

# THE EFFECT OF ANTAGONISTIC ACTIVITY OF SOME PLANT EXTRACTS ON THE GROWTH OF *ESCHERICHIA COLI* AND *STAPHYLOCOCCUS AUREUS*

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**ABSTRACT :** The effect on the growth of *Escherichia coli* and *Staphylococcus aureus* isolated from patients with urinary tract infections was investigated at various concentrations of aqueous extracts of *Punicas granatum*, *Ficus carica* and the *Phoenix dactyliferas* dates, where aqueous extracts were used for all plants separately and all together. The results showed a clear effect of plant extracts, it inhibited *Staphylococcus aureus* while, it was to a lesser extent on *Escherichia coli*. The main effect of plant extracts on these bacteria was pomegranate, while to a lesser extent, figs, then date. Also, the effectiveness of the aqueous extract formed from these plants in the form of a compound juice (cocktail) on these bacteria appeared, and very low effectiveness of the fresh juice appeared. The results of the examination also showed the sensitivity of antibiotics against bacterial isolates. Whereas, *Escherichia coli* bacteria showed the highest resistance to (Nor, IMI, DXT, CIP), while the least resistance appeared to (ATM, AK, CTX), while they showed no resistance to (VA, RP), while the bacteria showed *Staphylococcus aureus* had the highest resistance to (DXT, NOR, IMI, AK) while, it showed the lowest resistance to (RP, VA, CIP,) while it showed no resistance, CTXATM.

**Key words :** Plant extracts, *Escherichia coli* and *Staphylococcus aureus*.

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## INTRODUCTION

Interest in medicinal plants and herbs has increased in recent years, using them as the main sources of medicinal drug production or as a source of active substances included in the composition of the medicinal product (Nibras, 1998; Hawa, 2013; Al-Rubaie *et al*, 2009). Since they are used as raw materials to produce some chemicals and to produce certain medicinal materials (Majeed *et al*, 1988; Guitar, 2003; Talib *et al*, 2009). The potential to use it in the treatment of several conditions caused by different microbial illnesses Pomegranate plant (Musayqir, 2005; Muhammad and Hamid, 2010). *Punica granatum* L (Pomegranate), which belongs to the Punicaceae family, its trees are grown for fruit production and not for medical purposes, but it was found that it has many medicinal benefits and each part of the pomegranate plant has different therapeutic properties as its peel is used in the treatment of stomach diseases and diarrhea because it contains

tannins (Al-Rawi and Chakra, 1988). The body of the fruit is tonic for the heart and stomach and the seeds are useful for the stomach. The juice of the fruit is moisturizing and cooling. The active substances in it include alkaloids, the most important of which are Pelletierine, Granatin, Gallotannin, a substance once Punicine and tanning materials. The pomegranate peels have many other therapeutic uses, in addition to what was mentioned, it is considered one of the most deadly drugs. Tapeworm is also used in the treatment of dysentery (Barry, 1986; Ángel and Carbonell, 2010; BEN, 2012). The fig *Ficus carica* belongs to the moraceae family and the genus *Ficus*, which includes more than 800 species of plants, as the original home of the fig plant is West Asia, and its cultivation has spread in the Mediterranean basin (BEN, 2012). While, others remember that the original home of figs is The Arabian Peninsula, if there are so far wild forests from it and after the Islamic conquest, the Muslims spread its cultivation in North Africa and the Mediterranean countries such as Spain, Portugal, southern

France, Greece and Italy (Chakraborty *et al.*, 2012). The date palm *Phoenix dactylifera* L. belongs to the palm family Arecaceae and is one of the semi-tropical fruit trees. It occupies a distinguished position in economic terms and its fruits have a high nutritional value because they contain high levels of sugars, vitamins, amino acids and proteins (Chakravarty, 1976). These plants have been selected for their abundant availability in the local environment and the scarcity of studies on their effectiveness in inhibiting the growth of microbes. The present study aims to find alternatives to antibiotics from plant extracts that can be used in treatments and to reduce human resistance to antibiotics that can be used as inhibitors to the bacteria *Escherichia coli*, *Staphylococcus aureus*, thus finding safe, cheap and efficient alternative treatments.

## MATERIAL AND METHODS

### Specimen collection

Total 33 samples of urine were collected after making sure that they were suffering from urinary tract infections for the purpose of isolating *Staphylococcus aureus* and *E. coli* bacteria in the children's hospital in Ramadi city and these samples are mostly from women and children. Urine samples were taken and planted on suitable culture media in blood agar and MacConkey agar cultivated on Eosin Methylene Blue media (EMB). Green Metallic Shine meaning. It was grown on Mannitol salt agar medium and then diagnosed using a number of biochemical tests to diagnose bacterial isolates (Chopra, 1985). The results of the tests were confirmed for the selected isolates using a biochemical diagnosis using the Vitek2 compact system

### Preparation of plant extracts

A 250 gm of the fruits of the plants pomegranate, dates and figs were collected from the local market, the samples were cleaned of those related to them and spread in the laboratory at room temperature until dryness, and then they were ground in a clean mill (CLSI, 2011). Where, it was prepared from dissolving 1 gram dried pomegranate extracts, figs and dates in 10 ml of distilled and sterile water to obtain a concentration (100 mg/ml) separately from (pomegranate, figs and dates) and the concentrations were sterilized using the Millipore filter (0.45 µm), which prevents the passage of germs through it (Duke, 2003). These extracts were mixed together to obtain an aqueous extract that combines this dried plant and other concentrations were prepared which contain less amounts of dried plants if 0.5 gm is dissolved in 10 ml of distilled and sterile water to obtain different concentrations i.e. 50% mg/ml and then another concentration was prepared where the amount of plant

concentrations was increased 0.5 gm was dissolved in 10 ml of distilled and sterile water to obtain different concentrations i.e. 50% mg/ml and then another concentration was prepared where the amount of plant concentrations was increased if 3 gm of the dried plants were dissolved in 10 ml of distilled and sterile water to obtain. On the different concentrations, then a juice of this plant was prepared to know its effect on the bacteria, where the pomegranate juice was prepared after the sample was collected and cleaned, discarded and mixed with a blender and then sterilized with bacterial filters, while the juice of dates and figs was prepared by steeping (Gupte, 1982), where 10 grams were taken from each plant powder subject to the study and placed in 100 ml of sterile distilled water for 24 hours and the solids were removed by filtering the plant extracts through filter paper.

### Antibiotic sensitivity test

The sensitivity of the isolates to 9 of the commonly used medically used antibiotics, which were used in the form of ready-made tablets was tested by using the Modified Kirby-Bauer Method on Muller Hinton agar, according to Jawetz *et al.* (2007) and modified by the World Health Organization. (8), as the antibiotics mentioned were used as follows Rifampicin (RP 5 mg), Cefotaxime (CTX 30 mg), Vancomycin (VA 30 mg), Imipenem (IMI 10 mg), Aztreonam (ATM 30 mg), Norfloxacin (NOR 30 mg), Doxycycline (DXT 30 mg), Amikacin (AK 30mg), Ciprofloxacin (CIP 5mg).

## RESULTS AND DISCUSSION

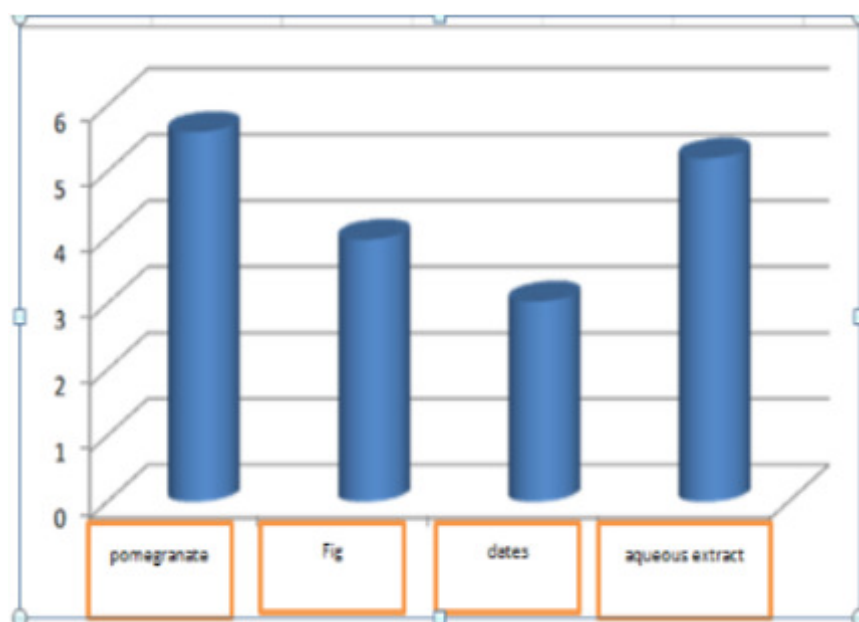
The results were subjected to statistical analysis with the aim of knowing the significant differences between the averages of the studied criteria in the different groups, and the significant differences between the averages were determined at the 5% probability level (JEM, 2009). CRD as shown in Table 1.

Where the results of the statistical analyzes in Table 1 showed that there were significant differences at the probability level of 5% in the resistance trait between the mean of the plant extracts, where the pomegranate plant extract gave the highest average for the resistance trait of 5.60 mm compared to the date plant extract, which recorded the lowest ratio for this trait of 3.03 mm that Because pomegranate contains natural antioxidants (Kokkos and Scott, 2002) that work to inactivate surface proteins and other structures in the outer envelopes of cells, in addition to disrupting some enzymes and transporting substances into cells. It can also be complexes with surface polysaccharides as shown in Fig. 1.

The results also indicate in the same table that there

**Table 1 :** Effect of plant extracts on bacterial resistance.

Mean of extracts		Extracts						
A1	5.60	A4	A3	A2	A1	Bacteria	Concentrations	
A2	3.97	9.60	5.00	5.60	10.30	C1	B1	
A3	3.03	8.00	4.60	5.60	6.00	C2		
A4	5.20	3.00	1.00	2.00	3.00	C1	B2	
L.S.D.5% = 0.476		2.30	1.00	2.30	2.00	C2		
Mean of concentration		3.00	4.00	5.30	7.30	C1	B3	
		5.30	2.60	3.00	5.00	C2		
B1	6.84	L.S.D5% = 1.168						
B2	2.07	Extracts						Concentrations
B3	4.44		A4	A3	A2	A1		
L.S.D5%=0.413			8.80	4.80	5.60	8.15	B1	
Mean of bacteria			2.65	1.00	2.15	2.50	B2	
			4.15	3.30	4.15	6.15	B3	
C1	4.92	L.S.D 5% = 0.826						
C2	3.37	Extracts						Bacteria
L.S.D. 5%=0.337			A4	A3	A2	A1		
			5.20	3.33	4.30	6.87	C1	
			5.20	2.73	3.63	4.33	C2	
			L.S.D5% = 0.674					
			Bacteria					Concentration
					C2	C1		
					6.05	7.62	B1	
					1.90	2.25	B2	
					3.97	4.90	B3	
			L.S.D.5% =N.S					



**Fig. 1 :** Bar graphs representing the average of the extracts used to study biological activity.

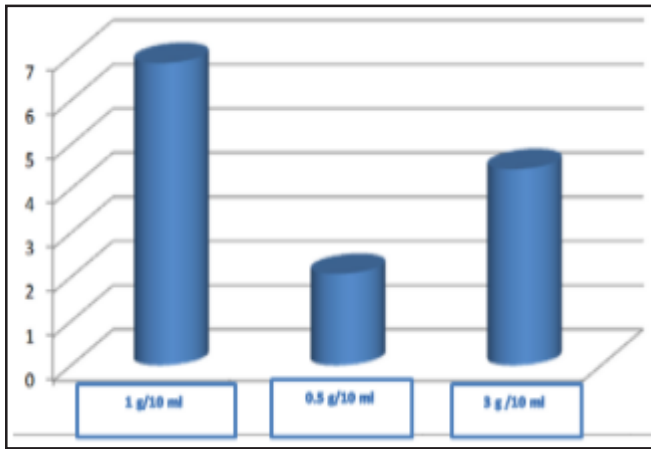


Fig. 2 : Graphic columns representing the average concentrations of extracts used to study biological activity.

which reached 6.84mlm, while the concentration of 0.5gm / 10 ml gave the lowest average for this trait, which reached 2.07 ml, as it was found to be all The higher the concentration, the higher the effect of the extract on bacterial isolates, as shown in Fig. 2.

It is noticed in Table 1 that there is a significant effect on the specificity of the bacteria on the resistance trait, where the significant effect of this resistant trait on *Staphylococcus aureus* was higher than that of *Escherichia coli* and each averaged 4.92 mm and 3.37 mm, respectively, as in Fig. 3.

The results in Table 1 indicate that there are significant differences between the two interactions of concentrations and extracts, where the highest

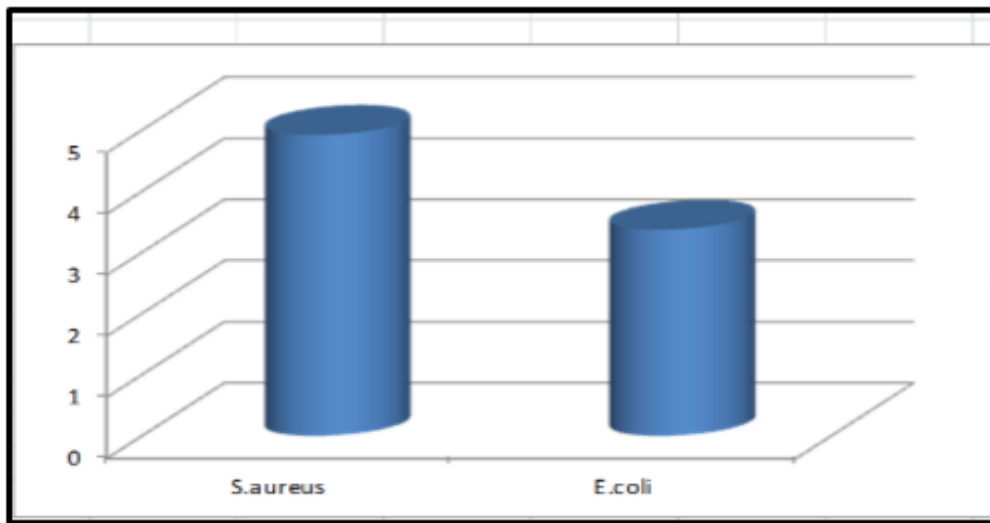


Fig. 3 : Graphic columns representing the average extract bacteria used to study the biological activity.

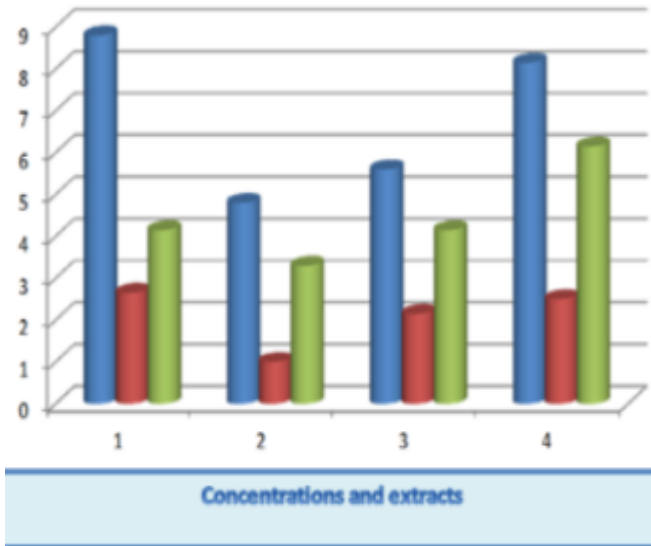
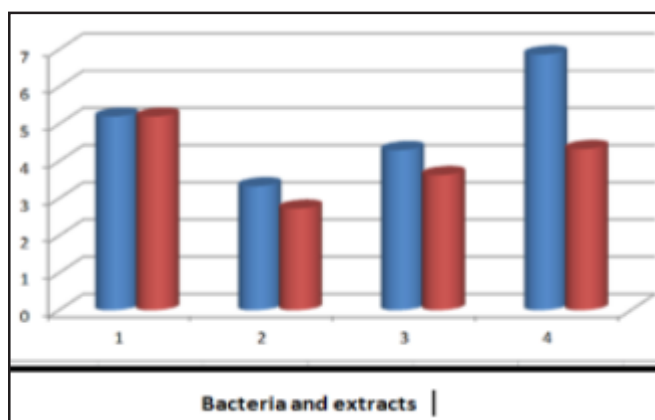


Fig. 4 : Graphic columns representing the dual overlap between the concentrations and extracts used to study biological activity.

is a significant effect of plant concentrations on the resistant trait, where the concentration of gm/10 ml recorded the highest average for the resistance trait,

combination (concentration of 1 g/10 ml) in the aqueous extract cocktail (pomegranate, fig and dates) recorded the highest mean of the resistance character was 8.80 mm compared to the combination (concentration 0.5 g/ 10 ml in the extract). The water content of dates, which gave the lowest average for this trait was 1.00 mm, as shown in Fig. 4.

The color of the concentration is 1 g/10 ml in the blue balloon while the concentration is 0.5 g/10 ml in the red balloon and the concentration is 3 g/10 ml in the green balloon. It is noticed through the results of Table 1 that there is an effect of the resistance characteristic in the bilateral interaction between the bacterial isolates and the extracts, where two combinations (*Staphylococcus aureus*) were superior. The aqueous extract of pomegranate cocktail, figs, dates) and (*Escherichia coli* bacteria and the aqueous extract of pomegranate cocktail, figs, dates) gave the highest rate for this characteristic of 5.20 mm, which did not differ in two meanings between the two top blends, while *Escherichia coli* was recorded



**Fig. 5 :** Graphic columns representing the binary overlap of bacteria and extracts used to study the biological activity.

in the abstract (Date water). The lowest average for this trait was 2.73 mm as shown in Fig. 5.

Where the symbol for pomegranate with the number 1, the fig with the number 2 and the dates by the number 3 and the water extract cocktail with the number 4, while the bacteria *Staphylococcus aureus* is symbolized by the blue color and the *Escherichia coli* bacteria in the red color shown in Fig. 6, where the concentration of 1 g/10 ml is symbolized by the number 1, while the concentration of 0.5 g/10 ml by the number 2 and the concentration 3 g/10 ml by the number 3, and the red *Escherichia coli* and *Staphylococcus aureus* bacteria are symbolized by the blue color.

### CONCLUSION

The results showed a clear effect of plant extracts, it inhibited *Staphylococcus aureus* while, it was to a lesser extent on *Escherichia coli*. The main effect of plant extracts on these bacteria was pomegranate, while to a lesser extent, figs, then date. Also, the effectiveness of the aqueous extract formed from these plants in the form of a compound juice (cocktail) on these bacteria appeared, and very low effectiveness of the fresh juice appeared. The results of the examination also showed the sensitivity of antibiotics against bacterial isolates. Whereas *Escherichia coli* bacteria showed the highest resistance to (Nor, IMI, DXT, CIP), while the least resistance appeared to (ATM, AK, CTX), while they showed no resistance to (VA, RP), while the bacteria showed *Staphylococcus aureus* had the highest resistance to (DXT, NOR, IMI, AK) while, it showed the lowest resistance to (RP, VA, CIP,) while, it showed no resistance, CTX ATM.

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