

Inhibition Effect of Water and Alcohol Extracts of *Cinnamomun zeylanicam* (Cinnamomun Plant) and *Zingiber officinale* (Ginger Plant) in the Growth and Efficacy of Some Microorganisms

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Abstract: A test was done to see if the medicinal herbs ginger and cinnamon would stop *Pseudomonas aeruginosa* and *Escherichia coli* from growing when their water and alcohol extracts were applied, additionally examined the bacterial isolates' susceptibility to the medicines ampicillin and amoxicillin. To identify the concentrations in which the bacteria displayed their development, gradient concentrations of each plant extract were utilised, which yielded vitality almost equivalent to the control group. The alcoholic extracts had less activity in comparison with aqueous extracts of both plants improved activity in reducing bacterial growth at concentrations of (15, 25, 35) and (5, 15, 25%), respectively. Amoxicillin also demonstrated a clear inhibitory effect on *E. coli* at a concentration of 0.05 ml, while *P. aeruginosa* demonstrated a wide antibody resistance. Two bacterial isolates did not respond to ampicillin in any way.

Key words: Medicinal plants, *Pseudomonas aeruginosa*, *Escherichia coli*, ginger, cinnamomun.

Introduction

Medicinal plants have been used in healthcare since time immemorial. Studies have been carried out globally to verify their efficacy and some of the finding have led to the production of plant based medicines. The global market value of medicinal plant products exceed \$100 billion per annum. That contributed significantly to the advancement of preventive medicine across the world, as well as curative medicine, which depended on plants and herbs from the natural world (Ahmed, 2012). Flowers have also been used since ancient times for their astringent and tonic properties in the treatment of cases of bleeding in the lungs, coughing, and ulcer active mouth diseases due to the vast observations made with the entire scope of science and life, for the benefit of people and their well-being, not only at the Arabic nation but on a worldwide scale. This is

because our nation, Iraq, is home to an infinite amount of plants and therapeutic herbs (Rose, 2010) in order to pick the optimal extraction technique and to diversify the application of these extracts across a variety of medicinal and industrial domains, as well as to stay up with scientific advancement in this area (Cowan, 1999). Due to their poisonous impact, products of plant origin have been shown to have a wide spectrum of biological consequences (Damiani et al., 2011). In this study, ginger and cinnamon were chosen as the two plant kinds to test for antibacterial activity.

Material and Methods

Bacteria Samples

Pseudomonas aeruginosa and *Escherichia coli* supplied by the Bacteriology Laboratory at Al-Karama Teaching Hospital. Experiment was conducted on 1/9/2022.

Plant Samples

1. *Cinnamomun zeylanicam*: Aailed from pharmacies that are equipped with the Ministry of Health's permission, such as the Herbal Medicine Center, in the form of ground-dried leaves stored in bags purchased from local markets after being subject to a medical examination and diagnosis.
2. *Zingiber officinale*: The leaves were dried, ground and stored in small bags (Central of Medicine Herbal).

Aqueous and Alcohol Extract Preparation

Preparation of aqueous extracts for *C. zeylanicam* and *Z. officinale*: The Soxhlet apparatus is used to weigh and deposit 20 g of dry plant powder in a thimble. About 150 ml of distilled H₂O is poured into the extraction flask, and the reaction is carried out for 2 hrs/60°C, then filtered (with Whattman No. 2) (Sato et al., 2000).

Preparation of alcoholic extracts for *C. zeylanicam* and *Z. officinale*: Deshmukh and Borle (1975) technique is utilised for alcohol extract, the procedure is carried out utilising ethyl alcohol (95%) for 3 hrs/60°C instead of water. The filter paper was then used to filter the extract (Whattman). The extract is then diluted using a drier, and a certain weight is extracted from it for the dilution process.

Ginger and Cinnamon Extracts Effect on Bacterial Isolates

To show how plant extracts affect bacterial isolates, *E. coli* and *P. aeruginosa* isolates were given gradient concentrations of 5, 15, 25, 35 and 40 mg/ml ginger plant and cinnamon plant, respectively, while both isolates received gradient concentrations of alcohol extracts from both plants at 10, 20, 30, 40 and 50 mg/ml.

Antibiotic Effect on Bacterial Isolates

After 24 hours of incubation at 37°C, a colony of bacteria was observed to be growing on its PDA media, 10 ml of the broth of each bacterial growth in the media was transferred to test tubes. About 0.1 ml of both bacterial extracts with 0.05 ml of amoxicillin and ampicillin was placed on a petri dish containing culture medium.

Results and Discussion

The results showed the effect of aqueous and alcohol extracts for ginger and cinnamon in the effective growth

of two kinds of bacteria *P. aeruginosa* and *E. coli*, which was found to be improved.

pH Measurement of Cinnamon and Ginger

pH of the cinnamon extracts was 6.5, while the ginger extract was 6.1. The pH value affects the nature of the amino acids when proteins interacting with the peptidoglycan layer that forms the bacteria wall membrane (Mahboubi et al., 2012), and also affects the effective locations of bacterial membrane enzymes and microbes (Atlas, 1995).

Effect of Plant Extracts and Antibiotics on Bacterial Isolates

The effects of cinnamon and ginger extracts on *P. aeruginosa* and *E. coli* were demonstrated by the results as shown in Figures 1 and 2. The highest percentage of the impact of ginger extract on *P. aeruginosa* were at 40 mg/ml, and the highest percentage of effect of alcoholic extract were 40 and 50 mg/ml at a concentration of 4.5 mg/ml with significant differences from the other treatments that agreed with Akram et al. (2011). This indicated the effectiveness of ginger against microorganisms. The inhibitory activity may be due to medicinal plants that contain most of the active ingredients especially tanning materials including

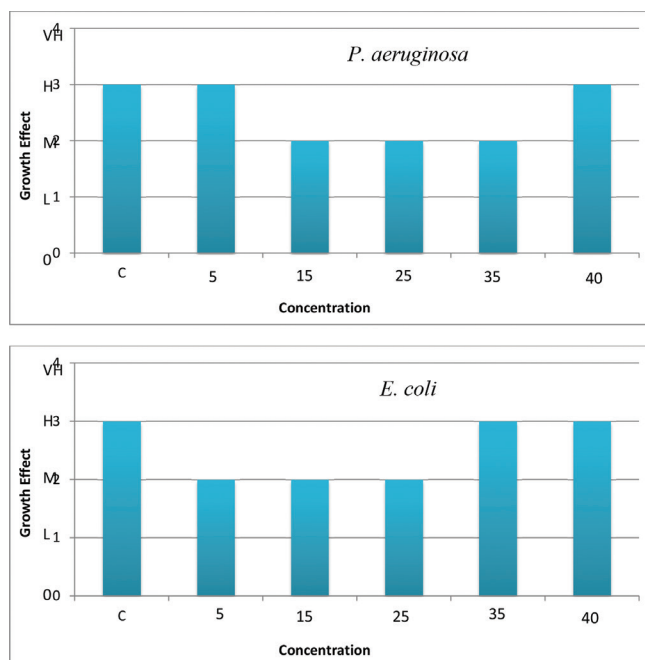


Figure 1: The aqueous extract activity of *Cinnamomun zeylanicam* and *Zingiber officinale* in growth of *P. aeruginosa* and *E. coli*.

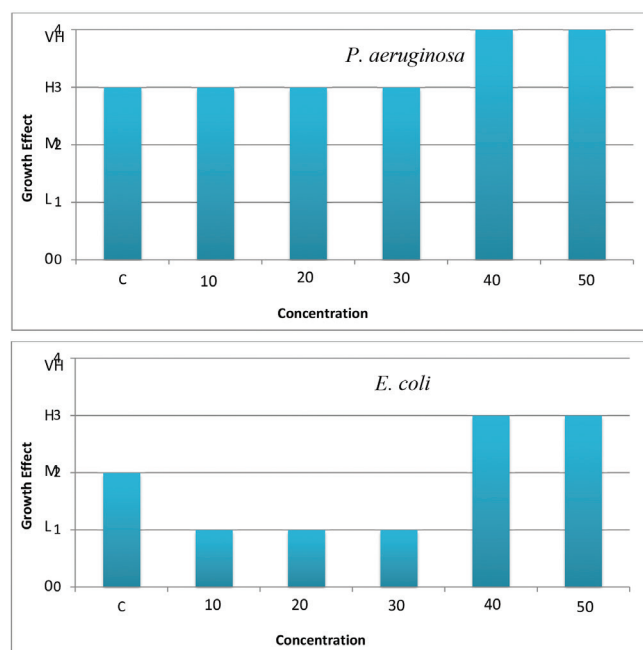


Figure 2: The effect of alcohol extract of *Cinnamomum zeylanicum* and *Zingiber officinale* in the growth of *P. aeruginosa* and *E. coli*.

tannic acid which affects the microorganisms (Core and Tariq, 2015).

Ginger contains many active compounds (alkaloids, phenols, zingerone, gingerols) which inhibit the growth of bacteria (Chrubasik et al., 2005), while cinnamon extract contains cinnamaldehyde, benzoic acid and benzaldehyde (Chericoni et al., 2005), in addition to certain oils (Gupta et al., 2008). Many medicinal plants produce secondary metabolites and oils that act as anti-bacterial, anti-fungal and microbial (Bigovic et al., 2017; Kamali et al., 2015). Aqueous and alcoholic extracts are antioxidants and anti-bacterial because they contain different phenolic compounds (Mokhte et al., 2014). Also, their effect is directly proportional to the concentration of extract; so the higher concentration of the extract leads to an increased inhibition rate (Deshand, 2013).

Amoxicillin and ampicillin antibiotics were also utilised (0.05 mg), showing reduction in the growth of *E. coli*, whereas *P. aeruginosa* was shown to be resistant to the antibiotic while the ampicillin did not show any effect (Table 1) because *P. aeruginosa* has self-resistance due to low permeability of the outer membrane, which is surrounded by peptidoglycan (Xiau et al., 1998).

Table 1: Effect of Amoxicillin and Ampicillin on *P. aeruginosa* and *E. coli*

Bacteria	Amoxicillin (0.05 ml)	Ampicillin (0/05 ml)
<i>P. aeruginosa</i>	-	-
<i>E. coli</i>	+	-

In addition, the anti-amoxicillin prevented the growth activity of *E. coli* at 0.05 mg. However, the antibiotic has negative impacts such as, affecting liver cells and producing gastric disorders; therefore, must not be consumed by children and pregnant women. Certain symptoms are browning of teeth and accumulating in the teeth during the growth period (El-Gali et al., 2012). The cause of bacterial resistance to antimicrobial is that bacteria contain endotoxin in their cell wall and some strain produces enterotoxins, causing non-blood watery diarrhea (Levinson and Jauetz, 2000).

P. aeruginosa showed more resistance to aqueous and alcohol extracts (Figures 3 and 4), and *E. coli* showed second levels resistance to plant extracts and antibiotics.



Figure 3: The effect of aqueous and alcohol extracts of cinnamon plant on the *E. coli* bacteria comparing with control.

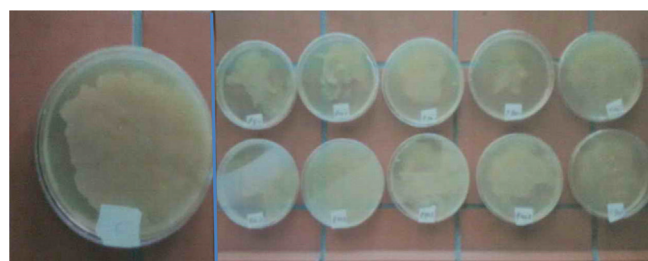


Figure 4: The effect of aqueous and alcohol extracts of ginger plant on *P. aeruginosa* compared with control.

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