

Assessment of Antimicrobial Activity of Onion Extract (*Allium cepa*) on *Staphylococcus aureus*; *in vitro* study

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Abstract— The methanol and aqueous suspensions of the dried *Allium cepa* (Liliaceae) bulbs extract was screened for its antimicrobial activity using the agar-well diffusion method. It is tested against Gram-positive bacteria (*Staphylococcus aureus*). The suspensions were tested at concentrations of 1, 10, 100 and 1000 µg/ml. All suspensions showed an inhibitory effect against tested bacteria. The highest zone of inhibition was estimated with the highest concentration of methanolic suspension (29 mm). The highest effect of the aqueous suspensions reached to 23 mm with the concentration of 1000 µg/ml. The other concentrations either methanolic or aqueous showed various inhibitory effect on the tested bacteria.

Keywords— Antimicrobial activity, *Allium cepa*, *Staphylococcus aureus*, traditional herbal.

INTRODUCTION

Since ancient times onion (*Allium cepa*, L.) have been an important dietary resource and have also been of interest for medical purposes [1]. *Allium* is the largest and important representative genus of the *Liliaceae* family comprises 450 species. Onion (*Allium cepa*) is a bulbous plant widely cultivated in almost every country of the world [2]. Onions are easily propagated, transported and stored. Onions are effective against common cold, heart disease, diabetes, osteoporosis, coughs and sore throat [3]. It is rich in proteins, carbohydrates, sodium, potassium and phosphorus [4]. Onion was consumed throughout Europe during the Middle ages and was later thought to guard against evil spirits and the plague, probably because of their strong odor [5]. Folk healers traditionally used onion to prevent infections is among the oldest cultivated plants used both as a food and for medicinal applications [6]. The plant is used as traditional remedy in the treatment of various disorders so it has particular medicinal importance [7]. Plants are rich in a wide variety of secondary metabolites, such as tannins, terpenoids, alkaloids and flavonoids, which have been found *in vitro* to have antimicrobial properties [8]. Onion bulbs contain a good number of phytochemicals, most of which are hydrocarbons and their derivatives [9]. Several authors have reported pharmaceutical activity of extracts of *Allium cepa* including

anti-tumor, anti-diabetic, antioxidant, antimicrobial, anti-allergic and molluscicidal activity [4]-[10]-[11]. *In vitro* studies have shown onion to possess antibacterial, antiparasitic, and antifungal activity [1]-[12]-[13].

MATERIAL AND METHODS

Tested microorganism

The test microorganism (*Staphylococcus aureus*) obtained from the Misurata Central Hospital Laboratory. Was characterized by standard microbiology methods. The pure cultures were subcultured on nutrient agar slants and kept at 4°C until ready for the study.

Collection of Plant Materials

Allium cepa (white onion bulb) was bought from Misurata local vegetables market. It was identified in the herbarium of the Department of Botany, Faculty of Science, Misurata University.

Extraction of bioactive constituents

The onion bulb was washed with freshly prepared sterile distilled water. The outer covering of the bulb was manually peeled off and the fleshy part of the onion was rewashed with freshly prepared sterile distilled water. A part of 50.0 gm of the onion bulb was cut into small parts and squashed. The squashed preparation sucked at 50 ml of methanol for 8hs with 10 minutes interval shaking. The extraction was filtered using muslin cloth and then Whatman no. 1 filter paper. The filtrate was evaporated at 45°C to dryness and the dried substance was kept in sterile bottle under refrigerated condition until use.

Preparation of plant materials

The dry weight of the extract was obtained by allowing the solvent to evaporate and was used to determine concentration in mg/mL. methodology based on [14]. Four concentrations of the extract (1000, 100, 10, and 1 µg/ml) were prepared by resuspending the dried extract in methanol. Other same concentrations were resuspended in sterile distilled water (aqueous).

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Preparation of Inoculum

About 18 hour broth culture of the test bacteria isolate was suspended into sterile nutrient broth. It was standardized according to National Committee for Clinical Laboratory Standards [15] (NCCLS, 2002) by gradually adding normal saline to compare their turbidity to McFarland standard of 0.5 which is approximately 1.0×10^6 cfu/ml.

Antibacterial activity

The antibacterial activity of the crude extract was determined in accordance with the agar-well diffusion method described by [16]. The bacterial isolate was first grown in a nutrient broth for 18 h before use and standardized to 0.5 McFarland standards (106 cfu/ml). Two hundred microliter of the standardized cell suspensions were spread on a Mueller-Hinton agar (Oxoid). Wells were then bored into the agar using a sterile 6 mm diameter cork borer. Approximately 50 μ l of the methanolic and aqueous crude extract suspensions at different concentrations (1, 10, 100 and 1000 μ g/ml) separately were introduced into the wells, allowed to stand at room temperature for about 2 h and then incubated at 37°C. Controls were set up in parallel using the solvent and sterile distilled water were used to reconstitute the extract. The plates were observed for zones of inhibition after 24 h.

RESULTS AND DISCUSSION

The present study investigates an antimicrobial activities of *Allium cepa* (onion) extract against tested bacteria (*Staphylococcus aureus*). The antibacterial activities of the methanolic suspension shows high effect at all concentration in comparison with the aqueous suspension examined at this study. Methanolic suspension of *Allium cepa* at 1000 μ g/ml was found to be more effective than the other concentrations with an inhibition zone reached to 29 mm (Table 1). The other concentrations used (1, 10 and 100 μ g/ml) of the methanolic suspension of *Allium cepa* gave an inhibition zones of 24, 25 and 26 mm, respectively.

TABLE I

Antibacterial Activities Profile of *Allium cepa* Extract Resuspended in Methano and Sterile Distilled Water Against *Staphylococcus aureus* Bacteria.

Extract	Zone of inhibition (mm)			
	(1 μ g/ml)	(10 μ g/ml)	(100 μ g/ml)	(1000 μ g/ml)
Methanolic	24 \pm 1.3	25 \pm 0.5	26 \pm 0.3	29 \pm 1.0
Aqueous	13 \pm 0.7	14 \pm 0.4	18 \pm 0.8	23 \pm 0.4

All concentrations of the aqueous suspension of *Allium cepa* extract showed an inhibitory effect against tested bacteria. An inhibitory zone of 23 mm was the highest which obtained by the effect of the concentration of 1000 μ g/ml. The lowest effect (13 mm) was gained with the concentration of 1 μ g/ml. Aqueous suspensions of 10 and 100 μ g/ml showed an

inhibitory zones of 14 and 18 mm, respectively.

Reverence [17] reported that petroleum ether, ethyl acetate and chloroform extracts of *Allium cepa* inhibited the growth of *Staphylococcus aureus* at both lower and higher concentration. In contrast, it was resistant to fresh *Allium cepa* extracts, also Butanol, ethanol and water extracted samples were ineffective to control the growth of *Staphylococcus aureus* at any concentration. Reverence [18] also reported that petroleum ether, methanolic and aqueous extract of bulbs of *Allium cepa* was found to be inactive against *staphylococcus aureus*. Reverence [19] hexane, diaxon, ethanol extracts of scale leaves of *Allium cepa* at a concentration of 1000 μ g/ml showed an inhibition zone of 8 mm for each against gram positive bacteria *Staphylococcus aureus*, where is the aqueous, isopropyl alcohol and n-Butanol extract of the same plant showed no effect.

The antibacterial activity of onion juice can be attributed to the presence of flavonoids and polyphenols which has been reported to have broad spectrum of antibacterial activity [20]. Polyphenols from plants have been reported to have antibacterial activity [21]. Some of the advantages that herbal preparations have over the synthetic ones are that they do not act directly on bacteria but create an adverse environment for them, thus threatening their survival and they have also been found to deter the development of resistant strains of microorganisms [22].

The inhibitory effect of the extract of tasted plant extract against pathogenic bacterial strain (*Staphylococcus aureus*) can introduce the plants as a potential candidate for drug development for the treatment of ailments caused by this pathogenic. The activity of the *Allium cepa* extract suspended in methanol or at the sterile distilled water against the bacterial strain *Staphylococcus aureus* investigated in this study is agreed with other previous works which showed an inhibition of growth of the most strains tested. This study showed fear results compared to the researches mentioned above. The effect rate may differ from one to another

CONCLUSION

It is concluded from this study that *Allium cepa* extract has antimicrobial activity against *Staphylococcus aureus*. It is expected that using natural products as therapeutic agents will probably not elicit resistance in microorganisms. It is essential that research should continue to isolate and purify the active components of this natural herb and use in experimental animals.

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