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Antimicrobial and antimutagenicity potentials of *Hordeum vulgare* L. extract

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Talbinah is a soup prepared from barley (*Hordeum vulgare* L.). The soup is named Talbinah for the reason that it is tinny and white. The main purposes of this research were determined antimicrobial and antimutagenicity action of Talbinah (*Hordeum vulgare* L.) extract. Dried Talbinah of 100 g were extracted with 80% methanol under agitation at room temperature. The consistent and reproducible results obtained using the standard disk diffusion technique showed that Talbinah extract exhibited strong antimicrobial potential. The strongest antimicrobial activity of extract was recorded against *Staphylococcus aureus*, and the lowest activity was observed against *Candida albicans.* The extracts showed both bacteriostatic and bactericide activities with MIC and MBC values found equal and ranged from 125 to 500 µg/mL. At all the doses antimutagenic response was significant at ($p < 0.01$) against both the strains with a percent mutagenicity decrease from 40 to 25 for TA98 followed by TA100 with percent antimutagenicity from 30 to 11. The results of the study established that Talbinah is a better antimicrobial and antimutagenic agent.

Keywords: *Hordeum vulgare*, Talbina, antimicrobial, antimutagenicity.

INTRODUCTION

Barley (*Hordeum vulgare* L.) is the fourth most significant cereal crop after wheat, maize and rice and is among the highest ten crop plants in the world (Akar et al. 2004). The wife of the prophet Mohammed peace is upon him “Aisha”, used to recommend Talbinah for the sickening and for one who is devastated completed a deceased person. She used to say, "I heard the Messenger (peace be upon him) saying, "The Talbinah gives rest to the heart of the patient and makes it active and relieves some of his sorrow and grief"' (Abd El-Rahman 2001). Talbinah is prepared by accumulation one or two tablespoon of barley flour (must be 100 out of a hundred whole grain barley flour) to one-and-a-half plates of water and positioned on low heat for 10-15 minutes (add milk or yoghurt and candy with honey) (Health Means Wealth Remedies from the Sunnah 2012).

Ibn Qayyim stated that Talbinah has the similar assistances of barley water but it is straight well. He thought that it has an emptying exploit and offers delicate diet. It is now known that the starch enclosed in barley is particularly suitable for its soothing, absorbent, anti-inflammatory and antiseptic assets creation it beneficial in smoothing the intestinal mucosa and highly recommended for stomach pain or irritation (http://www.prophetic-medicine.com/talbinah/). B Vitamins are involved in the progress and conservation of the nervous system; they produce brain chemicals that affect the mood and they are

vital for psychological and expressive well-being. Lack in B vitamins has been associated to unhappiness. This may explain the saying of the prophet Mohammed peace is upon him that Talbinah removes some of the sorrow. Our body does not store B vitamins so they must be a part of our daily diet (http://www.prophetic-medicine.com/talbinah/).

Whole grain barley and barley-containing products are permitted to right that they decrease the risk of coronary heart disease (CHD) (FDA 2002). This was based on the scientific research to support these claims. For the sake of shortness we have cited a few therapeutic practices for barley. Many present researches have been, and are being approved out on this astonishing prophetic medication which the Mohammed peace is upon him counselled the Muslims with. The main objectives of this investigation were determining the antimicrobial and antimutagenicity activity of Talbinah (*Hordeum vulgare* L.).

MATERIALS AND METHODS

Talbinah samples were procured from a farm located in the Sakaka City, KSA (Fig. 1).

Figure 1: Talbinah powder.

Dried Talbinah of 100 g were extracted with 80% methanol under agitation at room temperature. After 48 h, the extract was then filtered through Whatman No. 2 filter paper (Whatman International Limited, Kent, England) and the filtrate was vaporized to drought in a drying cabinet (Unitemp) at 40 ^{o}C, and stored in a desiccator at room temperature. The bioactive Talbinah extract was found to be stable at room temperature for many months. The yield of the extract was approximately 22% of the weight of the date pits.

The extract were liquefied in dimethylsulfoxide (DMSO) to an ending concentration of 30 mg/ml and sterilized by filtration by 0.45 µm Millipore filters. Antimicrobial tests were then approved out by disc diffusion method (Selim 2011; Selim et al. 2013; Rashed et al. 2016) using 100 µl of suspension containing 10^8 cfu/ml of bacteria and 10^6 cfu/ml of yeast spread on nutrient agar (NA) and Sabouraud dextrose agar (SDA), respectively. The minimal inhibitory concentration (MIC) values were studied for the bacterial strains, being sensitive to extract in the disc diffusion assay. MIC and MBC values of the extract against microbial strains isolates were determined based on a micro-well dilution method as previously described by (Selim and Al Jaouni 2015; 2016; Hamad et al. 2015; Adam and Selim 2013). Antimutagenicity of gallic acid was checked using Ames assay as proposed by Ames et al. (1975). In this study, histidine requiring strains of *Salmonella typhimurium* i.e. TA98 and TA100 were used and the experiments were carried out with (+S9 mix) and without metabolic activation (-S9 mix) system. Mutagen 4-nitro-o-phenylene diamine (NPD) and NaN_3 were used for TA98 and TA100 in experiments as positive control.

RESULTS AND DISCUSSION

The consistent and reproducible results obtained using the standard disk diffusion technique showed that Talbinah extract exhibited strong antimicrobial potential (Table 1). The strongest antimicrobial activity of extract was recorded against *Staphylococcus aureus***,** and the lowest activity was observed against *Candida albicans*.

Table 1: Antimicrobial activity of Talbina extract

Microorganisms	DD [a]	MIC	MBC
Gram Positive Bacteria			
Streptococcus sp	25	250	250
Staphylococcus aureus	25	125	125
Gram Negative Bacteria			
Escherichia coli	20	250	250
Klebsiella pneumoniae	15	250	250
Yeast			
Candida albicans	10	500	500

MIC (minimum inhibition concentration) and MBC (minimum bactericidal concentration) as µg/ml of methanol extract; (−) no antimicrobial activity. Values are average of triplicate. [a] Inhibition zone in diameter (mm) around the discs impregnated with methanol extract (100 µg/disc).

Table 2: Antimutagenic potential of Talbina extract for *S. typhimurium* TA98 and TA100 bacterial strains.

Test items	Concentration (µg /ml)	Inhibition % of Revertants	
		TA98	TA100
Positive control			
NPD*	**3**	**-**	**-**
NaN_3*	**8**	**-**	**-**
Talbina Extract	**2500**	**40**	**24**
	1500	**29**	**19**
	500	**28**	**16**
	250	**25**	**10**

***4-NPD and NaN_3 were used as positive controls for *S. typhimurium* TA98 and TA100 strains, respectively. Data shown are Mean±SD of experiments with triplicate plates/concentration/experiment.**

Furthermore, the extracts showed both bacteriostatic and bactericide activities with MIC and MBC values found equal and ranged from 125 to 500 µg/mL (Table 1).

The obtained results suggest that Talbinah extract was more efficient to inhibit Gram positive than Gram negative bacteria. We can assume that structural diversity of the bioavailable phenolics in the date pits extracts will influence their exhibited antimicrobial potentials. Based on the promising antimicrobial activity, Talbinah extract was evaluated for their antimutagenic activity by Ames test against indirect acting mutagen cyclophosphamide. The antimutagenic activity of Talbinah extract against 4-NPD and NaN_3 was evaluated by the means of the Ames test using two strains of *S. typhimurium*, i.e TA98 and TA100. AMES test results indicated strong antimutagenic activity of Talbinah extract at all of the concentrations tested. Talbinah extract was shown to have greater antimutagenic activity observed in the 2500 µg/plate concentration *S. typhimurium* TA98. At all the doses antimutagenic response was significant at ($p < 0.01$) against both the strains with a percent mutagenicity decrease from 40 to 25 for TA98 followed by TA100 with percent antimutagenicity from 24 to 10. According to Maron and Ames (1983), a compound is classified as a mutagen if it is able to increase at least twice the number of revertants as compared to spontaneous revertants. The present results showed the antimutagenic activity in Ames test that may be attributed in part to powerful radical scavenger associated with Talbinah extract. According to Negi et al. (2003), a compound is found to hold its less antimutagenic activity if its percentage of inhibition is less than 25%, a moderate activity if the percentage inhibition value lies between 25% and 40% and a strong antimutagenicity effect if it is more than 40%. Talbinah extract reduces the mutagenicity caused by indirect acting mutagen cyclophosphamide by 45% and 36% respectively in the strains TA98 and TA100 (in the presence of S9) at the highest tested dose (2500 g/plate) which shows strong antimutagenic activity. From the results it was found that Talbinah extract showed strong effective antimutagenicity against cyclophosphamide.

CONCLUSION

Conclusively, results of this study signify that the extract of Talbinah are an important source of natural antimicrobial and antimutagenic which can play vital role in reducing microbial diseases.

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