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EFFECT OF BAKING PROCESS ON β-GLUCAN CONTENT IN WHOLE BARLEY BALADY BREAD

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ABSTRACT

This study aimed to examine the possibility of the production of bread using whole barley flour (WBF); two levels of substitution of 50% and 100% compared with wheat flour (WWF) only were administered. The effect of the baking process on the content of dietary fiber, particularly β-glucan, was investigated. Chemical composition alongside with the content and solubility of b-glucan in both raw materials and bread produced were determined. The results obtained showed that the barley flour gave the highest content of ash, crude fiber and fat compared to wheat flour. The highest content of total and soluble beta-glucan were recorded in whole barley bread followed by 50% barley substituted treatment. Moreover, the 100%WBF bread scored the highest content of fiber, protein and ash as well as fat content compared with wheat bread only, which was the highest in carbohydrate content only. Content of β-glucan showed higher values for the bread produced from whole barley flour followed by treatment 50% of barley flour and then bread traditional wheat flour, which scored the least content of β-glucan. The process of fermentation and baking could significantly reduce the total content of β-glucan in spite of increased solubility of beta-glucan. Taking into account the functional dose of β-glucan, it could be assumed that, presented content of β-glucan in barley bread, meet the recommended daily needs to achieve the health benefits attributed to barley β-glucan.
Keywords: β-glucan, Whole Barley, Baking Process, Bread.

INTRODUCTION

The increasing prevalence of public health problems related to a sedentary life style has been widely discussed *(*WHO, 2003*).* The challenge for consumers is to gather a diet from the individual products available on the market, although the nutritional goals are satisfied overall diet. The noticeable development of health promoting diet called functional foods has been on the focus. A key perspective to understand the role of functional foods is to emphasis the role of functional foods as a socially and culturally shaped phenomenon instead of mere products to be accepted or rejected (Lyly, 2006*)*. Interestingly, there has been a growing research interest for the utilization of barley in a wide range of food applications (Erkan et al., 2006 and Siebenhandl-Ehn *et al*., 2011 and El-Refai, *et al.,* 2014*).* Apart from having a nutritive value, barley is unique among cereals for its healthy effects. Barley is the main cereal grain for the development of functional foods, as it contains high concentrations of many components of strong healthy interest. Consuming barley lowers the levels of blood cholesterol and attenuates postprandial glucose response *(*Lyly, 2006*).* Consumption of barley-containing foods and the associated soluble fiber significantly improved several metabolic diseases risk factors. The mixed linkage (1-3)(1-4)-β-D-glucans (β-glucan) from the endosperm of barley grains are valuable industrial hydrocolloids and have been shown to be important, physiologically active dietary fibre components. Cereals especially oat and barley are rich in β-glucan. (Wood et al., 2000*).*The highest ß-glucan intake resulted in the greatest reduction in total and LDL-cholesterol concentrations and total HDL cholesterol, especially in postmenopausal women and men as reported by *(*Behall, 2004). The Food and Drug Administration had allowed foods containing barley to claim that they reduce the risk of coronary heart disease. provide at least 0.75 grams of soluble fiber per serving (FDA, 2006). It is important to refer to that Prophet Muhammad (PBUH) recommended barley and used it in various forms such as barley bread and Talbeena as mentioned by Ibn Al Qayyim Al Jawziyyah *(195*7*).*

Thus, the present study was designed to investigate the possibility of producing a dietary fiber-rich traditional bread using whole hulless barley flour (88.2% extraction) and whole wheat flour. In addition, the effect of baking on β-glucan content and characteristics was investigated. On the way to, produce a feasible strategy for involving such a healthy component in our traditional staple foods.

MATERIALS AND METHODS

Materials:

Raw materials:

Barley (*Hordeum vulgare vulgare L*.), the six rowed naked barley cultivar Giza 130 grains were obtained from Barley Research Department, Crop Research Institute, Agriculture Research Center, Giza, Egypt. Wheat grains (*Triricum sativum*) (Gmiza 9) obtained from Agricultural Research Center, Wheat Department, Mansoura City, Egypt. Yeast, salt and sugar were purchased from local markets in Mansoura City.

Methods:

- Milling process: Hull-less barley was milled into flour using Brabender pilot automatic mill (mill senior Brabender, Mod. No.8802, Germany), with a milling yield of 63.7%. The fine bran was re-mixed with the flour again, and then sieved through 0.5 mm sieve to produce flour 88.2%. Wheat grains were milled at local Mill to produce Flour 83% extraction.

- Blends: three blends were prepared by replacing barley flour with different levels of wheat flour to produce barley bread. The used levels were 0, 50 and 100% of barley flour.

- Baking process: Balady bread was prepared by mixing the components of basic dough formula: 1000 g of flour 88.2% extraction from each blend with 5 g dry yeast, 10 g salt and the amount of water given by farinograph test According to (Abo-Elnaga, 2002) using (Brabender farinograph, USA). Breads were baked at 520 °C for 2 min in an automatic bread bakery in Mansoura City. Following baking, breads were cooled for 1 h before subsequent analyses. After that, bread loaves subjected to chemical analysis were stored frozen at (-18 C), frozen sample were ground in a mortar prior to analysis.

- Chemical Analyses: Moisture, ash, protein, crude fiber, and fat contents were determined according to the methods described by A.O.A.C. (2000).
Determination of total β-glucan: β-glucan was determined by a non enzymatic method designed by Madacsi *et al*., (1983).

Determination of solubility of β-glucan samples: The solubility of β-glucan (unpurified) in the native flour was determined according to the method of GaoSong and Vasanthan (2000).

Statistical analysis: All data were expressed as means ± SE. Statistical significance was considered at $p<0.05$. Significant differences among the experimental groups were determined by one-way analysis of variance using the SPSS statistical analysis program version 9.1.

RESULTS AND DISCUSSION

Chemical characteristics of whole barley flour and whole wheat flour blends:

Data shown in Table (1), exhibit the gross chemical composition of whole barley WBF and whole wheat WWF flours and their composite 50% blend. From data, it could be assumed that, protein and fat contents did not show significant differences in all three blends. Even though, barley flour was superior in both protein and fat content than wheat flour. Meanwhile, ash content was alittle higher in barley flour due to relevant higher content of grain intact out layers which contain the most mineral content in the grain. Noticeably, crude fiber content was significantly higher in whole barley flour reflecting its higher extraction percent also due to its natural intact grain outer layers. Crude fiber content recorded high significant differences between blends. That may be due to barley flour replacement level. The increase was parallel with the increase in barley flour level. Total carbohydrates content were reflecting the increase or decrease in all other dry contents. So, it was lesser in whole barley flour than whole wheat flour, due to barley's higher content in protein, fat, crude fiber and ash. These results were in agreement with those of Quinde *et al.,* (2004), Izydorczyk *et al.,* (2005) and El-Refai, *et al*., (2014)

Table (1): gross chemical composition of whole barley and whole wheat flours blends (on dry weight basis).

%Components / Samples	Moisture	Crude Protein	Crude Fat	Ash	Crude fiber	Total Carbohydrates
100% WBF	10.69 [a] ±0.17	11.97[a] ±0.54	2.12[a] ±0.12	2.08[a] ±0.22	2.80[a] ±0.21	81.03 [b] ±0.88
100%WWF	11.91[a] ±2.05	10.94[a] ±0.21	1.50[a] ±0.27	1.33[a] ±0.25	1.66[b] ±0.23	84.56 [a] ±0.47
WBF:WWF (1:1)	11.66[a] ±0.99	11.18[a] ±0.22	1.81[a] ±0.15	1.67[a] ±0.23	2.50[a] ±0.10	82.88 [ab] ±0.45

Values in the same column with different letters (a, b, c &d) are significantly different ($P \leq 0.05$). All values are means of three replicates ± SD on dry weight basis.
WWF = Whole Wheat Flour. WBF = Whole Barley Flour.

These results corroborate those of other authors who also reported chemical composition of barley. Assem *et al*., (2002) found that, chemical composition of whole wheat flour showed protein content 10. 23%, ash 0.97%, crude fiber 1.7%, fat 1.83%, and total carbohydrates 85.26%. Khalaf and Mohamed (2008) reported that, barley flour composed of 1.2% fat, 9.9% protein, 15.6% dietary fiber and 77% carbohydrates.

More recently, Alu'datt *et al*., (2012) reported a higher content in the following components in barley flour (14.0% protein, 3.9% fat, 4.2% fiber, 3.4% ash and 74.5% carbohydrate).

B-Glucan content in whole barley flour and whole wheat flour blends:

Table (2) show insoluble, soluble and total β-glucan contents of flour blends. As a rich source of β-glucan, whole barley flour exhibited the highest content of total β-glucan (7.26 gm\100gm) compared with wheat flour (1.03 gm\100gm). Insoluble β-glucan scored 5.28 g/100gm in whole barley flour which consists 72.53% of its total content. Comparatively it was only 0.78 g/100gm in wheat flour which formed 75.72% of the total b- glucan content. Formulating a 50% whole barley flour with 50% whole wheat flour had relevant effect on the total content of the whole blend content of β-glucan. Percentage of soluble β-glucan ranged between 27.27% in whole barley flour to 24. 27% in whole wheat flour of total β-Glucan content. Also, the reported differences between blends are shown in Fig. (1).

The findings was in match with *,* Skendi *et al., (*2003) who reported a β-glucan content 1% in wheat grains, and 5–11% in barley. Also, it was of agreement with (Izydorczyk *et al.,* 2001) who found 7.2% total β–glucan content in waxy barley flour within 3.2% soluble β-glucan.

In the same track, results from Siebenhandl-Ehn *et al*., (2011) interpret the noticed variances between different studies on β–glucan content. They found that, in 29 investigated varieties of hulless barley flour genotypes β–glucan content ranged from 4.5-6.1%, ash recorded 0.82- 4.74%, and protein was in range of 8.7- 13.4% . They attributed the scored differences to the genotype and environmental differences. Conclusively, barley is considerably rich source of beta glucan than wheat flour. Expectedly, the total beta glucan content in the blends was correlated to its barley flour content.

Table (2): Insoluble, Soluble and Total β-Glucan contents of balady bread flour blends (gm\100gm) on dry basis

Component / Blend	Insoluble β-Glucan	soluble β-Glucan	Total β-Glucan	%Insoluble β-Glucan	%soluble β-Glucan
100% WBF	5.28 ^{a} ±0.17	1.98 ^{a} ±0.06	7.26 ^{a} ±0.24	72.53 ^{a} ±0.356	27.27 ^{ab} ±0.51
50% WBF	2.48 ^{b} ±0.24	1.13 ^{b} ±0.057	3.61 ^{b} ±0.28	68.69 ^{b} ±1.09	31.30 ^{a} ±0.94
100% WWF	0.78 ^{c} ±0.03	0.25 ^{c} ±0.031	1.03 ^{c} ±0.04	75.72 ^{ab} ±0.06	24.27 ^{b} ± 2.84

Values in the same column with different letters (a, b, c &d) are significantly different (P ≤ 0.05). All values are means of three replicates ± SD on dry weight basis .
WWF = Whole Wheat Flour. WBF = Whole Barley Flour.

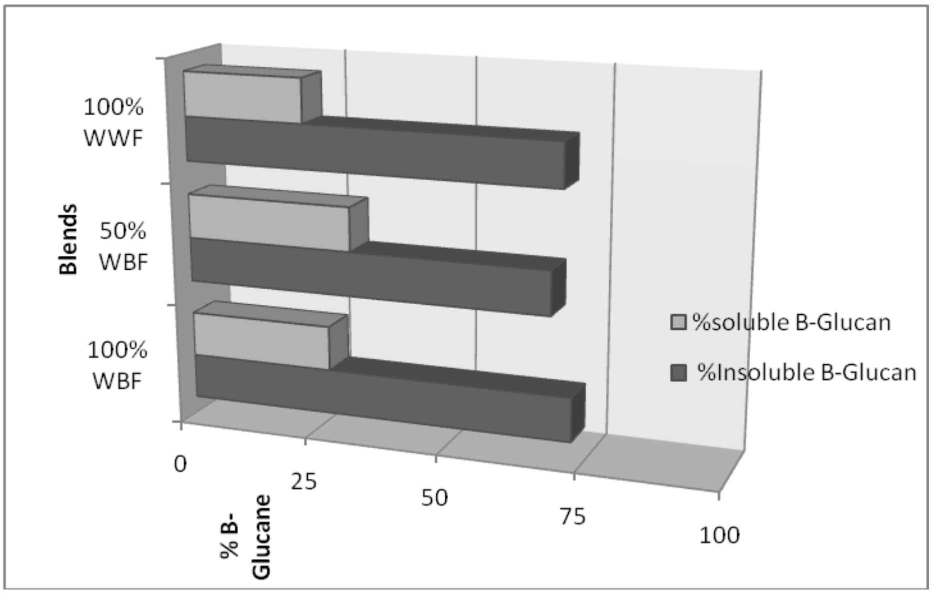

Fig. (1): Percentage of Soluble and insoluble β-Glucan content in whole barley flour and whole wheat flour blends

Chemical characteristics of whole barley and whole wheat balady bread:

Data in table (10) exhibit the chemical composition of the produced Balady bread. Starting from moisture content, which revealed the high water absorption characteristic of barley flour attributed to its high dietary fiber content. Thus, the barley bread consumed a higher water amount in its dough than wheat bread, due to its high dietary fiber content which increases water absorption. It may be the reason of its higher moisture content 41.68% compared to 26.06% in whole wheat bread and 34.97% in mixed blend (50% whole wheat + 50% whole barley). Protein content showed non significant differences between blends, it was ranging from 11.48% (whole barley bread) to 11.43% (whole wheat bread). These scores were logically correlated to the original raw flour blend with little increase due to the addition of yeast to the dough. Concerning fat content in bread, it was 1.73, 1.40 and 1.11% in whole barley bread, 50% WBF + 50% WWF bread and 100%whole wheat bread respectively.

In Table (3), ash content, showed a clear correlation to the added salt and raw material ash content. So that, it was higher in whole barley bread (3.89 %) reflecting the original higher mineral content in barley flour. Responsively, the substitution with 50% wheat flour decreased the ash content to reach 2.74%. While, whole wheat bread ash content was 2.03 %.

Significantly, crude fiber content was varied strongly between bread treatments according to its original flour type. Comparatively, whole barley flour bread recorded the highest fiber content 2.12% compared to 1.43% in 50% whole wheat bread and 0.79% in 100% whole wheat bread. This content showed a noticeable decrease than raw blends. Which due to the analytical effect of cellulases enzymes during fermentation. Also, thermal degradation during baking process on 520° C plays a role in fiber degradation. Finally, it could be assumed that, total carbohydrates content calculated by difference- was mirroring the differences in other dry matters especially, ash and crude fiber. It was negatively correlated to the increase in ash and crude fiber to score 80.78%, 82.76% and 84.64 in WBF, 50% WBF+50%WWF and 100% WWF breads, respectively.

Table (3): Chemical composition of balady bread prepared from whole barley and whole wheat flour blends (Dry weight basis %)

Component / Blend	Moisture	Crude Protein	Crude Fat	Ash	Crude fiber	Total Carbohy drates
100% WBF	41.68 [a] ±1.34	11.48 [a] ±0.33	1.73 a ±0.19	3.89 [a] ±0.28	2.12 [a] ±0.35	80.78 [c] ± 0.24
100%WWF	26.06 [c] ±0.78	11.43 [a] ±0.26	1.11 [b] ±0.06	2.03 [b] ±0.08	0.79 [b] ±0.16	84.64 [a] ± 0.31
WBF:WWF (1:1)	34.97 [b] ±2.88	11.65 [a] ±0.13	1.40 [ab] ±0.13	2.74 [a] ±0.23	1.43 [ab] ±0.02	82.76 [b] ±0.36

Values in the same column with different letters (a, b, c &d) are significantly different ($P \leq 0.05$). All values are means of three replicates ± SD on dry weight basis .
WWF = Whole Wheat Flour. WBF = Whole Barley Flour.

β-glucan content in whole barley and whole wheat Balady bread treatments:

As exhibited in table (4) and figure (2), β-glucan content in produced Balady bread treatments showed significant differences. Expectedly, the highest content of total β-glucan was 5.99 % in WBF bread. Followed by the treatment 50% whole barley + 50% whole wheat bread which contained 3.96% total β-glucan. Logically, Whole wheat bread scored the lowest β-glucan content. The solubility of β-glucan showed a noticeable increase in all bread blends.

It is clear that Insoluble, soluble and total β-glucan contents of the total β-glucan content decreased substantially than the raw blends. That may due to β-glucanase activity during mixing, fermentation, and baking processes also the destructive effect of heat on the soluble beta glucan. It is well known that baking into bread can cause significant depolymerization of b-glucan (Andersson *et al.,* 2004). This appears to be primarily caused by b-glucanase enzymes present more in wheat flour (Trogh *et al.,* 2005). Expectedly, soluble β-glucan percentage increased in WBF and 50% WBF containing blends. Noticeably, there was a higher increase in β-glucan solubility in WWF bread due to its higher content in β-glucanase enzymes as previously mentioned.

That finding was in contrast to Andersson *et al,* (2004) who detected no changes in β-glucan properties after baking bread.

Regarding health effects of barley β-glucan, according to Beer *et al.* (1997) baking increased the physiologically extractable amount of β-glucan three to four folds but decreased the molecular weight beak by 50% compared with raw materials in-vitro system simulating human digestion. An association between lower molecular weight and increased solubility of β-glucan has been noted by (Wood *et al,* 1991) the amount of β-glucan has to be adequate to reach the health function in food product. In the recent study, one portion (one quarter =35 gm) of whole barley bread supplied approximately 2.1 g of β-glucan, which means that one loaf of whole barley bread provide (4.29 gm) more than the least recommended amount of β-glucan (3 gm), needed to achieve the health claims of FDA for barley.

Bread was in great correlation with the raw material corresponding contents. Thus, high significant differences were noticed between all breads as presented in table (4). It is worth to say that, the used barley variety Giza 130 was chosen for its high beta glucan content in the same time it was cultivated under rigid conditions which increased its dietary fiber content to a higher percentage than normal.

Table (4): Insoluble, Soluble and total β-glucan contents of Balady bread (gm\100gm) on dry basis.

Component / Blend	Insoluble B-Glucan	soluble B-Glucan	Total B-Glucan	%Insoluble B-Glucan	%soluble B-Glucan
100% WBF	3.98 [a] ± 0.074	2.01 [a] ±0.47	5.99 [a] ±0.41	66.44 [a] ± 6.02	33.56 [b] ± 6.02
100% WWF	0.33 [c] ±0.07	0.34 [b] ±0.048	0.67 [c] ±0.11	49.25 [b] ± 3.050	50.74 [a] ±3.05
WBF:WWF(1:1)	2.35 [b] ±0.26	1.61 [a] ±0.13	3.96 [b] ±0.19	59.34 [ab] ±4.65	40.66 [ab] ± 4.65

Values in the same column with different letters (a, b, c &d) are significantly different ($P \leq 0.05$). All values are means of three replicates ± SD on dry weight basis.
WWF = Whole Wheat Flour. WBF = Whole Barley Flour.

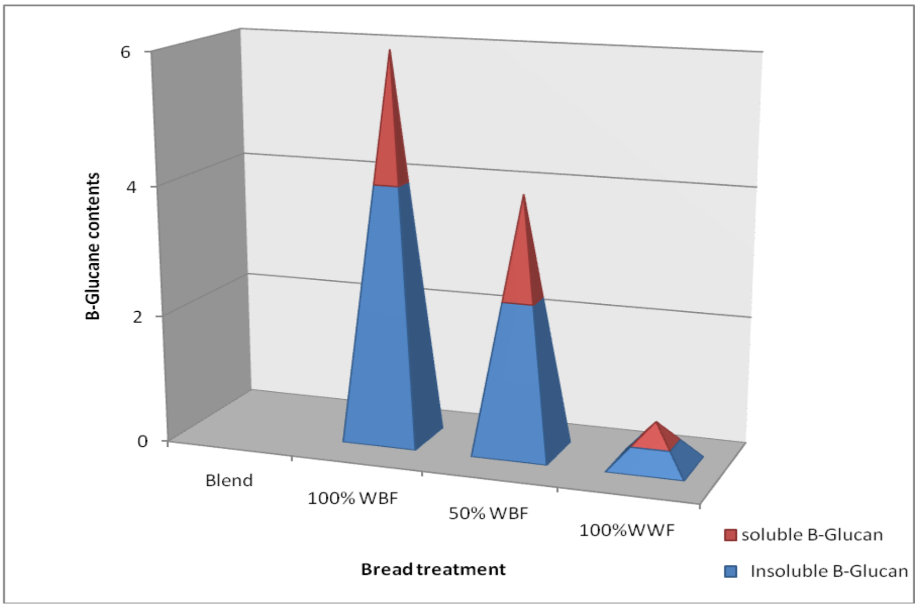

Fig. (2): Soluble and insoluble β-glucan content in WBF and WWF bread treatments.

There has to be 0.75 gm of β-glucan per portion in food product to reach the level recommended by FDA to achieve the health effect, which was 3g per day (FDA, 2003). In the recent work, total β-glucan content was 5.99 gm/100 gm in barley flour bread. which means that, each 140 gm weighed loaf of WBF bread provides 8.39 gm of β-glucan (with 2.8 gm of soluble β-glucan content). This content, after baking process, cover the required amount to have the health claim in compliance of the FDA limits.

CONCLUSION

Our recent experiment showed that the baking quality of hulless barley flour is sufficient to bake pure whole barley bread. Baking process considerably contributes in the loss of total β-glucan under fermentation and heat treatment conditions; however, it increases the solubility of β-glucan. Thus, hulless barley is an interesting alternative for commonly used wheat flour and could contribute to a higher health aspect in human nutrition.

REFERENCES

A.O.A.C. (2000). Official Methods of Analysis of AOAC International. (17^{th} ed.) by Horwitz, W. Suite 500, 481 North Fredric Avenue Gaithersburg, Maryland 20877 – 2417, USA.

Abo-Elnaga, M. M. (2002). Dietary fiber of barley and oat as hypochcholesterolymic action and source of fat replacement in foods. Ph.D. thesis, Fact. Of Agric., Cairo University.

Alu'datt, M. H. ; Rababah, T.; Ereifej K.; Alrababah, A.; Almajwal, N.; Masadeh, M. and Alhamad, M. (2012). Effects of barley flour and barley protein isolate on chemical, functional, nutritional and biological properties of Pita bread," Food Hydrocolloids, vol. 26, no. 1, pp. 135–143.

Andersson, A.; Armo, E.; Grangeon, E.; Fredriksson, H.; Andersson, R. and Åman, P. (2004). Molecular weight and structure of (1→3) (1→4)-β-d-glucans in dough and bread made from hull-less barley milling fractions. J. Cereal Science, 40: 195– 204.

Assem, N. H.; El-Mottaleb, M. and Attia, A. (2002). Effect of germination and gelatinization of hulless barley on produced balady bread. Pp 33-48. Proceeding of food quality conference, Cairo 10-13 October, 2002.

Beer, M. U.; Wood, P. J.; Weisz, J. and Fillion, N. (1997). Effect of cooking and storage on the amount and molecular weight of (1-3), (1-4) - β-D-glucan extracted from oat products by an in vitro digestion system. Cereal Chemistry, 74: 705- 709.

Behall, K.M.; Scholfield, D.J. and Hallfrisch, J. (2004). Diets containing barley significantly reduce lipids in mildly hypercholesterolemic men and women. American Journal of Clinical Nutrition, 80: 1185- 1193.

Burkus, Z.; and Temelli, F. (2005). Rheological properties of barley b-glucan. Carbohydrate Polymers, (59): 459– 465.

Cavallero, A.; Empilli, S.; Brighenti, F., and Stanca, A. M. (2002). High (1→3, 1→4) - β-glucan barley fractions in bread making and their effects on human glycemic response. J. Cereal Science, 36: 59- 66.

Dawkins, N. L. and Nnanna, I. A. (1995). Studies on oat gum [(1-3, 1-4) β-D-glucan]: Composition, molecular weight estimation and rheological properties. Food Hydrocolloids, 9: 1–7.

Eckles, C. H.; Combs, W. B. and Macy, H. (1951). Milk and Milk Products. fourth edition. published by TATA MCGRAW-HILL Publishing Company LTD. Bombay, New Delhi.

El-Refai, A., El-Bastawesy,Amal and El-Ashaal, Eman S.(2014). Utilization of germinated barley and oat flours for making untraditional and functional puree blends. Proceeding of NAFI 2014. International food congress, pp 56- 63.

Erkan, Y.; Celik, S.; Berna B. and Koksel, H. (2006). A new approach for the utilization of barley in food products: Barley tarhana. J. Food Chemistry, 97: 12– 18.

F.D.A. (2006). (Food and Drug Administration). FDA Finalizes Health Claim Associating Consumption of Barley Products with Reduction of Risk of Coronary Heart Disease.
http://www.fda.gov/ohrms/dockets/98FR/04p-0512-nfr0001.pdf

Gaosong, J. and Vasanthan, T. (2000). Effect of extrusion cooking on the primary structure and water solubility of β-glucan from regular and waxy barley. Cereal Chemistry, 77. (3): 396- 400.

Ibn Al Qayyim Al Jawziyyah. (1957). al Tibb al Nabawi. ALfaisal puplications. Egypt. In Arabic.

Izydorczyk, M. S.; Hussain, A. and MacGregor, A.W. (2001). Effect of barley and barley components on rheological properties of wheat dough, Journal of Cereal Science, 34(3): 251– 260.

Izydorczyk, M.S.; Lagasse´, S.L.; Hatcher, D.W.; Dexter, J.E. and Rossnagel, B.G. (2005). The enrichment of Asian noodles with fibre-rich fractions derived from roller milling of hull-less barley. J. Science and Food Agriculture, 85: 2094– 2104.

Lyly, M. (2006). Added β-glucan as a source of fiber for consumers. Espoo. VTT Publications 594. 96 p. + app. 50 p.

Quinde, Z.; Ullrich, S. E. and Baik, B. K. (2004). Genotypic variation in colour and discolouration potential of barley-based food products. Cereal Chemistry, 81: 752– 758.

Madacsi, J. P.; Parrish, F. W.; and Roberts, E. J. (1983). Nonenzymic Method for Determination of Beta-Glucan in the Presence of Starch. The American Society of Brewing Chemists, Vol. 41 No. 4: 161-162.

Siebenhandl-Ehn, Susanne; M. Kinner; Leopold, Loredana F.; Poppernitsch, Mara B.; Prückler, M.; Wurbs, P.; Poisinger, Sabine K.; Berghofer, E. and Grausgruber, H. (2011). Hulless Barley – A Rediscovered Source for Functional Foods Phytochemical Profile and Soluble Dietary Fibre Content in Naked Barley Varieties and Their Antioxidant Properties. Phytochemicals - Bioactivities and Impact on Health. Rasooli, I. (Ed.), ISBN: 978-953-307-424-5, Skendi, A.; Biliaderis, C.G.; Lazaridou, A. and Izydorczyk, M.S. (2003). Structure and rheological properties of water soluble β-glucans from oat cultivars of Avena sativa and Avena bysantina, J. Cereal Science, 38: 15– 31.

Trogh, I. et al., (2005). Fractions from hull-less barley and wheat to produce soluble dietary fibre-enriched bread. Cereal Foods World, 50: 253–258.

WHO (World Health Organization). (2003). Diet, nutrition and the prevention of chronic diseases. Report of a joint WHO / FAO expert consultation. WHO Technical Report Series 916. Geneva.

Wood, P.J.; Beer, M.U. and Butler, G. (2000). Evaluation of role of concentration and molecular weight of oat β-glucan in determining effect of viscosity on plasma glucose and insulin following an oral glucose load. British Journal of Nutrition, 84: 19– 23.

Wood, P. J., Weisz, J. and Mahn, W. (1991). Molecular characterization of Cereal β-glucans. II. Size-exclusion chromatography for comparison of molecular weight. Cereal Chemistry,. 68: 530.536.

دراسة تاثير عملية الخبيز علي محتوي البيتا جلوكان في الخبز البلدي المصنوع من دقيق الشعير الكامل.

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تهدف هذه الدراسة إلى بحث إمكانية إنتاج الخبز البلدي التقليدي باستخدام دقيق الشعير الكامل، بمستويين من الاحلال ٥٠% و ١٠٠% مقارنة مع دقيق القمح فقط. ودراسة تاثير عملية الخبيز علي محتوي الخبز من الالياف الغذائية الصحية وبخاصة البيتاجلوكان. تمت دراسة المحتوى الكيميائي بجانب محتوى وذوبانية البيتاجلوكان في كل من المواد الخام والخبز المنتج. تم تقييم جميع المعاملات حسيا. وأظهرت النتائج التي تم الحصول عليها ان دقيق الشعير أعطى أعلى محتوى من الرماد ، الألياف الخام والدهون مقارنة بدقيق القمح. و كذلك اعلي محتوي من البيتا جلوكان الكلي و الذائب. وعلاوة على ذلك ، سجل الخبز البلدي المصنع من دقيق الشعير ومعاملاته أعلى محتوى من الالياف والبروتين والرماد فضلا عن محتوى الدهون مقارنة مع خبز القمح فقط ، والذي كان أعلى في محتوى الكربوهيدرات فقط. محتوي البيتا جلوكان اظهر اعلي قيم للخبز المصنع من دقيق الشعير الكامل يلية المعاملة ٥٠% دقيق شعير ثم الخبز البلدي التقليدي من دقيق القمح فقط والذي سجل اقل محتوي من البيتا جلوكان. ادت عملية التخمير و الخبيز الي خفض المحتوي الكلي بالرغم من زيادة الذوبانية للبيتا جلوكان. وبمراعاة محتوى وحدة التقديم من كل معاملة من البيتا جلوكان يمكن القول إن الخبز البلدي المصنوع من دقيق الشعير يغطى الاحتياجات اليومية المطلوبة لتحقيق الفوائد الصحية المنسوبة لبيتاجلوكان الشعير.