay (Salvagnini, et al., 2008) was followed where the tablets were impregnated with a sufficient amount of prepared extracts for 30 minutes and left to dry at laboratory temperature. Antibiotics as a comparison test The antibiotics used (Erythromycin 30m cg, Gentamicin 10m cg, Amoxillin/calvulanic acid 20/10, levofloxacin 5m cg, Ciprofloxacin 5m cg) were then placed in the prepared dishes after being spread by a swab of cotton swab for each type Of the bacteria used under study on Muller Hinton Agar Medium, then the dishes were left for 15 minutes and then incubated at 37°C ◦ for 24 hours, then the diameters of the inhibition zone were measured using the ruler Figure (3).

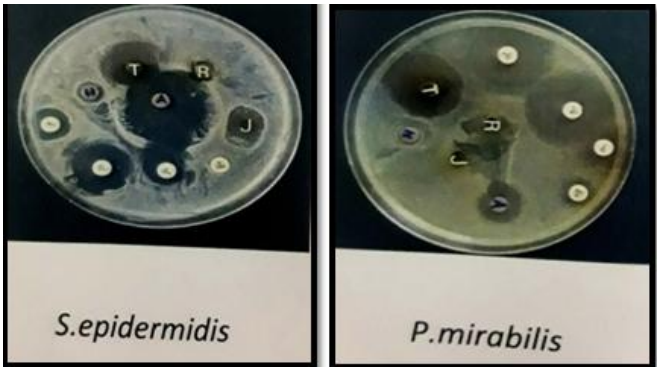

Figure 3: shows the results of the sensitivity test

3.Results and Discussion

The results showed, as shown in the table below, that most of the plant extracts had an effect on bacteria, as extracts of garlic, thyme and juniper showed an effect on S. aureus, S. epidermidis, while extracts of garlic and thyme also had an effect on E. coli and P. mirabilis, while the corona extract did not give any effect or inhibition of growth on the bacteria under study. As for the antibiotics used for comparison, they had a clear effect on bacteria except (Amoxicilin), which had no effect on S. aureus, S. epidermidis, E. coli, and its effect was limited to P. mirabilis.

anti biotic					Extract				type of bacteria
CN	**AMC**	**LEV**	**CIP**	**E**	**R**	**A**	**T**	**J**	
+	-	++	+	+	-	+	+++	+	***S. aureus***
+	-	++	+	+	-	+++	++	+	***S. epidermidis***
+	-	+	+	+	-	++	++	-	***E. coli***
+	+	++	+++	+	-	+	++	-	***P. mirabilis***

Resistant (-), Medium Sensitive (+), Sensitive (++), Very Sensitive (+++)

J = Juniperus phoenicea, T = Thymus serpyllum, A = Allium sativum, garlic, R = Salvia rosmarimus, rosemary
E = Erythromycin, CN = Gentamicin, AMC = Amoxillin, LEV = Levofloxacin, CIP = Ciprofloxacin
S. aureus = Staphylococcus aureus, S. epidermids = Staphylococcus epidermids, E. coil = Escherichia coli, P. mirabilis = Proteus mirabilis

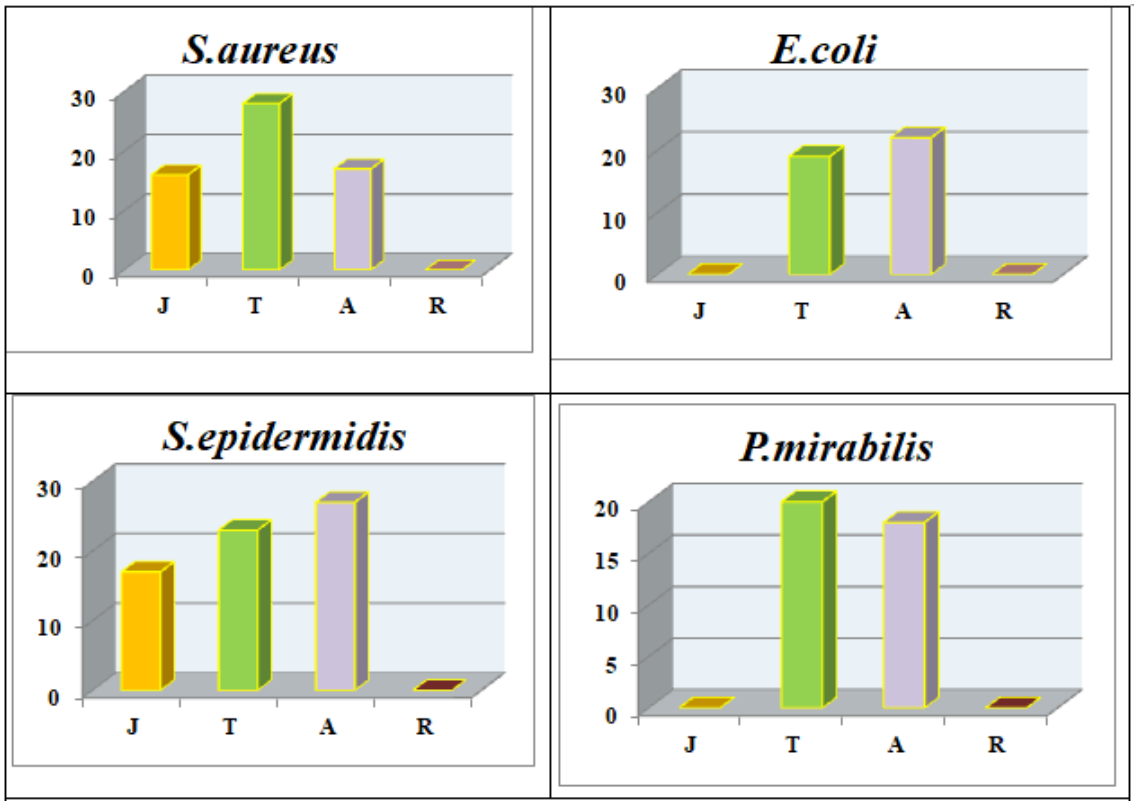

Figure 4: shows the effect of extracts on bacteria
J = *Juniperus phoenicea*, T = *Thymus serpyllum*, A = *Allium sativum*, R = *Salvia rosmarimus*

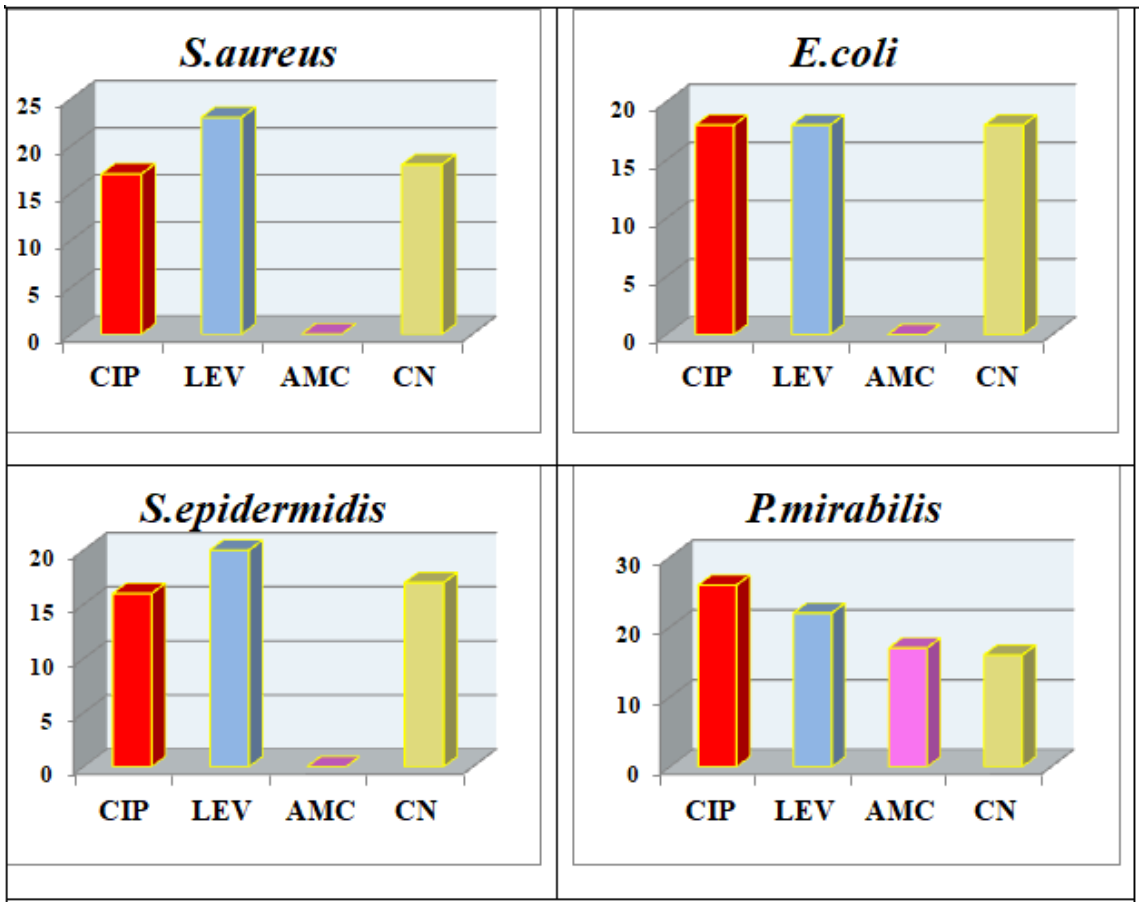

Figure 5: shows the effect of antibiotics on bacteria
CIP = Ciprofloxacin, LEV = Levofloxacin, AMC = Amoxillin, CN = Gentamicin

4.Conclusion

The present study showed that the study showed inhibitory effect of alcoholic extracts (ethanol) of some plants on the growth of some bacteria, where Four types of bacteria were selected to test their sensitivity against the extracts and compare them with the antibiotic sensitivity test for them so that alternatives to plant extracts can be found results of the extracts showed a clear discrepancy in their effect on bacteria, as they had the strongest effect on Gram-positive bacteria, as Gram-positive bacteria were affected by the four types of extracts, while Gram-negative bacteria had the effect in only three types,

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Conflict of Interests

The authors of this manuscript are declared there is no conflict of interest of this manuscript.

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