International Journal of Agriculture Sciences
ISSN: 0975-3710&E-ISSN: 0975-9107, Volume 9, Issue 28, 2017, pp.-4366-4367.
Available online at http://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

ANTIOXIDANT ACTIVITY AND NUTRITIONAL PROPERTIES OF DIFFERENT OAT (*Avena sativa L.*) VARIETIES

MEHTA BHAWNA* AND JOOD SUDESH

Department of Foods and Nutrition, College of Home-Science, CCS Haryana Agriculture University, Hisar, Haryana 125004
*Corresponding Author: Email-bhawna.mehtaa2013@gmail.com

Received: May 01, 2017; Revised: May 15, 2017; Accepted: May 16, 2017; Published: June 18, 2017

Abstract- Five oat varieties namely HJ-8, HFO-114, OS-6. OS-346 and Kent were examined for their antioxidant activity and nutritional properties. Among the studied varieties, variety OS-346 was shown to be a good source of total phenolic content and DPPH radical scavenging activity. This variety also exhibited highest amount of *in vitro* protein digestibility (63.53%), *in vitro* starch digestibility (52.63mg maltose released /g meal) and total dietary fibre as compared to other varieties.

Keywords- Oat varieties, Antioxidants, *in-vitro* digestibility, Dietary fibre.

Citation: Mehta Bhawna and Jood Sudesh (2017) Antioxidant Activity and Nutritional Properties of different Oat (*Avena sativa L.*) Varieties. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 9, Issue 28, pp.-4366-4367.

Academic Editor / Reviewer: Dr Smritikana Sarkar

Introduction

Oats (*Avena sativa L.*) rank sixth in the world cereal production statistics following wheat, maize, rice, barley and sorghum [1]. Oats are excellent source of different dietary fibre compound of mixed linkage (1→3), (1→4) β-D glucan, arabinoxylans and cellulose. Soluble fibre of oat has been reported to reduce elevated blood cholesterol, triglycerides and glucose levels and thereby reducing the risk of degenerative diseases [2, 8], whereas insoluble dietary fibre helps in preventing the colorectal cancer [14]. Oats contain relatively high level of protein, minerals, lipids (unsaturated fatty acids), vitamins, antioxidants (avenanthramides, tocotrienols and tocopherols) and phenolic compounds (20,25]. Oats may also provide a useful substitute for wheat products in patients suffering from celiac disease [26,16]. The incorporation of oats into a gluten free diet which diversifies the celiac diet and also provides high fibre, vitamins, minerals, antioxidants and phytochemicals. The enrichment of gluten free products with dietary fibres has proved to be necessary, since it has been reported that celiac patients generally have a low intake of fibres attributed to their gluten free diet [13,16]. Oats has recently attracted research and commercial attention mainly due to its high content of β-glucans and compounds with antioxidant activity. Now-a-days, scientists keep on working on cereal crops to develop new varieties. Different varieties differ in their nutritional content. Not much nutritional data is available on these varieties of oats so, this research work was carried out with the objective to assess the nutritional properties of various oat varieties.

Material and Methods

Seed samples of five oat varieties namely HJ-8, HFO-114, OS-6, OS-346 and Kent were procured in a single lot from the Forage Section of the Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar. The grain samples were cleaned, made free of dust, dirt and foreign materials. Half of the seed samples were ground in an electric grinding mill and stored in plastic containers at room temperature for further analysis.

Total phenolic content and antioxidant activity using DPPH

Total phenolic content was estimated by the method of Singleton and Rossi [19]. DPPH free radical scavenging activity was measured using DPPH [7].

In vitro starch and protein digestibility

Starch digestibility (*in vitro*) was assessed by employing pancreatic amylase and incubating at 37C for 2 hours. Liberated maltose was measured colorimetrically by using dinitrosalicyclic acid reagent [18]. Protein digestibility (*in vitro*) was assessed by employing pepsin and pancreatin [12]. The nitrogen contents of the sample and the undigested residue were determined using automatic KEL PLUS [3]. The digested protein of the sample was calculated by subtracting residual protein from the total protein of the sample.

$$\text{Protein digestibility (\%)} = \text{Soluble protein N/ Total protein N} \times 100$$

Dietary fibre

Total dietary fibre was analyzed enzymatically according to the method of Furda [4].

Statistical Analysis

The data were statistically analyzed for analysis of variance to determine the critical difference (CD) among different varieties [17].

Results and Discussion

Table-1 *Antioxidant activity of different oat varieties (on dry matter basis)*

Varieties	Total phenolic contents (mg GAE/g)	DPPH free radical scavenging activity (%)
HJ-8	1.80±0.08	10.90±0.37
HFO-114	2.25±0.13	13.70±0.63
OS-6	1.85±0.02	12.86±0.52
OS-346	2.62±0.17	15.90±0.28
Kent	2.55±0.11	14.83±0.44
CD (P ≤0.05)	0.38	1.50

The results regarding total phenolic content and DPPH free radical scavenging activity of different oat varieties are presented in [Table-1]. Total phenolic contents of five oat varieties ranged from 1.80 to 2.62 GAE/g, respectively. The highest and lowest being observed for variety OS-346 and HJ-8, respectively. Variety HJ-8 vs

OS-6, OS-346 vs Kent were not differed significantly in total phenolic contents. Total phenolic contents reported to be 1.74 to 2.68 mg GAE/g in different oat varieties [15]. These results are in agreement with the present results. Other workers also reported similar results [5]. DPPH scavenging activity of five oat varieties ranged from 10.90 to 15.90 %, with varieties HFO-114 vs OS-6 and OS-6 vs Kent showing non-significant difference whereas other varieties differed significantly. Similarly, antioxidant activity of different oat varieties reported to be 11.9 to 15.3% [15]. These results are in lines of present study. There is significant positive correlation between total phenolic content and the antioxidant activity (DPPH) in whole oat flour [9].

Table-2 *In vitro digestibility of different oat varieties (on dry matter basis_)*

Varieties	*In vitro* protein digestibility (%)	*In vitro* starch digestibility (mg maltose/g)
HJ-8	59.70±0.90	45.46±0.40
HFO-114	60.23±1.28	49.33±0.75
OS-6	55.50±1.18	47.60±1.42
OS-346	63.53±1.27	52.63± 1.29
Kent	62.60±1.21	50.33± 0.49
CD (P≤0.05)	2.11	2.08

Values are mean ± SE of three independent determinations

In-vitro digestibility of different oat varieties are presented in [Table-2]. *In-vitro* protein and starch digestibility varied from 55.50 to 63.53% and 47.60 to 52.63 mg maltose released/g meal among different oat varieties. The highest and lowest *in vitro* protein and starch digestibility were observed with variety OS-346 (63.53% and 52.63 mg maltose/g meal). Varieties HJ-8 vs HFO-11, OS-346 and Kent differed non-significantly whereas variety OS-6 differed significantly (P≤0.05) with other four oat varieties. Other workers also reported similar results of *in - vitro* digestibility in different oat varieties [22,10, 6].

Table-3 *Dietary fibre content (%) of different oat varieties (on dry matter basis)*

Varieties	Total dietary fibre	Soluble dietary fibre	Insoluble dietary fibre
HJ-8	10.56±0.40	6.13±0.08	4.40±0.20
HFO-114	10.80±0.49	6.36±0.09	4.50±0.15
OS-6	11.50±0.37	6.43±0.34	5.13±0.12
OS-346	13.10±0.32	7.40±0.12	5.76±0.17
Kent	12.13±0.69	6.60±0.11	5.13±0.20
CD (P ≤0.05)	1.52	0.57	0.56

Values are mean ± SE of three independent determinations

Dietary fibre content of five oat varieties are presented in [Table-3]. Total, soluble and insoluble dietary fibre content varied from 10.56 to 13.10, 6.13 to 7.40 and 4.40 to 5.76 %, respectively in five oat varieties. Among them, variety OS-346 exhibited highest amount of total, soluble and insoluble dietary fibre content and variety HJ-8 had lowest. Usman *et al*. (2010) reported 12 % total dietary fibre in whole oat grain flour. Oat contains 10.6 % of dietary fibre which are in lines of present study [11]. Other workers also reported similar results of dietary fibre[17, 24].

Conclusion

It may be concluded from the present study that the variety OS-346 exhibited higher antioxidant activity, *in vitro* digestibility of protein and starch and dietary fibre contents. Hence, in further study, flour from this oat variety can be used for making breakfast cereals and bakery products. The developed functional foods could be beneficial for human consumption.

Acknowledgement / Funding: Author are thankful to Department of Foods and Nutrition, College of Home-Science, CCS Haryana Agriculture University, Hisar, Haryana 125004

Author Contributions: All author equally contributed

Conflict of Interest: None declared

References

[1] Ahmad M., Gul-Zaffar Z., Dar A. and Habib M. (2014) *Journal of Scientific Research and Essays*, 9, 52-59.
[2] Anderson J.W., Baird P., Davis R.H., Ferreri S., Knudtson M., Koraym A., Waters V. and Williams C.L. (2009) *Nutrition Reviews,* 67,188-205.
[3] AOAC. (2000) Approved Methods of Analysis. 16th Ed. Association of official Analytical Chemists. Arlyngton, Verginia, USA.
[4] Furda I. (1981) Simultaneous analysis of soluble and insoluble dietary fibre. In W.P.T. James, and O. Theander (Eds.), The Analysis of Dietary Fibre in Food. Marcel Dekker, New York. pp. 163-172.
[5] Gujral H.S., Sharma P. and Singh R. (2011) *LWT- Food Science and Technology,* 44, 2223-2230.
[6] Gupta S. and Brar J. (2015) *International Journal of Food and Nutrition Sciences*, 5,182-90.
[7] Hatano T., Kagawa H., Yasuhara T. and Okuda T. (1988) *Chemistry Pharmacology Bulletin,* 36, 2090-2097.
[8] Immerstrand T. (2010) Cholesterol-lowering properties of oats: Effects of processing and the role of oat components. Ph.D. Thesis, Lund University, Sweden.
[9] Lahouar L., Arem A.E., Ghairi F., Chahdoura H., Salem H.B., Felah M.E. and Achour L. (2014)*Food Chemistry*, 145- 578-83.
[10] Li Q. and Guo-Xu J. (2015) *European Journal of Food Science and Technology*, 3,49-57.
[11] Maboodurrahman A. and Birari S.S. (2014) *International Journal of Science Residency,* 4, 793-796.
[12] Mertz E.T., Kirleis A.W. and Aretell J.D. (1983) *Fed. Proc.* 32(5), 6029.
[13] Padalino L., Mastromatteo M., Sepielli G. and Alessandro M. (2011) *Open Access Materials,* 4, 2119-2135.
[14] Ryan D., Kendall M. and Robards K. (2007) *Nutrition Research Reviews*, 20, 147-162.
[15] Sandhu K.S., Godara P., Kaur M. and Punia S. (2015) *Journal of Saudi Society of Agricultural Sciences*, 6, 1-7.
[16] Sharma V. and Chawla P. (2012) *Journal of Dairying, Foods & Home-Science,* 31, 112–116.
[17] Sheoran O.P. and Pannu R.S. (1999) Statistical package for agricultural works. "O.P. Stat" Collage of Agriculture, Kaul, CCS HAU, Hisar. India.
[18] Singh U., Khedekar M.S. and Jambunathan R. (1982) *Journal of Food Science and Technology*, 47, 510-516.
[19] Singleton V.L. and Rossi J.A. (1965) *American Journal of Enology Viticulture*, 16,144-158.
[20] Skoglund M., Peterson D.M., Andersson R., Nilsson J. and Dimberg L.H. (2008) *Journal of Cereal Science,* 48, 294-303.
[21] Sterna V., Zute S. and Brunava L. (2016) *Agriculture and Agricultural Science Procedia,* 8, 252-256.
[22] Urbano G., Lopez T., Porres J.M., Gomez villalvaa E. and Frias J. (2005) *Journal of Nutrition Science*, 21, 230-39.
[23] Usman S., Nazir S., Ali S., Nasreen Z. and Nazim A. (2010) Journal of *Bangladesh Res. Publ.* 4, 312-319.
[24] Vijayakumar M., Chappalwar M., Dayanand, P., Bobde H. and Steffi M. (2013) *International Journal of Engineering Science and Technology (ESTIJ),* 3, 677- 82.
[25] Wani S. A., Shah T. R., Bazaria B., Nayika G.A., Gull A., Muzaffar K. and Kumar P. (2014) *UJP.* 3,14-20.
[26] William D. (2008) *European Journal of Gastrointestinal Hepatology*, 20, 494-97.