

Phytochemical Constituents and Antibacterial Activity of Onion (*Allium cepa*) Bulb and Leaf Extracts against *Salmonella Typhi* and *Staphylococcus aureus*

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Abstract—The widespread occurrence of drug-resistant bacteria poses a serious threat to public health despite the continued development of new antibiotics. Onion (*Allium cepa*) is one of the most widely cultivated species of the genus *Allium* and contains diverse phytochemicals with potential antimicrobial properties. This study determined the phytochemical constituents and in vitro antibacterial activities of onion bulb and leaf extracts against *Salmonella Typhi* and *Staphylococcus aureus*. Ethanolic and aqueous extracts of the bulb and leaves were prepared using cold maceration. Qualitative phytochemical screening was conducted using standard methods, while antibacterial activity was evaluated using the agar-well diffusion method at concentrations of 50, 100 and 200 mg/mL. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were also determined. Qualitative phytochemical analysis revealed the presence of flavonoids, tannins, saponins, glycosides, alkaloids and steroids, particularly in the leaf extracts. The bulb extracts generally demonstrated greater antibacterial activity than the leaf extracts. The ethanolic bulb extract at 200 mg/mL produced the largest extract-associated inhibition zone of 17.00 ± 1.41 mm against *Salmonella Typhi*, while the ethanolic leaf extract at the same concentration produced an inhibition zone of 11.50 ± 0.70 mm against *S. aureus*. The ethanolic extracts demonstrated antibacterial activity at all tested concentrations and were generally more active than the corresponding aqueous extracts. No inhibition zone was recorded for the aqueous leaf extract at 50 mg/mL against *S. aureus*. The aqueous leaf extract produced the highest MIC and MBC values of 50 and 100 mg/mL, respectively, against *S. aureus*, indicating comparatively low activity. Conversely, the ethanolic bulb extract produced the lowest MIC and MBC values of 6.25 and 12.5 mg/mL, respectively, against *Salmonella Typhi*. Ciprofloxacin, used as the positive control, produced inhibition zones of 35.00 ± 4.24 mm against *Salmonella Typhi* and 24.00 ± 2.82 mm against *S. aureus*. The antibacterial activity of the onion extracts may be associated with their phytochemical constituents. These findings demonstrate that ethanolic onion bulb extract possesses promising in vitro antibacterial activity, although further studies are required to identify its active compounds and establish its safety and therapeutic efficacy.

Index Terms—*Allium cepa*, antibacterial activity, flavonoids, *Salmonella Typhi*, saponins, *Staphylococcus aureus*

I. Introduction

Onion (*Allium cepa* L.) is the most widely cultivated species of the genus *Allium* (Grubben and Denton, 2015). The plant portion commonly used is the bulb, which is utilized as a food ingredient to give flavour and aroma to a great variety of dishes. Onions are one of the world's most popular vegetables and

have been cultivated for their intrinsic properties for more than 4000 years (Hanelt, 2020). They are thought to have been originally domesticated in the mountains of Turkmenistan and Northern Iran (Brewster, 2018). Onions are a versatile vegetable used worldwide to add flavour to an extensive variety of cuisines. Onions are also valued for their purported health benefits, some of which have been attributed to the presence of organosulphur compounds (Keusgen, 2020). Together, the onions culinary versatility, flavour, long storage life and adaptation across agro-ecosystems has made it one of the world's most popular vegetables, and the consequent demand makes it a regularly traded commodity in both domestic and global markets (Brewster, 2018).

The onion plant has a fan of hollow, bluish-green leaves, and its bulb at the base of the plant begins to swell when a certain day-length is reached. The bulbs are composed of shortened, compressed, underground stems surrounded by fleshy modified scale (leaves) that envelop a central bud at the tip of the stem. In the autumn (or in spring, in the case of overwintering onions), the foliage dies down and the outer layers of the bulb become drier, and brittle. The crop is harvested and dried and the onions are ready for use or storage. The crop is prone to attack by a number of pests and diseases, particularly the onion fly, the onion eelworm, and various fungi which can cause rotting. Some varieties of *Allium. cepa*, such as shallots and potato onions, produce multiple bulbs (Fernandes *et al.*, 2018). Onions are cultivated and used around the world. As a food item, they are often served raw as a vegetable or part of a prepared savory dish, but can also be eaten cooked or used to make pickles or chutneys. They are pungent when chopped and contain certain chemical substances which may irritate the eyes (Votto *et al.*, 2020).

Allium cepa has been traditionally used for its remedial characteristics in the management of various ailments. The essence of *Allium. cepa* proliferated into ancient Greece where it was used as a blood purifier for athletes. During the invasion of Rome, gladiators used to rub down onion juice to firm up the muscles. The Greek and Phoenicians sailors consumed it to prevent scurvy. Moreover, the Greek physician Hippocrates, used to prescribe onion as a wound healer, diuretic and pneumonia fighters. In the 6th century, onion was described as one of the indispensable vegetable or spice and medicine in India (Kabrah, 2020). *Allium. cepa* is commonly taken raw or as a decoction for treating infectious diseases. It is also used in a wide variety of preparations for internal and external use to relieve several ailments including digestive problems, skin diseases, metabolic disease, insect bites and others (Silambarasan and Ayyanar, 2015).

Development and improvement of the resistance of microorganism for human infection then needed new antimicrobial discoveries and developments. Plants produce chemical compounds derived from plant secondary metabolite compounds, which can have an effect as antimicrobial. A number of studies have been carried out in various parts of the world by extracting plants to searching for antimicrobial activity. Main groups of plant compounds with antimicrobial activity had been reported, such as phenolics (simple phenols, phenolic acid, flavonoids, flavones, flavonols, tannins, coumarins and quinones); terpenoids;

essential oils; an also, alkaloids. Allium is spread over almost 750 species throughout the hemisphere (Lampe, 2016).

Bacterial resistance is of growing concern to medical practice worldwide which impairs the effectiveness of antimicrobial agents (Thomson *et al.*, 2018) resulting in considerable increased illnesses and death rate. *Staphylococcus aureus* is a notorious antibiotics resistant bacterium, infections caused by antibiotics resistant strains have reached epidemic proportions worldwide. *S. aureus* is a major cause of nosocomial infections of surgical wounds and infections associated with indwelling medical devices (Hannan *et al.*, 2018). *Salmonella typhi* is another important pathogen that causes enteric fever, an endemic disease in the tropic and sub-tropic (Asia and Africa) which has become a serious public health problem in developing countries of the world. Increasing frequency to several antibiotics has also been reported in several strains of *Salmonella* (Uhlemann *et al.*, 2022). One of the measures to combat the increasing rate of resistance in the long run is to have continuous investigation for new, safe and effective antimicrobials as alternative agents to substitute with effective one.

Onion (*Allium cepa*) is an important vegetable crop grown by farmers in northern part of Nigeria (Lekshmi *et al.*, 2015). The use of plant extracts, with known antimicrobial properties, can be of great significance in the treatment of various microbial infections. In the last decade, numerous studies have been conducted in different countries to prove such efficiency in number of medicinal plants. Onions are consumed as young green plants or as bulbs mainly for its flavor or to enhance the flavor of food. However most of the peoples especially thus that living in rural areas are not aware of its medicinal benefits. Therefore, it is important to carry out this research to bring awareness to the people about medicinal importance of onion bulbs and leaves as well as antibacterial activity against *staphylococcus aureus* and *salmonella typhi*. Concern has been expressed about the rising prevalence of pathogenic microorganisms, which are resistant to the newer or modern antibiotics that have been produced in the last three decades. Also, the problem posed by the high cost, adulteration and increasing toxic side effects of these synthetic drugs coupled with their inadequacy in diseases treatment found more especially in the developing countries cannot be over emphasized. Coincidentally, the last decade has also witnessed increasing intensive studies on extracts and biologically active compounds isolated from plant species used for natural therapies or herbal medicine (Parton, 2020).

This has led to the search of new raw materials that can be used in developing new antimicrobial agents that can combat the increasing resistance by the pathogenic microbes. Extracts obtained from medicinal plants have been used over some time to in the manufacturing of herbal antimicrobial agents by pharmaceutical companies. However, over time some of the pathogenic microorganisms have been gaining resistance against some of the commercially produced herbal antimicrobial agents (Van-der *et al.*, 2021). This has led to the need for improving the antimicrobial capability of both commercially produced herbal and synthetic/conventional antimicrobial agents. Evaluation of the combined effect of herbal extracts with commercially produced antimicrobial agents and formulation of herbal extracts concoctions as a means of

developing new and improved antimicrobial agent (Garcha, 2018). The aim of this study was to determine the Antibacterial activity of ethanolic and aqueous extracts of red onions (*Allium cepa*) bulbs and leaves against *Staphylococcus aureus* and *Salmonella typhi*. To Analyzed the bioactive components presents in the ethanolic and aqueous extracts of red onion bulbs and leaves. To screen the antibacterial activities of ethanolic and aqueous extract of red onion bulbs and leaves on *Staphylococcus aureus* and *Salmonella typhi*. To determine the minimum inhibitory concentration (MIC) and minimum bactericidal concentrations (MBC) of the extracts against the bacterial isolates.

II. Materials and Methods

Sample Collection

Onions (*Allium cepa*) bulbs and leaves used in the present study was purchased from Kalgo Market, Kalgo Local Government, Kebbi State, Nigeria. They were identified and authenticated at the department of Biological sciences with voucher number FUBK-H-312, Federal university Birnin Kebbi, Kebbi State.

Experimental design of the plant extract

Cold maceration method of extraction as described by Sankeshwari *et al.*, (2022). was used in this study. Onions bulbs and leaves was skinned, sliced and washed using sterile distilled water and were dried at room temperature for four weeks. After four weeks of drying, the samples were pounded separately into powder forms. 100g of each onion bulbs and leaves powders were weighed separately and dissolved in different conical flasks containing 1000ml of ethanol (75%) (Ethanol extracts). Another 100g of the powder of each onion bulbs and leaves were weighed and dissolved in different conical flasks containing 1000ml of water (aqueous extracts). The flasks were corked and kept under agitation for 72 hours using rotary shaker. After 72 hours of agitation, the mixture comprising the solvent and the plant materials in each conical flask was filtered using muslin cloth of 200 µm pore size and what-man no. 1 filter paper, the filtrates was collected in separate beakers and labeled accordingly. The filtrates were then evaporated to dryness using water bath at 40 °C. Each dried extract was packed in a well labeled sterile sample container and stored in the refrigerator until further use.

Formation of extracts concentrations

Exactly 0.5g of the sample powdered ethanol extract was weighed and place into a crucible containing 1ml of distilled water obtained a concentration of 50mg/ml the same procedure was repeated for 1g, and 2g to obtained a concentration of 100mg/ml, and 200mg/ml of the ethanol extract. The same procedure was repeated for the aqueous extract.

Phytochemicals Screening

Phytochemical analysis of onion (*Allium Cepa*) bulbs and leaves extract was conducted to detect the presence of major bioactive compound using standardizes procedures. The methodologist and reagents used were referenced from Harbone (2016). and El-Olemyl *et al.*, (2018).

Alkaloids The presence of alkaloid was assessed using Mayers test as described by Harbone (2016). Two milliliters (2mL) of extract of the onion (*Allium Cepa*) was stirred with 2ml of 10% aqueous hydrochloride acid. For Mayer's reagent (potassium mercuric iodide) one milliliter (1mL) of the filtrate was treated with few drops of the reagent. Appearance of creamy precipitate indicated the presence of alkaloids in the extract. **2.Flavonoids** Flavanoid were detected according to a method as described by El-Olemyl *et al.*, (2018). Three milliliters (3mL) extract filtrates were mixed with 2mL of 10% sodium hydroxide (NaOH). A yellow color developed which indicated the possible presence of flavonoids compounds. **3. Glycosides** were detected using modified Fehling's test as described by El-Olemyl *et al.*, (2018). Two and half milliliter (2½mL) of 50% (H₂SO₄) were added to 5mL of the extracts in a test tube. The mixture was heated in boiling water for 15 minutes, cooled and neutralized with 10% NaOH. Five milliliter (5mL) of Fehling's solution (A & B) were added and the mixture was boiled. A brick red precipitate was observed which indicated the presence of glycosides. **4.Saponins** The frothing test was to detect saponins (El-Olemyl *et al.*, 2018). Two grams (2g) of the powdered extract were placed in a test-tube and mixed with 5mL distilled water. The solution was shaken vigorously and observed for persistent frothing which indicate the presence of saponin. **5 Steroids** Steroid was screened according to a method as described by Harbone (2016). Five-gram (5g) of the onion (*Allium Cepa*) powder was dissolved in 5mL of Chloroform, followed by filtration. Two milliliter of conc. sulphuric acid (H₂SO₄) was carefully added along the tube to form lower layer. A reddish brown color at the interface indicates the presence of steroidal ring. **6.Tannins** Tannin detection was carried out using ferric chloride test (El-Olemyl *et al.*, 2018). Five per cent Ferric Chloride solution were added drop by drop to 2-3mL of the extract. A dark green colored precipitate indicates the presences of tannins

Bacterial isolates use in the study

The test microorganisms were obtained from the Sir Yahaya Memorial Hospital laboratory, Birnin Kebbi, Kebbi State, Nigeria. Conventional biochemical tests were used such as gram staining, catalase and oxidase tests to identify and confirm the test organisms as *Stapylococcus aureus*, and *Salmonella typhi*. The isolates were obtained in pure cultured form and were subcultured into a nutrients agar plates for the analysis.

Media Preparation

All media used was prepared according to the manufacturer's directives. Agar (Fluka) was prepared by suspending 28grams of the medium in one liter of distilled water and sterilized by autoclaving at 121°C for 15mins and checked for sterility at 37°C for 24hours. The Muller-Hinton Agar (Biotec) was prepared by suspending 38 grams of the medium in one 30ml of distilled water. It was mixed well and boiled for about one minute and sterilized in an autoclave at 121°C for 15mins and checked for sterility at 37°C for 24 hours.

Antibacterial activity of plant extracts against the bacterial isolates

Evaluation of antibacterial activity was carried out using agar well diffusion method as described by Balouiri *et al.*, (2024). Mueller Hinton agar was prepared according to the manufacturer's instruction and

dispensed aseptically into petri dishes, after which they were allowed to solidified. The solidified medium was streaked entirely on the surface with overnight culture of the test organisms which was adjusted to 0.5 Mcfaarland turbidity standards using sterile swab stick. Four adequately spaced out wells were bored in the culture medium using a sterile 5mm diameter cork borer, after which each of the well were filled with the different concentrations of extracts (100 mg/ml, 150 mg/ml and 200 mg/ml). The remaining well which served as a positive control had a known antibiotics ciprofloxacin 500 mg/ml. The plates were allowed to stand for one hour for proper diffusion of extracts before incubation at 37 °C for 24 hours. The diameters of zones of inhibition observed were measured with a meter ruler and recorded in millimetres. This was done in duplicate.

Determination of Minimum Inhibitory Concentration (MIC) and Minimum bacterial Concentration (MBC) of the Plant Extracts

The minimum inhibitory concentration and minimum bactericidal concentration of the onion bulbs and leaves extracts on the test bacteria (*Staphylococcus aureus* and *Salmonella typhi*) was determine according to the method proposed by Shinkafi *et al.*, (2019). Twelve sterile test tube was obtain and 1ml of sterile nutrient broth was dispensed from test tube 2 to test tube 12, a stock solution of the sample extract was prepare i.e. 80mg of each crude extract was dissolve into 2ml of distilled water, 1ml of the stock solution was dispensed aseptically into tube 1 and 1ml into tube 2 and from the contents of test tube 2 a serial dilution was perform using 1ml transfer to tube 10, leaving tube 11 and 12 1ml was taken out from tube 10 and discard, 1:100 (10^{-2}) broth culture of the organism (*Staphylococcus aureus* and *Salmonella typhi*) was prepare separately and 1ml of the prepare broth culture was dispense into each test tube with exception of the tube 11 and 1ml of sterile nutrient broth was add to test tube, and will then incubate at 37°C for 24hours, the test tube was examine for turbidity in order to determine the MIC and MBC. The MIC was the concentration in the tube that fails to show evidence of growth (turbidity), just immediately after the last one that show growth. MBC was the two test tubes before the MIC test tube, which were culture on nutrient agar. The absent of growth after incubation indicate a positive result for MBC.

Statistical analysis

The data obtained were analyzed using statistical method. Results were expressed as Mean $\pm$ Standard deviation (SD), with n indicating the sample size. All statistical analyses were performed using the statistical package for the social science (SPSS version 2.1).

III. RESULTS

Qualitative phytochemical constituents of red onion bulbs (*Allium cepa*)

The result shows the qualitative phytochemical constituents of ethanolic and aqueous extracts of red onion bulbs. It indicates the presence (+) of all the phytochemicals constituents screened including; flavonoids, saponins, tannins, glycosides, alkaloids and steroids in aqueous extracts. The result also shows that tannins

and steroids were not detected (-) in ethanolic extract of onion bulbs (Table 4.1).

Table 3.1: Qualitative phytochemical Constituents of Onion Bulbs (*Allium Cepa*)

Parameters	Ethanolic Extract	Aqueous Extract
Flavanoids	+	+
Saponins	+	+
Tannins	-	+
Glycosides	+	+
Alkaloids	+	+
Steroids	-	+

Key: + = Detected

-- = Not detected

Qualitative phytochemical constituents of red onion leaf (*Allium cepa*)

The result shows the qualitative phytochemical constituents of ethanolic and aqueous extracts of red onion leaves, it shows that in aqueous extracts of red onion leaves, phytochemicals constituents including; flavonoids, saponins, glycosides, alkaloids and steroids were detected (+) and only tannin is not detected (-). The results also indicate the presence (+) of flavonoids, saponins, tannins and glycosides in ethanolic extract and alkaloids, steroids were not detected (-) (Table 4.2).

Table 3.2: Qualitative phytochemical Constituents of Onion Leaves (*Allium Cepa*)

Parameters	Ethanolic Extract	Aqueous Extract
Flavanoids	+	+
Saponins	+	+
Tannins	+	-
Glycosides	+	+
Alkaloids	-	+
Steroids	-	+

Key:

+ = Detected

- = Not detected

3.3 Antibacterial activity of red onion extract against *Staphylococcus aureus*.

The results indicate that ethanol extract of red onion bulbs and leaves recorded highest zone of inhibition 11.5 ± 0.70 and 10.0 ± 0.00 at the same concentration of 200mg/ml, least zone of inhibition in lower concentration (50mg/ml) of ethanolic and aqueous extracts of leaves and bulbs (2.50 ± 3.53) with no zone of inhibition recorded in aqueous extracts of red onion leaves (0.00 ± 0.00) at 50mg/ml. The result also shows

that positive control ciprofloxacin 500mg/ml used is more potent than the extract used, recording 24.00 ± 2.82 inhibition zone (Table 4.3).

Table 3.3: Antibacterial activity of onion extract of against *Staphylococcus aureus*

Onion Extract	50mg/ml	100mg/ml	200mg/ml	500mg/Ciprofloxacin
EB	5.00 ± 0.00	7.50 ± 0.70	11.5 ± 0.70	24.00 ± 2.82
EL	2.50 ± 3.53	6.50 ± 0.70	10.00 ± 0.00	
AB	2.50 ± 3.53	6.00 ± 0.00	9.50 ± 0.70	
AL	0.00 ± 0.00	5.50 ± 0.70	8.00 ± 0.00	

Keys: EB- Ethanol extract of onion bulbs, AB - Aqueous extract of onion bulbs, EL - Ethanol extract of onion leaves and AL- Aqueous extract of onion leaves

3.4 Antibacterial activity of red onion extract against *Salmonella typhi*

The result shows that 200mg/ml concentration of ethanolic extract of red onion bulbs recorded highest zone of inhibition 17.00 ± 1.41 which is followed by ethanol and aqueous extracts of leaves and bulbs (14.50 ± 0.00 and 13.00 ± 1.40). The results also show lower zone of inhibition in 500mg/ml concentration of ethanolic extract of bulbs, leaves and aqueous extracts of leaves, recording 5.00 ± 0.70 , 5.00 ± 0.00 and 2.50 ± 3.53 respectively. The results also indicate highest activity in positive control used (ciprofloxacin 500mg/ml), recording 35.00 ± 4.24 zone of inhibition (Table 4.4).

Table 3.4: Antibacterial activity of onion extract of against *Salmonella typhi*

Onion Extract	50mg/ml	100mg/ml	200mg/ml	500mg/Ciprofloxacin
EB	5.00 ± 0.70	9.50 ± 0.70	17.00 ± 1.41	35.00 ± 4.24
EL	5.00 ± 0.00	7.50 ± 0.70	14.50 ± 0.00	
AB	6.00 ± 0.00	6.50 ± 0.70	13.00 ± 1.40	
AL	2.50 ± 3.53	6.00 ± 0.00	10.5 ± 0.70	

Keys: EB- Ethanol extract of onion bulbs, AB - Aqueous extract of onion bulbs, EL - Ethanol extract of onion leaves and AL- Aqueous extract of onion leaves

Minimum inhibitory concentration and minimum bactericidal concentration of red onion extracts against *Staphylococcus aureus*.

The result shows that ethanol extract of bulbs recorded minimum inhibitory concentration and minimum bactericidal concentration of 12.5mg/ml and 25.0mg/ml indicating highest activity, aqueous extract of bulbs and ethanol extracts of leaves recorded the same results of 25.0mg/ml and 50.0mg/ml respectively. The results also indicate that aqueous extracts of leaves recorded least activity against *Staphylococcus aureus*, recording 50.0mg/ml and 100mg/ml of MIC and MBC results (Figure 4.1)

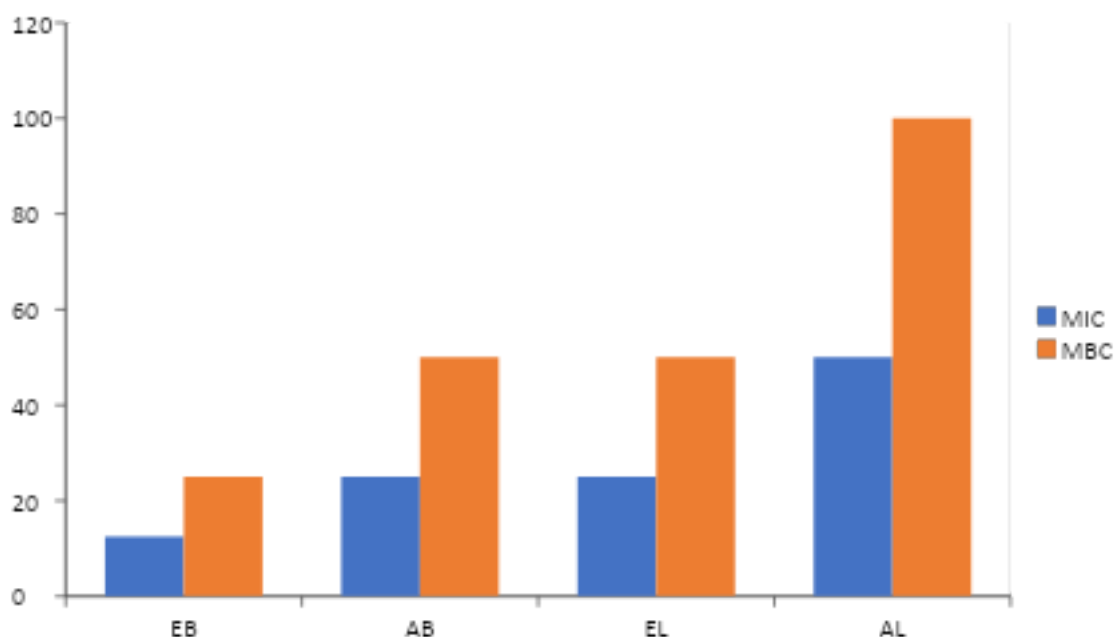


Figure 3.1: Minimum inhibitory concentration (MIC) and Minimum Bactericidal concentration (MBC) of Onion extract against *Staphylococcus aureus*

Keys: EB- Ethanol extract of onion bulbs, AB - Aqueous extract of onion bulbs, EL - Ethanol extract of onion leaves and AL- Aqueous extract of onion leaves

minimum inhibitory concentration and minimum bactericidal concentration of red onion extracts against *Salmonella typhi*

The results show that ethanol extract of bulbs recorded highest activity against *Salmonella typhi*, recording MIC and MBC results of 6.25mg/ml and 12.5mg/ml. Aqueous 1 extract of bulbs records 12.5mg/ml and 25.0mg/ml. aqueous and ethanol extracts of leaves recorded the same MIC and MBC results of 25.0mg/ml and 50.0mg/ml indicating least activity against *Salmonella typhi* (Figure 4.2).

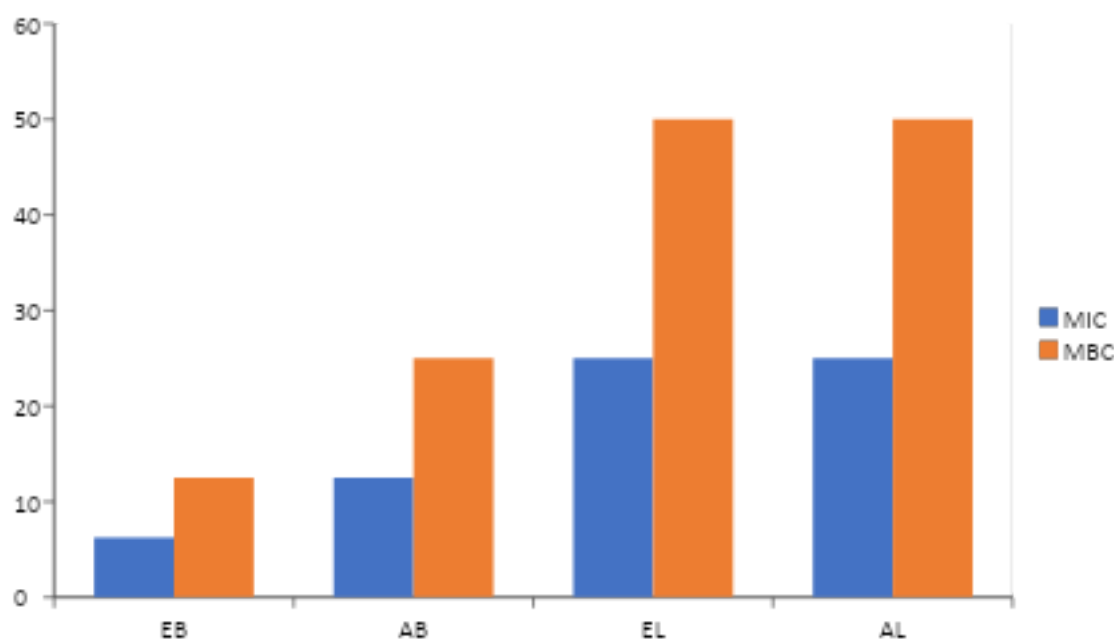


Figure 3.2: Minimum inhibitory concentration (MIC) and Minimum Bactericidal concentration (MBC) of Onion extract against *Salmonella typhi*

Keys: **EB**- Ethanol extract of onion bulbs, **AB** - Aqueous extract of onion bulbs, **EL** - Ethanol extract of onion leaves and **AL**- Aqueous extract of onion leaves

IV. DISCUSSION

The present study investigates phytochemicals and antibacterial activity of onions (*Allium cepa*) bulbs and leaves extract against *Staph aureus* and *Salmonella typhi*. Qualitative phytochemical screening of the extracts (ethanol and aqueous) from bulbs and leaves indicate the presence of important secondary metabolites including Flavonoid, Saponin, Steroid Tannins, Alkaloids, Glycoside in some extract while others are absent. The findings are in line with the results obtained by Josephine *et al.*, (2020). In his research of phytochemical and proximate analysis of onions bulbs, leaves and their mixture in which secondary metabolites found include Flavanoids, Saponins Steroid and glycoside in ethanol, methanol and aqueous extracts. Ethanol extract revealed the presence of more number of compounds compared to aqueous extracts in the survey which contradicts the results obtained by Williamsoet *al*, (2014) in which aqueous extracts recorded high number of secondary metabolites compared to ethyl acetate, ethanol and methanol extracts.

Antimicrobial activity of bulbs extract against the isolates is more effective in the study than leaves extract

with zone of inhibition at different concentration ranging from 2.50 ± 3.53 to 17.00 ± 1.41 and 0.00 ± 0.00 to 14.50 ± 0.00 respectively. The findings also reveal that the higher the concentrations of the extracts the higher the zone of inhibition recorded against the isolates (50mg/ml, 100mg/ml and 200mg/ml with 5.00 ± 0.0 , 7.50 ± 0.70 and 11.50 ± 0.70 as in ethanol extract of bulbs against *Staph aureus*) which correspond to the to the research of antimicrobial activity of onions against *enterococci* carried out by Irobiet *al* (2019) Which reported higher zone of inhibition in methalic and ethyl acetate extract of onions bulbs (24.4mm and 20.8mm).

Sensitivity results from the study also shows that *Staph aureus* was more resistance to the extracts than the *salmonella typhi* in which no zone of inhibition was recorded (0.00 ± 0.00) in aqueous extracts of leaves at 50mg/ml concentration. Bakht *et al*, (2017) Reported the same scenario of results in his research were *Salmonella shigella*, *Pseudomonas*, *E.coli*, *Klebsiella* and *Staph aureus* were tested and recorded inhibition zone of 14.0mm, 8.8mm, 12.4mm, 10.0mm and 0.00mm respectively.

The conventional antibiotics drug used in the study (ciprofloxacin 500mg) is more effective against *Salmonella* and *Staphylococcus aureus* (24.0mm and 35.0mm) compared to highest inhibition zone recorded in onions extract of 17.0mm at 200mg/ml concentration against salmonella and 11.0mm at 200mg/ml against *Staph aureus* which contradict research of many scholars.

Minimum inhibitory concentration and minimum bactericidal concentration (MIC and MBC) results from the study indicate highest results (50mg/ml and 100mg/ml) in aqueous extracts of leaves against *Staph aureus* and least results in ethanolic extract of bulbs against *Salmonella typhi* (6.25mg/ml and 12.5mg/ml) indicating highest effectiveness than *Staph aureus*. Similarly results obtained by many researchers, Grover *et al*, (2017) reported MIC and MBC results of 25.0mg/ml and 50.0mg/ml of onions, ginger and garlic extract against *Staph aureus*, and *E.coli* with 5.0mg/ml and 10.0mg/ml against *Salmonella*, *Streptococcus* and *Bacillus spp*. The survey shows a fear results compared to the researchers mentioned above, and the effects rate may differ from one to another.

V. CONCLUSION

It is concluded from the study that Onions (*Allium cepa*) bulbs and leaves extract exhibit

antimicrobial activity against *Salmonella typhi* and *Staphylococcus aureus*. The effectiveness could be attributed to the important bioactive secondary metabolites found to be present including Flavanioids, Steroids and Saponins. It is expected that using natural products and plant resources as therapeutic agent will probably not elicit resistance in pathogenic microorganisms.

VI. RECOMMENDATION

Based on the findings from the present study on the phytochemicals and antibacterial activity of onions bulbs and leaves extract against *Salmonella typhi* and *Staphylococcus aureus*. It is recommended that: Further research should be carried out to isolates more specific important bioactive secondary from onions bulbs and leaves. It is also recommended that many solvents should be employed in obtaining the extracts as they can bring more interesting results of secondary metabolites. Research on comprehensive toxicology assessment of onions bulbs and leaves is recommended for safe medicinal use. Antimicrobial activity on other pathogenic organisms including fungi is also recommended as a potential source for new antimicrobial drugs against drug- resistance microbes. Scientific institutions should allow the use of medicinal plants as an alternative medicinal drug so the issues of toxicity and safety will be addressed.

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