

# **An Investigation of Antimicrobial Activity of Wheat Grass Juice, Barley Grass Juice, Hardaliye and Boza**

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## **Abstract**

*In this research, antimicrobial effect of Wheat Grass Juice (WGJ), Barley Grass Juice (BGJ), Hardaliye and Boza on total coliform, total bacteria and specific microorganisms such as B.cereus, S.typhimurium L.monocytogenes, E.coli, S.aureus, Streptococcus pneumonia, A.brassilensis and S.cerevisiae was researched by using disc diffusion method. Most significant effect was hardaliye on E. coli and boza on total bacteria. Results has been shown WGJ and BGJ have same antimicrobial effect on S. typhimurium, L. Monocytogenes and E. coli. All products that have been analyzed had antimicrobial effects on L. monocytogenes ve E. coli.*

**Key words:** Wheat, barley, grass juice, antimicrobial effect, inhibition zone

## 1. INTRODUCTION

Inactivation of pathogen microorganisms or microorganisms that cause food spoilage is one of the basic purposes of food preservation methods. Using antimicrobial agents in food preservation is most common and oldest method (Vigil, Palou and Alzamora, 2005). Using of natural vegetable origin antimicrobial compounds is important both health and food preservation.

Wheat grass juice is a new vegetative beverage which is obtained from sprout of mature wheat grains (*Triticumaestivum*). Because of the similarity between hemoglobin in human blood and chlorophyll molecule of plants, WGJ is called green blood. The only difference between this two compounds is while hemoglobin contains Fe atom in its center, chlorophyll contains Mg atom in its center. WGJ contains approximately %70 chlorophyll. Owing to high chlorophyll content WGJ may use an alternative treatment to cure some disease like Cooley's anemia and hemolytic anemia which is caused by lack of hemoglobin (Fernandes and O' Donovan, 2005). WGJ contains high amount of K, F, Mg and Fe next to A, C, E and B group vitamins. Vitamin content of WGJ supports blocking disease such as asthma and some allergenic infections (Andrew et al., 2000). WGJ also includes some flavonoid compounds such as luteolin, apigenin and quercetin. Due to content of this compounds WGJ helps to cure inflammatory bowel diseases in a way (Shah, 2007).

There are many similarities between barley grass juice (BGJ) and wheat grass juice (WGJ). For instance BGJ contains C, E and B group vitamins like WGJ. BGJ includes minerals like Ca, Cu and Zn next to Mg and K (Droushiotis 1984; Aruoma and Halliwell 1987).

Hardaliye is a fermented beverage which is specifically produced in the region of Thrace in Turkey (Anonymous, 2011). Natural microbiota of hardaliye has lactic as it bacteria like *Lactobacillus paracasei subsp. Paracasei*, *Lactobacillus casei subsp. Pseudopantarum*, *Lactobacillus brevis*, *Lactobacillus pontis*, *Lactobacillus acetotolerans*, *Lactobacillus sanfransisco*, *Lactobacillus vaccinostercus*. The pH of hardaliye was measured between 3.21 and 3.97 (Güven and Aksoy, 2009). Red grape juice and black mustard grains with cherry leaves are used producing of hardaliye. After, this mix is released to fermentation. Etheric oils in black mustard grains blocks forming alcohol by inhibition of yeast growth. In addition, this compounds help to occur special flavor of hardaliye (Arıcı ve Coşkun, 2001). Another active compound, sinigrin black mustard grains have, has antikanserogenic effect. This effect of hardaliye has been increased interest towards this beverage. Hardaliye helps coroner hearth disease and digestion system next to its nutritional value (Prado vd. 2008).

Another fermented beverage has been consumed for a long time in Turkey is boza. Boza is made of fermentation of some grains like corn, barley, wheat and rice. This fermentation includes some lactic acid bacteria's and some yeasts such as saccharomyces species (Arıcı ve Dağlıoğlu 2002). Boza has light yellow colour and sweet or sour taste besides its viscous liquid structure. It is mostly produced and consumed in Turkey, Bulgaria and some Balkan countries. (Akpınar-Bayizitet al., 2010; Gotcheva et al., 2001; Yegin and Fernandez-Lahore, 2012). Next to its nutritional values boza has positive effect on intestinal microbiota and digestion system (Hancıoğlu ve Karapınar, 1997; Yücel and Otlar, 1998; Evliya, 1990). Many properties of boza is occurred after uncontrolled fermentation which includes different types

and amounts of cereals and cereal based foods. (Akpinar- Bayizit et al., 2010; Gotcheva et al., 2000, 2001).

## **2. MATERIAL AND METHOD**

Wheat grass and barley grass which are used in this study, was growth in air conditioning cabinet. After, liquids of this plants extracted by using fruit squeezer. Hardaliye was purchased from a local market which was located in Trakya Region. On the other hand boza produced homemade. Microorganism cultures in this research was supplied from Tekirdağ Food Control Laboratory of Ministry of Food, Agriculture and Livestock. Specific agars (Oxoid) were used for every bacteria. Bacteria cultures and agars used to develop microorganisms were given in Table 1.

**Table 1. The total dry matter, protein, total sugar, ash, titratable acidity, pH and ethyl alcohol contents of boza**

Total dry matter	5.57% to 29.82%
Protein	0.27% to 2.75%
Sugar	10.64% to 22.59%
Ash	0.02 to 0.17%
Titratable acidity	0.13 to 0.50 %
pH	3.16 to 4.63
Ethyl alcohol	ND to 0.39%

(Gotcheva et al., 2000; Köse and Yücel, 2003; Meric, 2010; Uylaser et al., 1998; Uysal et al., 2009; Yegin and Üren, 2008).

### **2.1. Antimicrobial Activity Analysis**

Disc diffusion method was used for antimicrobial activity analysis. Sterile paper disks which was 6 mm diameters was waited in beakers which was included WGJ, BGJ, hardaliye and boza for 1 minute. After, 3 piece discs were located on solid cultures which was developed in specific agars. For forth one an antibiotic disc named Vancomysin was used to compare.

## **3. RESULTS AND DISCUSSION**

Results of antimicrobial effects of wheat grass juice, barley grass juice, hardaliye and boza were shown in Table 2.

Antimicrobial effects of all products we studied were shown in Table 2. WGJ, BGJ, hardaliye and boza had no antimicrobial effect on *A.brassillesisveS.cerevisiae*(Table 2). Most significant antimicrobial effect on *E. coli* was hardaliye by forming 20 mm inhibition zone. Boza had second significant antimicrobial effect on total bacteria by forming 16 mm inhibition zone. All products used in this study didn't have distinctive antimicrobial effect

when compares with Vancomysin. Otherwise WGJ and BGJ had antimicrobial effect as much as Vancomysin(Table 2).

As WGJ and BGJ had high antimicrobial effect on *L. monocytogenes*, hardaliye had same antimicrobial effect on *E. coli*. WGJ had same antimicrobial effect on total coliform, *S. typhimurium*, *L.monocytogenes* ve *E.coli*, however BGJ had highest antimicrobial effect on total coliform (Table 3).

Antimicrobial effects of hardaliye and boza which are traditional beverages of Turkey were shown Table 4 and Table 5. From this Tables the antimicrobial effect of hardaliye on bacteria is *E.coli* >total coliform>total bacteria >*L.monocytogenes*. On the other hand the antimicrobial effect of boza total bacteri>*E.coli*>*L.monocytogenes*>*S. pneumonia*>*B.cereus*.

**Table 2. Bacteria Cultures and Agars**

<b>Bacteria Cultures</b>	<b>Agars</b>
<i>Bacillus cereus</i>	Mannitol Egg Yolk Polymyxin (MYP) Agar
<i>Salmonella typhimurium</i>	Xylose Lysine Deoxycholate (XLD) Agar
<i>Listeria monocytogenes</i>	Oxford Agar
<i>Escherichia coli</i>	Eosin Metilen Blue (EMB) Agar
<i>Staphylococcus aureus</i>	Baird- Parker Agar(BPA)
<i>Streptococcus pneumonia</i>	Blood Agar
<i>Aspergillus brassilensis</i>	Dichloran Rose Bengal Chloramphenicol (DRBC) Agar
<i>Saccharomyces cerevisiae</i>	Sabouraud Dextrose Agar (SDA)
Total Coliform	Violet Red Bile Agar (VRBA)
Total Bacteria	Plate Count Agar (PCA)

**Table 3. Antimicrobial activity of products on microorganism cultures**

<b>Inhibition Zone (mm)</b>					
	BÇS	AÇS	Hardaliye	Boza	Compare Zone (Vancomycin)
<i>B.cereus</i> (MYP Agar)	-	-	-	9	20
<i>S. typhimurium</i> (XLD Agar)	11	11	-	-	11
<i>L. monocytogenes</i> (Oxford Agar)	11	11	9	10	18
<i>E.coli</i> (EMB Agar)	11	11	20	15	13
<i>S.aureus</i> (Baird- Parker Agar)	9	9	-	-	15
<i>Streptococcus pneumonia</i> (Blood Agar)	-	-	-	10	15
<i>A.brassilensis</i> (DRBC Agar)	-	-	-	-	-
<i>S.cerevisiae</i> (SDA)	-	-	-	-	-
Total coliform (VRBA)	11	15	10	-	10
Total bacteria (PCA)	-	-	9	16	15

**Table 4. Antimicrobial effect of WGJ and BGJ on bacteria's İnhibisyonZonu (mm)**

	Toplam koliform	<i>S.typhimurium</i>	<i>L.monocytogenes</i>	<i>E.coli</i>	<i>S.aureus</i>
<b>BÇS</b>	11	11	11	11	9
<b>AÇS</b>	15	11	11	11	9

**Table 5. Antimicrobial effect of hardaliye**

<b>İnhibisyonZonu (mm)</b>				
	<i>E.coli</i>	Toplam koliform	Toplambakteri	<i>L. monocytogenes</i>
<b>Hardaliye</b>	20	10	9	9

**Table 6. Antimicrobial effect of boza**

<b>İnhibisyon Zonu (mm)</b>					
	Toplambakteri	<i>E.coli</i>	<i>L.monocytogenes</i>	<i>S.pneumonia</i>	<i>B.cereus</i>
<b>Boza</b>	16	15	10	10	9

#### **4. CONCLUSIONS**

This research has shown that WGJ, BGJ, Hardaliye and Boza have an antimicrobial effects on *L.monocytogenes* and *E. coli*, on the other hand all of this samples has no antimicrobial effects on *A.brassillesis* and *S.cerevisiae*.

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