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ORIGINAL ARTICLE

Antibacterial Effect of Onion's Infusion and Garlic's Infusion on *Escherichia Coli* Isolated from Urine Samples

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Abstract

Introduction many searchers studies properties of Onion extract and garlic extract, but they do not study infusion effect of garlic and onion against bacteria
The Aim to know antibacterial activity of Onion's Infusion and Garlic's Infusion
Methodology searcher prepared garlic infusion for many periods, and onion infusion for many periods also, and study antibacterial activity against *Escherichia Coli* Isolated from Urine Samples
Results : thirty urine samples were collected to detect the presence of E. coli and the study found that (26) samples contained *Escherichia Coli* bacteria at a rate of (86.66%) through phenotypic and microscopic diagnosis and then diagnosed with Vitek, infusion garlic and onion separately for different periods of time and with different concentrations, and it was found that the highest concentration of 100ppt was more effective on inhibiting the growth of bacteria, the study also tested the synergistic and antagonistic activity of both infusions on the inhibition of bacterial growth.
Conclusion The activity of preventing the growth of bacteria was enhanced by prolonging the infusion of garlic or onions. Additionally, neither a synergistic nor an inhibitory effect is related to concentration changes.

Keywords: Antibacterial activity, E. coli, Garlic, Onion, Urine.

1 Introduction

1.1 Onion characteristics Allium *cepa*

With more than 700 species, the Allium genus of the Liliaceae family—which includes the onion—is the most significant and extensively distributed [1]. Constitute a sizable percentage of the global vegetable. Allium bulbs are widely used as a food flavoring and valued not just for their distinctive flavor and aroma but also as significant sources of healthy components [2]. The Allium genus has long been known to be a rich source of secondary metabolites with a variety of health advantages, including polyphenols, phenolic acids, their derivatives, flavonoids, and flavonoid polymers [3]. The species Numerous biological features of allium have been demonstrated, including the ability to scavenge free radicals and function as an antioxidant, protect cardiovascular illnesses, and have anti-inflammatory and antiplatelet effects. favorable hematological effects, including the ability to

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suppress the growth of all examined microorganisms, including bacteria, fungus, viruses, and parasites, as well as the ability to prevent carcinogenicity [4]. Allium species vary in flavor, form, and color, but they also have similar biochemical, phytochemical, and nutritional features. However, because different Allium species contain variable amounts of useful components, their biological activities are diverse [5].

1.2 Garlic characteristics *Allium sativum*

Garlic has a respectable medicinal reputation, is excellent for the prevention of flu, skin diseases, and colds and infallible disinfectant for the intestine, a clove of garlic is a reservoir of highly effective healing active ingredients such as allicin, sulfur, and B vitamins, it has anti-helminthic properties against ascarids and pinworms, antimucolytic, hypotensive, expectorant, digestive, carminative, antiseptic, and hypoglycemic [6]. The role of this plant in the regulation of cholesterol and triglycerides and in improving the relationship between LDL cholesterol and HDL cholesterol that is between bad lipoproteins, has now been widely demonstrated, which promotes the formation of cholesterol deposits in the arterial walls, and good lipoproteins, i.e., those that work as tiny arteries sweepers, removing harmful accumulations of cholesterol [7]. It can be useful in chronic infections caused by Candida albicans, and in those of the system Notable properties of garlic are also recognized as “spicy” it would help to maintain active and healthy sexuality, being a food with aphrodisiac properties, above all thanks to the positive action, it exerts on circulation in general [8].

1.3 Allicin was antibiotic and antibacterial

This very important substance is released when garlic is" damaged ", or broken and cut, especially through chewing. In this way, the garlic also releases its pungent odor. In nature, this substance has the task of defending the plant from parasite aggression, so by consuming garlic this antibacterial characteristic is preserved which gives garlic its beneficial properties, especially when consumed raw [9]. The precious synergy of active ingredients, vitamins, and minerals gives this bulb excellent properties, recognized by science [10, 11].

1. antiseptics, especially those directed towards the gut, which assist to clear the body of parasites and diseases (and also act as a vermicide), are helpful in cases of dysentery, bloating, and stomach cramps.
2. Digestive, as it promotes stomach secretions due to certain enzymes, purifying, as it aids in the removal of heavy metals (which build up in the liver, kidneys, and lungs), functioning as a chelator by binding to the metal and making removal easier.
3. Antioxidants, sprouting garlic in particular being credited. Because it decreases blood sugar levels and fights diabetes, hypertension, and high cholesterol, garlic is beneficial for heart health.
4. anticancer, because to a combination of bacterial and purifying qualities, is thought to be helpful in avoiding stomach cancer.

2 Escherichia Coli

Escherichia coli is a gram-negative Brevis bacillus with blunt ends, motile, and no spores. Most E. coli strains are not pathogenic, but some serotypes can cause severe food poisoning or food contamination, harmless strains are part of the normal flora in the human gut, make vitamin K, prevent the growth of other pathogenic bacteria in the gut, and are beneficial to the human body [12]. *Escherichia coli* are often spread into the environment through fecal emissions, and they thrive in fresh feces in a well-oxygenated environment for about 3 days, after which the bacterial count declines [13]. Its genus name Escherichia comes from its discoverer, Theodor Escherichia. When Escherichia was trying to identify the causative agent of cholera in 1885, he isolated *Escherichia coli*, which he originally named Bacterium coli commune [14]. *Escherichia coli* and other facultative anaerobic bacteria make up 0.1% of the gut microbiome, and fecal-oral infection is the main route of transmission for pathogenic strains. It can survive outside the human body for some time, so it has become one of the microbial indicators in environmental hygiene testing. *Escherichia coli* is a member of the Enterobacteriaceae family and is frequently used in scientific research as a model organism for bacteria [15]. Each person excretes an average of 1×10^{11} to 1×10^{13}, E. coli bacteria in their feces per day, various fecal bacteria, and similar bacteria living in soil or plant degradants (the most common being Enterobacter aerogenes) are grouped in the "coliform" group. *Escherichia coli* does not form endospores and can grow in the presence of bile salts, gram-positive bacteria do not, this flora can utilize lactose and produce gas, bacteria are easy to culture and easy to distinguish from other bacteria, so they are ideal indicator bacteria, unless there are special heteromorphic bacteria that increase the difficulty of identification, abnormal lactose fermentation

may represent a health problem [14]. In the field of water purification and sewage treatment, because *Escherichia coli* is very abundant in feces, it is often used as a sign to check whether the water source is contaminated by feces, the measurement standard is the coliform index, in addition, E. coli is mostly harmless [16].

3 Materials and methods

The search included a study of 30 Urine samples collected from both sexes and of different ages between 5-70 years, the bacteria were initially diagnosed by culturing them on the medium of the MacConkey, then stained with a gram stain, and then diagnosed with a Vitek device. The study found 26 positive isolates from this sample with a percentage of 86.66%.

3.1 Preparing the garlic infusion

The garlic cloves were thoroughly peeled, crushed, and then placed in sterile distilled water for a variety of periods as follows (1 hour, two hours, four hours, 10 hours, 24 hours).

3.2 Preparing the onion infusion

The same way to prepare garlic infusion

3.3 Study of antibacterial efficacy

The searcher prepared the following concentrations of onion infusion and garlic infusion, each separately (10 ppt, 20 ppt, 30 ppt, 50 ppt, and 100 ppt) on MacConkey and Nutrient Agar media to study the inhibitory activity of these concentrations. Cork borer was used to Make wells (10mm) on culture media, bacteria cultured on media by spreading method.

4 Result

4.1 Onion antibacterial activity

Table 1: Comparison of the clinical and hemodynamic variables for the study groups.

Conc.	Infusion for 1 hour	Infusion for 2 hours	Infusion for 4 hours	Infusion for 10 hours	Infusion for 24 hours
	Inhibition zone (mm)				
10 ppt	-	-	-	4 ± 1	4 ± 2
20 ppt	-	4±1	5±2	7±1	8±2
25 ppt	6±1	6±2	8±1	8±2	10±1
50 ppt	9±1	9±1	10±2	13±2	15±1
100 ppt	13±1	18±2	20±1	24±1	29±2

The results of Table 1 showed that the high concentration of 100 ppt more than the other concentrations had an effect on inhibiting the growth of bacteria, followed by the concentration of 50 ppt, and the concentration of 10 ppt was not effective at the different times of the onion infusion, and the results showed that the duration of the onion infusion 24 hours at the concentration of 100 ppt was close to the duration of the infusion of 10 hours, but The difference was significant between the 10-hour infusion and the 1-hour infusion at 100 ppt.

4.2 Garlic antibacterial activity

The results of Table 2 indicated that there was a difference in the effect on bacterial growth between the different concentrations, where the concentration of 100 ppt came in the first level in terms of inhibiting bacterial growth, and the concentration of 50 ppt came in second place, and the concentration of 10 ppt had little effect on bacterial growth. The garlic infusion period affected the growth of bacteria, as we note that there is a difference between infusion of garlic for 24 hours and infusion for 10 hours, and we did not notice a difference between infusion of garlic for 10 hours and infusion it for 4 hours.

Table 2: Comparison of the clinical and hemodynamic variables for the study groups.

Conc.	Infusion for 1 hour	Infusion for 2 hours	Infusion for 4 hours	Infusion for 10 hours	Infusion for 24 hours
	Inhibition zone (mm)				
10 ppt	-	-	4±1	5±2	7±1
20 ppt	-	4±2	6±2	8±2	12±1
25 ppt	7±1	8±2	8±2	11±2	13±1
50 ppt	9±2	10±1	11±1	15±2	16±2
100 ppt	14±2	16±1	21±2	23±1	30±1

4.3 Antagonistic or synergistic effect

Antagonistic or synergistic activity (24 hours infusion) (1:1 concentration ratio)

Table 3: synergistic and antagonistic effects.

Concentration	Inhibition zone	Result
10 ppt	12±1 mm	No synergistic or antagonistic
20 ppt	13±2 mm	antagonistic
25 ppt	23±1 mm	synergistic
50 ppt	24±1 mm	No synergistic or antagonistic
100 ppt	27±1 mm	antagonistic

At the concentration of (1:1) between onions and garlic, from Table 3 it was found that the concentration of 10 ppt did not show any inhibitory or synergistic relationship between them, as well as the case at the concentration of 50 ppt, and the two concentrations of 20 ppt and 100 ppt showed an inhibitory correlation between the infusions of onions and garlic, while the only concentration that showed a synergistic relationship Between the two infusions is 25 ppt.

5 Discussion

Onion antibacterial activity

The effect of the higher concentration was more than other concentrations on the growth of bacteria, which is consistent with Zhao et al., 2021 findings [16], and the increase in the infusion time led to an increase in the inhibitory effect, and the reason may be due to the increase in the absorption of active substances from onions as mentioned Gao et al., 2021 [17]. The effect of onion infusion was active in inhibiting bacterial growth, and the result was consistent with what was Grode et al., 2019 reported [18]. The lowest concentration of onion infusion was not affecting the growth of bacteria, and the reason may be due to the dispersal and loss of active substances among the other concentrations as Nicastro et al., 2015 mentioned [19].

Garlic antibacterial activity

We note from Table 2 that the effect of garlic infusion at the highest concentration of 100 ppt was higher than that of onion infusion at the same concentration, and that garlic infusion was effective in inhibiting bacterial growth, which is consistent with what Abe et al., 2020 and Feng et al., 2021 mentioned [20, 21], but at low concentration Infusion of garlic reduces its effect accordingly, and this agrees with what Cheng et al., 2020 mentioned [10].

Antagonistic or synergistic effect

From Table 3, we find that the inhibitory or synergistic effect is not related to increasing or decreasing the concentration, and this agrees with what Awan et al., 2019 found [22], and it does not agree with what Kma L. 2013 mentioned [23], which sees that increasing the concentration leads to an increase in the synergistic effectiveness, and it also differs with what Gho & Ha. 2021 founded [24] that lowering the concentration lowers the synergistic efficacy.

6 Conclusion

The activity of preventing the growth of bacteria was enhanced by prolonging the infusion of garlic or onions. Additionally, neither a synergistic nor an inhibitory effect is related to concentration changes.

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