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SURVIVAL OF SOME MICROORGANISMS IN THE PRESENCE OF ONION (*ALLIUM CEPA* L.) EXTRACTS *IN VITRO*

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By using disc diffusion assay, the antibacterial and anticandidal activities of extracts prepared from two varieties of onion (red and white) with water and different solvent extracts (ethyl alcohol, methyl alcohol, acetone and diethyl ether) at different concentrations (800, 400, 200 and 100 mg/mL) were evaluated against six bacteria: *Enterobacter aerogenes* (ATCC 13048), *Escherichia coli* (ATCC 25922), *Salmonella enteritidis* (ATCC 13076), *Salmonella typhimurium* (ATCC 14028), *Staphylococcus aureus* ssp. *aureus* (ATCC 29213), *Bacillus subtilis* (test microorganism of sterilization) and one genus of yeast *Candida albicans* (ATCC 10231). The research clearly indicates that white *Allium cepa* (diethyl ether, water and methyl alcohol) and red *Allium cepa* (diethyl ether, methyl alcohol, water and acetone) extracts were inhibitory against the tested microorganisms. White *Allium cepa* extract of ethyl alcohol at 800 mg/mL dose was found to be able to inhibit *Candida albicans* and other extracts were definitely non-inhibitory ($p<0.01$).

INTRODUCTION

Onion may be among the first cultivated crop in the world due to its prolonged storage time and portability. At this point in time, *Allium* family has over 500 members, each differing in colour and taste, but close in biochemical, phytochemical and neutraceutical contents [Topal 1989; Phay *et al.,* 1999; Yin & Tsao, 1999; Benkeblia, 2004, 2005]. Onion aqueous extracts are effective against many yeast species and several G(+) bacteria but ineffective against G(-) bacteria [Yin & Tsao, 1999; Benkeblia, 2004; Elnima *et al.,* 1983; Zohri *et al.,* 1995; Kivanc & Kunduhoglu, 1997; Ghahfarokhi-Shams *et al.,* 2006]. Ali *et al.* [2000] reported that a strong antimicrobial (antibacterial) effect of fresh onion homogenates was due to both methyl-cysteine sulfoxide and S-n-propyl cysteine sulfoxide from which the corresponding thio-sulfinates are formed enzymatically [Phay *et al.,* 1999; Kyung & Lee, 2001].

Alliums were concurred to possess antimicrobial activities, and they contain numerous phenolic compounds beside of sulphurous compounds which arouse great interest [Yin & Tsao, 1999; Benkeblia, 2004; Elnima *et al.,* 1983; Zohri *et al.,* 1995; Kivanc & Kunduhoglu, 1997]. The flavonoids exhibit various antimicrobial activities [Puupponen-Pimia *et al.,* 2001]. Earlier researches on the flavonoid content of onions *(Allium cepa* L.) have indicated that the main flavonoids are quercetin, quercetin-4'-glucoside, quercetin-3,4'-diglucoside, quercetin-7,4'-diglucoside and isorhamnetin glycoside [Fossen *et al.,* 1998].

The researches show that *Allium* plant extracts as a natural preservative, could be an alternative to synthetic antimicrobial compounds in various industries. The use of plant parts and extractives helps in designing new drugs as therapeutic agents or controlling food-related microorganisms [Thangadurai *et al.,* 2004]. Onion is commonly used as spice in Turkey especially in ground beef, doner kebab (it is a popular meat product consumed widely in Turkey and in many countries), meat balls and raw meat balls-cig kofte (it is a traditional food which is consumed in Turkey, it is prepared by adding boiled and powdered wheat, onion, garlic, tomato sauce, parsley and different spices into ground meat); it may also be used to reduce pathogenic microorganisms whether they could be contaminated during unhygienic productions.

The purpose of this study was to investigate the antibacterial and anticandidal activities of two forms of onions (white and red) against some pathogen bacteria and a yeast *in vitro*. Also basically, this study examines the effect of antimicrobial activity of onion phenolic compounds which are present in red onion extracts and establishes whether antimicrobial effects between the white and red onion varieties can be possible.

MATERIALS AND METHODS

Allium cepa samples

Two varieties of onions (*Allium cepa* L.*,* white and red), were selected for this research. Onions were cultivated in Erdek region of Turkey, during July 2007. The freshly harvested samples were classified for homogeneity and lack of flaws and prepared for analyses.

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Microorganisms

Six species of bacteria: *Enterobacter aerogenes* (ATCC 13048), *Escherichia coli* (ATCC 25922), *Salmonella enteritidis* (ATCC 13076), *Salmonella typhimurium* (ATCC 14028), *Staphylococcus aureus* ssp. *aureus* (ATCC 29213), *Bacillus subtilis* (test microorganism of sterilization) and one species of yeast, *Candida albicans* (ATCC 10231), were used in this research.

Preparation of onion extracts

Fresh onion was peeled and then was homogenized with water, ethyl alcohol, acetone, methyl alcohol, and diethyl ether (w/v) by using a commercial percussion kneader (55 rpm) for one minute. The mixtures were macerated during 24 h at 4°C. This method was adapted by Turantas & Unlütürk [1990]. After that, the obtained extracts of onions were sterilized by using a 0.45 μm pore size cellulose acetate membrane filter under nitrogen gas pressure. The extracts were used directly. In this research, antibacterial and anticandidal effects of four concentrations (800, 400, 200 and 100 mg/mL) of two onion varieties for each solvent were determined.

Preparation of inoculum

Stock cultures of *E. Aerogenes, E. Coli, S. Enteritidis, S. Typhimurium* and *S. Aureus* ssp. *aureus* were cultured in Nutrient Broth at 37°C for 22 h and the same process was followed for *B. Subtilis* at 30°C for 22 h [Kivanc & Kunduhoglu, 1997; Ilcim *et al.,* 1998]. *C. Albic*ans were cultured in Sabouraud Dextrose Broth-SDB-(Oxoid CM0147) at 30°C for 22 h [Bakri & Douglas, 2005]. All bacteria tested in Nutrient Broth (NB) and yeast in SDB were enumerated by using the serial dilution method. Final cell concentrations of cultures were 10^6-10^7 cfu/mL for bacterium and 10^5- 10^6 cfu/mL for yeast.

Antibacterial and anticandidal activities tests

The antibacterial and anticandidal activities of the onion extracts were determined with the disc diffusion method. Water and other solvents were added at the same concentration on discs to provide a control [Yin & Tsao, 1999; Karaman *et al.,* 2003]. Petri dishes with Nutrient Agar (NA) medium for bacteria were used for antibacterial tests. Suspensions (3 mL) of the bacteria were added to flasks containing 300 mL of sterile NBA at 43-45°C and poured into the Petri dishes (9 cm in diameter). Sabouraud Dextrose Agar (SDA) medium for yeast was employed for the anticandidal test. Each plate containing SDA was inoculated with 0.2 mL of yeast. Inoculums were evenly spread on agar plates with drigalski spatula. After that, sterile paper discs (6 mm in diameter, Schleider-Schuell, Spain) were placed on the surface of the inoculated culture media and were appended with 50 μL of each of the extracts (800, 400, 200 and 100 mg/mL concentrations) of the white and red onions. Water and other solvents were added at the same concentration on sterile discs to provide a control. They were incubated at 37°C for 24 h for *E. Aerogenes, E. Coli, S. Enteritidis, S. Typhimurium* and *S. Aureus* ssp. *aureus*. On the other hand, *B. Subtilis* and *C. Albic*ans were cultured at 30°C for 24 h. At the end of the period, inhibition zones occurring in the medium were measured in millimeters (mm). All experiments were done in two replicates.

Statistical analyses

The statistical package SPSS 15.0 for Windows was used to explore the statistical significance of the results. The experimental data were expressed as means ± standard deviation. For all concentrations, zone diameters measured in two plates (containing three disks) in two replicates were analysed by Univariate Analyses of variance with repeated measures, and *post-hoc* Duncan tests were carried out to determine significant differences ($p<0.01$) between the means.

RESULTS

The antimicrobial test results of the onion extracts are shown in Table 1. In this research, inhibition zone less than 10 mm in diameter indicated that the microorganism was not sensitive to the extract [Ponce *et al.,* 2003].

E. Aerogenes (ATCC 13048) was mostly sensitive to white onion and methyl alcohol extract at the concentration of 100 mg/mL (Table 1). Extracts with concentrations higher than 100 mg/mL of water, ethyl alcohol and diethyl ether solvents and higher than 200 mg/mL of acetone solvent were also effective to the microorganism. Between the red onion extracts, that with methyl alcohol solvent at 100 mg/mL was the most inhibitory.

Diethyl ether and white onion extract with the concentration of 100 mg/mL (Table 1) was the most effective against to *E. Coli* (ATCC 25922). It was determined that the extracts with water, diethyl ether and ethyl alcohol concentrations at concentrations of up to 200 mg/mL of, and those with the other two solvents at the concentration of 400 mg/mL were effective against *E. Coli*. When considering the extracts of red onion; *E. Coli* was completely destroyed above the concentration values of 200 mg/mL of extracts with water, acetone and methyl alcohol. Ethyl alcohol and diethyl ether extracts were less sensitive to *E. Coli* while applied at concentrations higher than 400 mg/mL.

S. Enteritidis (ATCC 13076) was sensitive to the white onion extract with ethyl alcohol at the concentration of 100 mg/mL (Table 1). However in the case of extracts with the other solvents it was inhibited at concentrations higher than 200 mg/mL. Red onion extracts were also inhibitory to the *S. Enteritidis* when applied at concentrations of 200-800 mg/mL.

The 200 mg/mL (Table 1) extracts of the white onion with all solvents were inhibitory to *S. Typhimurium* (ATCC 14028) and red onion extracts were effective to the microorganism but red onion extract with water was more effective only at the higher concentrations than 200 mg/mL.

Results also showed that *S. Aureus* ssp. *aureus* (ATCC 29213) was inhibited with the 200 mg/mL (Table 1) concentration of white onion and ethyl alcohol extract. The concentrations of up to 400 mg/mL were effective with the other solvents. According to red onion results, the extracts with water, acetone and methyl alcohol between the concentrations of 200-800 mg/mL, and those with ethyl alcohol and diethyl ether, at higher concentrations of 400 mg/mL have an inhibitory effect on *S. Aureus* ssp. *aureus*.

Only diethyl ether extract of white onion at 800 mg/mL (Table 1) had the inhibitory effect on *B. Subtilis* (test microorganism). In the case of red onion, both acetone, methylalcohol, diethyl ether and water extracts at concentrations of up to 400 mg/mL were effective as well.

TABLE 1. Inhibition zones (mm) of white and red onion extracts on tested microorganisms.

Microorganisms	Solvent	White onion			
		800[1]	400	200	100
Enterobacter aerogenes (ATCC 13048)	Water	40.00 ± 2.00^{ak,2}	34.33 ± 0.58^{al}	17.33 ± 0.58^{bm}	nd
	Ethanol	24.33 ± 0.58^{bck}	19.33 ± 0.58^{dl}	11.67 ± 0.58^{cm}	nd
	Acetone	26.33 ± 0.58^{bk}	26.00 ± 1.00^{bl}	nd	nd
	Methylalcohol	25.33 ± 0.58^{bk}	21.33 ± 0.58^{cl}	19.33 ± 0.58^{am}	14.33 ± 0.58^{an}
	Diethyleter	21.67 ± 0.58^{ck}	20.33 ± 0.58^{dcl}	18.67 ± 0.58^{abm}	nd
	Solvent	Red onion			
		800	400	200	100
	Water	22.67 ± 0.58^{dk,2}	15.67 ± 1.16^{dl}	11.00 ± 1.00^{cm}	nd
	Ethanol	35.67 ± 0.58^{ak}	28.33 ± 1.16^{al}	17.67 ± 0.58^{am}	nd
	Acetone	31.00 ± 1.73^{bk}	22.67 ± 0.58^{bl}	16.33 ± 0.58^{abm}	nd
	Methylalcohol	27.33 ± 0.58^{ck}	22.67 ± 0.58^{bl}	14.67 ± 1.16^{bm}	11.33 ± 0.58^{an}
	Diethyleter	22.67 ± 0.58^{dk}	20.33 ± 0.58^{cl}	18.33 ± 0.58^{am}	nd
Esherichia coli (ATCC25922)	Solvent	White onion			
		800[1]	400	200	100
	Water	26.33 ± 0.58^{ck,2}	18.33 ± 0.58^{bl}	16.33 ± 1.16^{bm}	nd
	Ethanol	27.67 ± 0.58^{bck}	17.00 ± 0.00^{bl}	14.67 ± 0.58^{cm}	nd
	Acetone	28.33 ± 0.58^{bk}	15.33 ± 0.58^{cl}	nd	nd
	Methylalcohol	28.67 ± 0.58^{bk}	17.33 ± 0.58^{bl}	nd	nd
	Diethyleter	31.67 ± 0.58^{ak}	27.67 ± 0.58^{al}	23.67 ± 0.58^{am}	16.33 ± 0.58^{an}
	Solvent	Red onion			
		800[1]	400	200	100
	Water	26.33 ± 0.58^{bck,2}	22.33 ± 1.16^{al}	16.00 ± 1.00^{bm}	nd
	Ethanol	27.33 ± 0.58^{bk}	18.00 ± 0.00^{bl}	nd	nd
	Acetone	30.33 ± 0.58^{ak}	21.67 ± 0.58^{al}	18.67 ± 0.58^{am}	nd
	Methylalcohol	27.33 ± 0.58^{bk}	21.67 ± 0.58^{al}	17.00 ± 0.00^{bm}	nd
	Diethyleter	25.67 ± 0.58^{ck}	16.33 ± 0.58^{bl}	nd	nd
Salmonella enteritidis (ATCC 13076)	Solvent	White onion			
		800[1]	400	200	100
	Water	31.67 ± 0.58^{bck,2}	26.33 ± 0.58^{al}	21.67 ± 0.58^{am}	nd
	Ethanol	33.67 ± 0.58^{ak}	26.33 ± 0.58^{al}	23.33 ± 0.58^{am}	15.00 ± 0.00^{an}
	Acetone	30.33 ± 0.58^{ck}	23.67 ± 0.58^{bl}	19.00 ± 0.00^{bm}	nd
	Methylalcohol	30.67 ± 0.58^{ck}	25.33 ± 0.58^{abl}	18.33 ± 0.58^{bm}	nd
	Diethyleter	32.67 ± 0.58^{abk}	24.67 ± 1.53^{abl}	19.00 ± 1.73^{bm}	nd
	Solvent	Red onion			
		800[1]	400	200	100
	Water	33.00 ± 0.58^{abk,2}	26.33 ± 0.58^{abl}	19.33 ± 1.16^{am}	nd
	Ethanol	35.33 ± 0.52^{ak}	27.67 ± 1.16^{al}	20.33 ± 0.58^{am}	nd
	Acetone	30.33 ± 0.58^{bk}	21.67 ± 0.58^{cl}	18.67 ± 0.58^{am}	nd
	Methylalcohol	30.67 ± 0.58^{bk}	22.67 ± 2.52^{bcl}	19.67 ± 1.16^{am}	nd
	Diethyleter	30.00 ± 0.00^{bk}	23.67 ± 1.16^{bcl}	15.67 ± 1.16^{bm}	nd
Salmonella typhimurium (ATCC 14028)	Solvent	White onion			
		800[1]	400	200	100
	Water	31.00 ± 0.00^{abk,2}	24.33 ± 0.58^{bl}	17.33 ± 0.58^{bm}	nd
	Ethanol	32.33 ± 0.58^{ak}	21.67 ± 0.58^{cl}	19.33 ± 0.58^{am}	nd
	Acetone	30.33 ± 0.58^{abk}	25.00 ± 0.00^{abl}	10.33 ± 0.58^{cm}	nd
	Methylalcohol	31.67 ± 0.58^{abk}	26.33 ± 0.58^{al}	20.33 ± 0.58^{am}	nd
	Diethyleter	29.67 ± 1.53^{bk}	20.33 ± 0.58^{cl}	10.33 ± 0.58^{cm}	nd
	Solvent	Red onion			
		800[1]	400	200	100
	Water	26.67 ± 0.58^{dk,2}	13.67 ± 1.53^{dl}	nd	nd
	Ethanol	32.33 ± 0.58^{ak}	28.33 ± 0.58^{al}	22.67 ± 1.53^{am}	nd
	Acetone	32.67 ± 0.58^{ak}	24.33 ± 0.58^{bl}	18.67 ± 0.58^{bm}	nd
	Methylalcohol	28.33 ± 0.58^{ck}	20.33 ± 0.58^{cl}	14.00 ± 1.00^{cm}	nd
	Diethyleter	30.33 ± 0.58^{bk}	25.67 ± 1.16^{bl}	18.33 ± 0.58^{bm}	nd

Table 1. continued

	Solvent	White onion			
		800[1]	400	200	100
Staphylococcus aureus ssp. *aureus* (ATCC 29213)	Water	21.67 ± 0.58^{ck,2}	16.33 ± 0.58^{bl}	nd	nd
	Ethanol	30.33 ± 0.58^{ak}	23.33 ± 0.58^{al}	16.33 ± 0.58^{am}	nd
	Acetone	23.67 ± 0.58^{bck}	16.33 ± 0.58^{bl}	nd	nd
	Methylalcohol	31.67 ± 0.58^{ak}	24.67 ± 0.58^{al}	nd	nd
	Diethyleter	24.67 ± 1.53^{bk}	18.00 ± 1.00^{bl}	nd	nd
	Solvent	Red onion			
		800[1]	400	200	100
	Water	25.67 ± 1.16^{dk,2}	21.67 ± 0.58^{cl}	18.67 ± 0.58^{bm}	nd
	Ethanol	28.33 ± 0.58^{ck}	20.33 ± 0.58^{cl}	nd	nd
	Acetone	33.67 ± 0.58^{ak}	28.33 ± 0.58^{al}	20.33 ± 0.58^{am}	nd
	Methylalcohol	31.67 ± 0.58^{bk}	24.67 ± 1.16^{bl}	20.00 ± 0.58^{am}	nd
	Diethyleter	16.33 ± 0.58^{ek}	10.33 ± 0.58^{dl}	nd	nd
	Solvent	White onion			
		800[1]	400	200	100
Bacillus subtilis (test microorganisms)	Water	nd	nd	nd	nd
	Ethanol	nd	nd	nd	nd
	Acetone	nd	nd	nd	nd
	Methylalcohol	nd	nd	nd	nd
	Diethyleter	13.67 ± 1.16^{ak,2}	nd	nd	nd
	Solvent	Red onion			
		800[1]	400	200	100
	Water	nd	10.00 ± 0.00^{cl}	nd	nd
	Ethanol	nd	nd	nd	nd
	Acetone	25.33 ± 1.53^{ak,2}	20.67 ± 0.58^{al}	nd	nd
	Methylalcohol	nd	12.00 ± 0.00^{bl}	nd	nd
	Diethyleter	21.67 ± 0.58^{bk}	11.33 ± 0.58^{bcl}	nd	nd
	Solvent	White onion			
		800[1]	400	200	100
Candida albicans (ATCC 10231)	Water	nd	nd	nd	nd
	Ethanol	17.67 ± 0.58^{ak,2}	nd	nd	nd
	Acetone	nd	nd	nd	nd
	Methylalcohol	nd	nd	nd	nd
	Diethyleter	nd	nd	nd	nd
	Solvent	Red onion			
		800[1]	400	200	100
	Water	nd	nd	nd	nd
	Ethanol	nd	nd	nd	nd
	Acetone	nd	nd	nd	nd
	Methylalcohol	nd	nd	nd	nd
	Diethyleter	nd	nd	nd	nd

Each zone diameter represents the mean of 2 plates x 1 concentration x 2 replicated samples means ± standard deviation. [1]Concentration levels; [2]Diameter of inhibition zone (mm); nd.: Not detectable. Mean values within columns followed by different letters (a-d) are significantly different at $p < 0.01$. Mean values within rows followed by different letters (k-n) are significantly different at $p<0.01$.

Onion had a marginal effect on the test yeast microorganism, *C. Albicans* (ATCC 10231). The inhibitory effect was shown only at 800 mg/mL (Table 1) concentration of white onion and ethanol extract. Otherwise red onion had no effect under the conditions of this study.

DISCUSSION

The differences between the zones obtained for extracts with various solvents and in different concentrations were found significant ($p<0.01$). The extent of the inhibitory effect of the onion extracts could be attributed to the presence of antimicrobial compounds and to their dissolving ratios in the solvents and concentration doses.

E. Aerogenes (ATCC 13048) was mostly sensitive to white onion and methyl alcohol extract, but Kumral & Sahin [2003] did not determine any inhibitory effect of pure onion extract (without any dilution) on *E. Aerogenes, E. Coli* and *S. Typhimurium.*

Abdou *et al.* [1972] reported that antimicrobial activities of crude juices of *Allium cepa* had been found to be strongly active against *E. Coli.* In turn, Elnima *et al.* [1983] determined

that red onion extract at 66% concentration with water was inhibitory against *E. Coli* NCTC 10418. Kivanc & Kunduhoglu [1997] investigated antimicrobial effects of fresh vegetable juices against bacteria and yeasts. They reported that the onion extract had a mild inhibitory effect against *E. Coli*. Also, De *et al.* [1999] reported that onion with ethyl alcohol extractions at 1, 25 and 100 mg/ mL concentrations did not have any influence on *E. Coli.* Those results indicate that onion varieties, stage, growing and storage conditions are very effective on the MIC value and onion active compounds [Block, 1992; Block *et al.,* 1992].

White and red onion extracts show inhibitory effects against *S. Enteritidis* and *S. Typhimurium* especially between the 400--800 mg/mL concentrations of extracts. Jeyakumar *et al.* [2005] reported the antibacterial effect of onion extracts against *E.coli, S. Aureus, S. Enteritidis* and *B. Subtilis* by using agar diffusion method. Johnson & Vaughn [1969] studied the kinetics of populations decline of *S. Typhimurium* inoculated into freshly reconstituted dehydrated onion and garlic powders and they reported 5 and 10% maximal death rates of *S. Typhimurium* with onion and garlic concentrations of 1 and 5% (w/v), respectively. Kivanc & Kunduhoglu [1997] also determined the inhibitory effect of an onion extract on *S. typhimurium*. Srinivasan *et al.* [2001] reported moderate antibacterial activity of an onion extract against *E. coli* and *S. Typhimurium*. Indu *et al.* [2006], reported that the various concentrations of an onion extract failed to inhibit the growth of *S. Enteritidis* and *S. Typhimurium*. Good antibacterial activity of an onion extract on the growth of *S. Enteritidis* was also reported by Suresh *et al.* [2006].

Elnima *et al.* [1983] reported that 66% of aqueous extracts of red onion inhibited the growth of *S. Aureus* NCTC 6571. Also, Topal [1989] reported that onion and water extracts at the concentration of up to 1/ 50 (mL/mL) had the inhibitory effect on the *S. Aureus* (KUEN-704). On the other hand, Kivanc & Kunduhoglu [1997] found the inhibitory effect against *S. Aureus*. Kyung & Lee [2001] determined that 4% onion extract completely inhibited the growth of *S. Aureus*. In this research, red onion extracts were more inhibitory than the white onion extracts and it can be said that phenolic compounds in red onion were effective inhibitors to *S. Aureus*.

B. Subtilis was inhibited by 800 mg/mL concentration of diethylether extract of white onion and 400-800 mg/mL of red onion extracts with several solvents. Phenolic compounds also appeared to be effective inhibitors of *B. Subtilis*. Topal [1989] determined that 1/5 (mL/mL) concentration and above this level was inhibitory to *B. Subtilis* (KUEN-12). Also De *et al.* [1999] found that 100 mg/mL ethyl alcohol and onion extract inhibited *B. Subtilis* growth. On the other hand, Kivanc & Kunduhoglu [1997] reported that onion juice did not exert any inhibitory effect on *B. Subtilis*.

C. Albicans was the most resistant tested microorganism in this research. Elnima *et al.* [1983] determined the anticandidal effect of red onion extract at 66% concentration on the *C. Albicans* 3153 (Mycology Reference Laboratory London). Also Kivanc & Kunduhoglu [1997] indicated the inhibiting effect of onion juice against *C. Albicans*. In the *Allium cepa* var. *cepa L*. ve *A. cepa* var. a*ggregatum* (in the family *Liliaceae*), MICs (9.3 mg/mL) and MFCs (37.5 mg/mL) were the same for both water and ethanol extracts showing that MIC is sufficient for fungicidal activity, whereas in all other families the ethanol extracts showed more activity than the water extracts, perhaps due to the increased solubility of the active principle in ethanol. *A. cepa* var. *aggregatum* was less active than the other *Allium* species [Vaijayanthimala *et al.,* 2000].

CONCLUSIONS

It was determined that the differences in inhibitory zones of *S. Aureus, E. Coli, E. Aerogenes* and *S. Typhimurium* were not statistically significant ($p>0.01$), the most sensitive and resistant microorganisms were *S. Enteritidis* and *C. Albicans* in the study, respectively. Diethyl ether solvent with white onion has the most inhibitory effect between all the other solvents ($p<0.01$). High dissolving properties of antimicrobial compounds of white onion in the diethylether solvent can be effective on its inhibitory activity. On the other hand, both diethylether and water extracts of red onion had inhibitory activities against the test microorganisms. Except ethanol, other solvents did not exert any effect on *C. Albicans*. Antimicrobial activities of *Allium cepa* plants are important for foods applications industries. Further research in this area, particularly red onion with water extract, has the potential to prevent some pathogens in foods in natural ways.

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