Research Article

Effect of Edible Mushroom Powder on Antioxidant Activity of Tarhana

Tülin Eker[1]*, Fuat Bozok[2]

[1]Department of Food Engineering, Faculty of Engineering, Osmaniye Korkut Ata University, TURKEY,
[2]Department of Biology, Faculty of Arts and Science, Osmaniye Korkut Ata University, TURKEY

ABSTRACT

Background: In this study, two edible mushroom (*Morchella conica* and *Ramaria flava*) were used to raise the biological value of tarhana. **Objective:** Tarhana was supplemented with two edible mushroom species to improve its nutritional value and functional properties. **Method:** Antioxidant activities of tarhana were analysed by using different assays. Total phenolic (TPC) and flavonoid contents (TFC) were also determined. **Results:** Tarhana with mushroom had high total phenolic, flavonoid contents as well as antioxidant activities. **Conclusion:** The results indicated that high positive correlations were found between the antioxidant activities and the polyphenol contents of tarhana with mushroom.

Keywords: Tarhana, Fermented Product, Antioxidant Activity, Phenolic, Flavonoid, Frap.

INTRODUCTION

Tarhana which is a fermented traditionally product prepared with cereal flour, yoghurt, some vegetables and spices, is widely consumed and a popular nutrient source in Turkey. Fermented foods have an importance in all around the world because of long shelf life, high nutritional and sensory values when compared to the raw materials used in their production.[1-3] Tarhana-like products made in our country are also produced and often consumed in some countries. For example, "kishk" in Egypt, Palestina and Jordan, "kushuk" in Iraq, "trahana" in Greece, "tahonya" in Hungary and "talkuna" in Finland is similar to tarhana in Turkey.[4] There are several studies, adding different cereals to increase the nutritional and antioxidant properties of tarhana.[5-7] In the present study, tarhana with different mushroom powders were produced for the first time and antioxidant activities were investigated.

MATERIAL AND METHODS

Materials

Ramaria flava on November 2015 and *Morchella conica* on May 2015 were collected from Cebel (37°01'27" N, 36°22'24" E, 975 m) and Hasanbeyli (37°09'26" N, 36°27'56" E, 650 m) regions of Amanos Mountains (Osmaniye, Turkey), respectively. Macrofungal species were dried in dehydrator and then powdered.

METHODS

Tarhana samples were produced according to Kilci and Göçmen (2014).[8] The solid-liquid extraction was performed as previously mentioned by Bilgicli *et al.*[9] The clear supernatant was used to determine total phenolic described by Singleton and Rosie (1965),[10] total flavonoid described by Sun *et al.*[11] Antioxidant activity was measured using a free radical DPPH (2,2-diphenyl-1-picryl-hydrazyl) methanolic solution,[12] reducing power,[13] FRAP (ferric reducing antioxidant power)[14] and NO (nitric oxide) removal activity[15]. The colour of tarhana samples measured by using colorimeter (Minolta Chroma meter CR-400, Japan). SPSS statistical software (version 18.0, Chicago, IL) were used for analysing data. At 5% level, the significance of differences among means was

DOI: 10.5530/ijper.51.3s.27
Correspondence:
Tülin Eker,
Department of Food Engineering, Faculty of Engineering, Osmaniye Korkut Ata University, TURKEY.
Phone no: +903288250097
E-mail: tulinsahin@osmaniye.edu.tr

www.ijper.org

Table 1 : Total phenolic, flavonoid content and antioxidant activity of tarhana samples.						
Concentrations	DPPH (µM Trolox)	NO (µM Trolox)	FRAP (Fe^{+2} mM)	RP (µM Trolox)	TPC (GAE mg/100g)	TF (mg CE/100g)
Control	197.0^{c}±14.14	60.00^{d}±06.22	1.51^{c}±0.02	298.2^{c}±02.12	202.20^{c}±11.31	3.50^{d}±00.64
100 %M	740.6^{b}±09.19	268.70^{a}±02.05	2.65^{b}±0.09	956.2^{ab}±26.87	1099.50^{a}±53.03	106.30^{c}±07.78
100 %R	782.7^{a}±04.94	246.40^{ab}±14.42	2.87^{a}±0.05	962.5^{ab}±31.81	1124.90^{a}±101.82	209.90^{b}±10.93
50%M+50%R	794.2^{a}±02.12	199.30^{b}±39.81	2.94^{a}±0.02	1010.0^{a}±29.69	1168.10^{a}±21.92	281.30^{a}±14.14
25%M+25%R+50%C	733.1^{b}±01.41	130.40^{c}±0.00	2.57^{b}±0.00	944.0^{b}±07.07	815.10^{b}±22.62	112.60^{c}±03.21

Table 2: Color values of tarhana samples			
Samples	L*	a*	b*
Control	81.56^{a}±0,06	03.39^{b}±0,26	36.77^{a}±0,27
100% R	42.97^{c}±0,29	04.24^{a}±0,12	16.50^{c}±0,33
100% M	37.15^{d}±1,15	02.49^{c}±0,20	11.30^{d}±0,80
50% M+50%R	35.86^{e}±0,13	02.25^{c}±0,08	10.33^{e}±0,19
25%M+25%R+50%C	52.18^{b}±0,18	03.59^{b}±0,05	20.57^{b}±0,17

*Mean values within a column with unlike superscript letters were significantly different ($p < 0.05$).

detected with Duncan test by using one-way ANOVA. And also, Pearson correlation coefficients were calculated.

RESULTS AND DISCUSSION

It was determined that total phenolic and flavonoid contents of tarhana gradually increased with the addition mushroom powder, when compared to the control (Table 1). The published report monitored that addition steel-cut oats visibly increased the total phenolic content of tarhana.[8]

The addition of edible mushroom powder in tarhana formulation enhanced levels of antioxidant activity significantly because of rich antioxidant capacities of mushroom species compared with wheat flour. When compared to the control, values in all analyses (DPPH, RP, FRAP, NO) were significantly increased with the addition mushroom (Table 1).

Positive and sufficiently good correlations were found between polyphenol contents and antioxidant activities of tarhana samples. Except between TFC and NO, all correlations were significant at $p<0.01$. In earlier studies, correlation between total phenolic content and antioxidant activity in mushroom extracts was determined.[16-18]

100%R had the highest a* value, while control had the highest L* and b* values (Table 2). In previous reports, increase in browning and darkness in suplemented tarhana powder affected the panelists negatively in sensory test.[19,20]

CONCLUSION

Results of this study showed that high positive correlations were observed between the antioxidant activities and the phenolic contents. According to sensory analyses of the tarhana supplemented with edible mushroom indicated that the using of lower concentrations of the edible mushroom powders was suggested to decrease detrimental effect on sensory properties of tarhana.

ACKNOWLEDGEMENT

The authors are grateful to Professor Zeynep Ulukanlı-Director, Department of Biology, University of Korkut Ata, Turkey-for her continuous encouragement during the work and Asst. Professor Ayşe Tülin Öz-Director, Department of Food Engineering, University of Osmaniye Korkut Ata, Turkey-for the use of all laboratory facilities for our entire work.

CONFLICT OF INTEREST

None

ABBREVIATION USED

TPC: Total phenolic flavonoid content; TFC: Total flavonoid content; DPPH: 2,2-diphenyl-1-picrylhydrazyl; FRAP: ferric reducing antioxidant power; NO: nitric oxide

REFERENCES

1. Tamime AY, O'Connor TP. Kiskh-a dried fermented milk/cereal mixture. International Dairy Journal. 1995;5(2):109-28.

2. Gotcheva V, Pandiella, SS, Angelov A, Roshkova Z. Monitoring the fermentation of the traditional Bulgarian bewerage boza. International Journal of Food Science and Technology. 2001;36(2):129-34.
3. Köse E, Süngü . Tarhana yapımında farklı un çeşitlerinin kullanılma olanaklarının araştırılması. Unlu Mamuller Teknolojisi. 2000;9:34-38.
4. Ibanoglu S, Ibanoglu E. Rheological properties of cooked tarhana, a cereal-based soup. Food Research International. 1999;32(1):29-33.
5. Türker S, Elgün A. Nutritional value of naturally or yeast fermented (*Sacharomyces cerevisiae*) tarhana supplemented with sound, cooked and germination dry legumes. Journal of Agricultural Faculty of Selcuk University. 1995;8:32-45.
6. Bilgicli N, Elgün A, Herken EN, Türker S, Ertas N, Ibanoglu S. Effect of wheat germ/bran addition on the chemical, nutritional and sensory quality of tarhana, a fermented wheat flour-yoghurt product. Journal of Food Engineering. 2007;77(3):680-6.
7. Erkan H, Celik S, Bilgi B, Koksel, H. A new approach for the utilization of barley in food products: barley tarhana. Food Chemistry. 2006;97(1):12-8.
8. Kilci A, Göçmen D. Changes in antioxidant activity and phenolic acid composition of tarhana with steel-cut oats. Food Chemistry. 2014;145:777-83.
9. Bilgicli N, Aktaş K, Levent H. Utilization of citrus albedo in tarhana production. Journal of Food & Nutrition Research. 2014;53(2):162-70.
10. Singleton VL, Rossi JA. Colorimetry of total phenolics with phosphomolybdic-phosphotungstic acid reagents, American Journal of Enology and Viticulture. 1965;16(3):144-58.
11. Sun L, Zhang J, Lu X, Zhang L, Zhang Y. Evaluation to the antioxidant activity of total flavonoids extract from persimmon (Diospyros kaki L.) leaves. Food and Chemical Toxicology. 2011;49(10):2689-96.
12. Brand-Williams W, Cuvelier ME, Berset C. Use of a free radical method to evaluate antioxidant activity. LWT-Food Science Technolgy. 1995;28(1):25-30.
13. Oyaizu M. Studies on products of the browning reaction. Antioxidative activities of browning reaction products prepared from glucosamine. Japanese Journal Journal of Nutrition. 1986;44(6):307-15.
14. Benzie IFF, Strain JJ. The ferric reducing ability of plasma (FRAP) as a measure of "antioxidant power": The FRAP assay. Analytical Biochemistry. 1996;239(1):70-76.
15. Garrat DC. The quantitative analysis of drugs, Champ man and Hall, Japan. 1964;3:456-8.
16. Velioğlu YS, Mazza G, Gao L, Oomah BD. Antioxidant activity and total phenolics in selected fruits, vegetables and grain products, Journal of Agricultural and Food Chemistry. 1998;46(10):4113-7.
17. Cheung LM, Cheung PCK, Ooi VEC. Antioxidant activity and total phenolics of edible mushroom extracts. Food Chemistry. 2003;81(2):249-55.
18. Turkoglu A, Kivrak I, Mercan N, Duru ME, Gezer K, Turkoglu H. Antioxidant and antimicrobial activities of *Morchella conica* Pers. African Journal of Biotechnology. 2006;5(11):1146-50.
19. Çağlar A, Erol N, Elgün MS. Effect of carob flour substitution on chemical and functional properties of tarhana. Journal of Food Process and Preservation. 2012;37(5):670-5.
20. Köse E, Çagindi ÖS. An investigation into the use of different flours in tarhana. Journal of Food Science and Technology. 2002;37(2):219-22.

PICTORIAL ABSTRACT

SUMMARY

- Tarhana was supplemented with two edible mushroom species (*Morchella conica* and *Ramaria flava*) to improve its nutritional value and functional properties.
- Antioxidant activities of tarhana were analysed by using different assays.
- Total phenolic (TPC) and flavonoid contents (TFC) were also determined.
- Tarhana with mushroom had high total phenolic, flavonoid contents as well as antioxidant activities.
- The results indicated that high positive correlations were found between the antioxidant activities and the polyphenol contents of tarhana with mushroom.

ABOUT AUTHORS

TÜLİN EKER: is working as a Research Assistant at Food Engineering Department, Faculty of Engineering, Osmaniye Korkut Ata University, Turkey. She has been doing Master in Science in Department of Food Engineering, Çukurova University, Adana, Turkey. Research interests include antioxidant properties of foods.

FUAT BOZOK: is working as a Research Assistant Doctor at Department of Biology, Faculty of Arts and Science, Osmaniye Korkut Ata University, Turkey. He has experience on the systematic of plant and macrofungal species.

Cite this article: Eker T, Bozok F. Effect of Edible Mushroom Powder on Antioxidant Activity of Tarhana. Indian J of Pharmaceutical Education and Research. 2017;51(3)Suppl:S268-70.