Evaluation of dry soup of fermented barley with some vegetables.

Okba M. A., Abdelrasoul E. A. and Gomaa M. A.
Food Technology Res. Inst., ARC, Egypt

ABSTRACT

The purpose of this study was to the evaluation of dry soup from fermented kishk prepared from hulless barley flour; in addition to the different amounts of artichoke were 0, 100, 150 and 200 g. In order to take advantage of barley content of fiber, especially soluble including a compound β-glucan which useful in feeding patients with diabetes and cholesterol, as well as the content of artichokes from antioxidants, especially a silymarin compound which useful in the treatment of liver patients. The results showed that each of add the artichokes and fermentation process led to a significant increase in the content of the kishk of moisture, ash, fiber and starch but, decrease in protein and fat. While not affecting add artichoke on the the kishk of β-glucan content while, the fermentation process leading to a significant decrease ratio of 27.3%. Add 100, 150, and 200 g of artichoke has led to an increase in total phenols for 9.2, 13.7 and 23.0%, respectively, and all the mineral elements, while it did not affect the fermentation process, but also led to a significant decrease of phytic acid to 90%. Also, show that the viscosity was 17.6, 16.7, 15.9 and 15.2 Rapid Visco Analyzer (RVA) and the overall sensory acceptance was 4.6, 4.4, 4.0 and 3.5 degrees out of 5 degrees by adding a 0, 100, 150, 200 g of artichoke, respectively. From these results, we can see that the kishk prepared from hulless barley flour alone or by adding 100 or 200 gm artichoke was the best ingredients to produce acceptable sensory soup has high nutritional and therapeutic value.

Keywords: Kishk; Fermentation; Dry Soup; Barley; Artichoke

INTRODUCTION

The mixed linkage (1→3)(1→4)-β-D-glucans (β-glucan) from the endosperm of cereal grains are valuable industrial hydrocolloids and have been shown to be important, physiologically active dietary fiber components (Wood, 2001). β-glucans are water-soluble, linear, high molecular-weight polysaccharides (Autio, *et al*.,1987; Autio, *et al.*,1992 and Doublier & Wood, 1995). They give viscous, shear thinning solutions even at low concentrations. The viscosity is related to the molecular weight andis strongly dependent on concentration. A part from having a nutritive value comparable to wheat, barley is unique among cereals containing high concentrations of β-glucan which is known to have the effect of cholesterol lowering effect (McIntosh, *et al.*, 1991 and Newman, *et al*., 1989), regulating blood glucose level and insulin response in diabetics (Cavallero, *et al*., 2002) and even reducing risk of cancer (Jacobs, *et al*., 1998). Interest in the production and use of isolated cereal β-glucans in foods is due to their potential health benefits. If a product contains at least 0.75 g β-glucan per portion, the Food and Drug Administration (FDA) of USA allows a health claim for oat and oat products concerning the cholesterol lowering effect of soluble β-glucan fibers and thereby a reduced risk of

coronary heart diseases (FDA, 1996). The recommended daily intake of β-glucan for achieving the health effects is 3 g/d, corresponding to four portions per day.

Although barley is the fourth most important cereal in the world in terms of total production after wheat, rice and corn (Jadhav, *et al*., 1998), only a small amount of barley is used for human consumption. Taste and appearance factors along with its poor baking quality have limited the use of barley in human foods. However, in recent years there has been a growing research interest for the utilization of barley in a wide range of food applications (Bhatty, 1999; Bilgi & C, elik, 2004 and Koksel, et al., 1999).

Fermented cereal–yoghurt mixtures play an important role in the diets of many people in the Middle East, Asia, Africa and some parts of Europe (Ibanoglu & Ibanoglu, 1999). Kishk in Egypt, a popular traditional fermented food product in Turkey, is prepared by mixing yoghurt, wheat flour, yeast, and a variety of vegetables and spices (tomatoes, onions, salt, mint, paprika) followed by fermentation for 1–7 days. Lactic acid bacteria and yeast are responsible for the acid formation during fermentation. After fermentation, the mixture is sun dried and ground. Kishk has an acidic and sour taste with a yeasty flavor and is used for soup making (Ibanoglu & Ibanoglu, 1997). Because of the low moisture content (about 10%) and low pH, it can be stored for 2–3 years (Ozbilgin, 1983). There are some other products similar to tarhana such as Tarhana in Turkey, and Kushuk in Iraq and tahonya/talkuna in Hungry and Finland (Hafez & Hamada, 1984 and Siyamoglu, 1961). Methods for preparation for such mixtures may vary from one place to another, but cereals and yoghurt are always the two major components. The amount and type of ingredients used in kishk production may affect its nutritional content and sensory attributes. In general, kishk is produced with white-wheat flour. However, whole meal flour, semolina or both can also be used (Anonymous, 1981). Fermentation results in significant increases of riboflavin, niacin, pantothenic acid, ascorbic acid and folic acid contents of tarhana (Ekinci, 2005). During the long tarhana fermentation process, almost 95% of phytic acid gets lost (Bilgicli, *et al*., 2006). Phytic acid is an ant-nutritional agent due to its ability to bind minerals and proteins, either directly or indirectly, and thus alter their solubility, functionality, digestibility and absorption (Rickard & Thompson, 1997).

Tarhana soup can be made with wet or dry tarhana. Tarhana is also locally consumed as a snack after it has been dried, as a thin layer or as nuggets, but not in ground form. Since there is no standard procedure in the production method of tarhana, its nutritional properties depend heavily on the ingredients and the amounts used in the recipe. The following averages were measured in tarhana: moisture 10.2%, protein 16%, carbohydrates 60.9%, fat 5.4%, crude fiber 1%, salt 3.8% and ash 6.2% (Siyamoglu, 1961 and Daglioglu, 2000). Other researchers (Temiz and Pirkul, 1990 and Erbas, 2003) also reported similar results.

The nutritional properties, aroma and flavor of tarhana dough can be improved by fermentation. This results from the appropriate balance between the metabolism of the homo/hetero fermentative lactic acid bacteria (LAB) and the metabolism of yeast, which represents the naturally occurring microorganisms in tarhana. The LAB (Mensah, 1997) predominantly ferments cereal and milk. The association of LAB and yeast during fermentation may contribute to the production of metabolites, which could impart pleasant tastes and flavors to foods (Hattingh and

Viljoen, 2002 and Mugula *et al*., 2003). Fermentation, an old and economical method of producing and preserving food, is carried out to enhance flavor, aroma, shelf-life, texture, nutritional value and other pleasant and appealing properties of foods (Nout, 1993; Svanberg and Lorri, 1997; Mensah, 1997; Nout and Motarjemi, 1997 and Steinkraus, 2002). Various fermentation methods have traditionally been used worldwide to prepare and preserve food. Studies on fermented food were identified and prioritized with respect to safety, nutritional value, socio-economic and cultural aspects during the FAO/WHO workshop held in Pretoria, South Africa in December 1995 (Nout and Motarjemi, 1997).

The flavor and taste of acid-fermented foods are believed to be produced mainly by organic acids together with free amino acids and carbonyl compounds such as acetaldehyde and diacetyl. At the beginning of the fermentation period, tarhana dough contains a considerable amount of organic acid from the presence of ingredients such as yoghurt and vegetables. Lactic acid, formed by microbial degradation of available sugars, is the main organic acid of many fermented foods (Fennema, 1985). Changes of the fatty acid composition and free fatty acids in milk products occur because of the biological activity of microorganisms (Rasic and Kurmann, 1978).

The objectives of this study were evaluation to dry soup of fermented barley flour (a high β-glucan) with mixing yoghurt, yeast, and a variety of some vegetables as a therapeutic food.

Materials and methods

Materials:

Barley (*Hordeum apertum* - *Giza 128*) samples used in this study were obtained from Barley Research Department, Sakha Agricultural Research Station, A R C, Egypt. The barley samples were tempered to 14.5% moisture content and milled in a laboratory mill (Buhler, Germany). The other ingredients used in Kishk production purchased from local markets of Kafr El-sheikh Governorate, Egypt. Concentrated full fat yoghurt made from cow milk, tomato paste, compressed baker's yeast, artichokes, onion, peppers (green and red) and salt used in Kishk preparation. Equipped with 0.5 mm opening screen. All chemicals were obtained from Elgomhoria Co. for Chemical and Drugs, Tanta, Egypt.

Methods:

Kishk (Tarhana) preparation:

Kishk samples were prepared according to the method of Mugula *et al*., (2003) with some modifications. The ingredients used in kishk preparation are given in Table (1). To prepare kishk samples, artichokes, onions, green and red peppers were chopped. Tomato paste, paprika and salt were added and the mixture was blended. Flour, yoghurt and yeast were added to the mixture and blended until complete homogenization. The resulting mixture was taken into covered containers and incubated at 30 ºC for fermentation for 5 days. Samples were taken initially, during the course of fermentation and at the end of the fermentation for the determination

of acidity and pH. After fermentation, the kishk (tarhana) was dried at room temperature and then ground and sieved to pass a 1 mm screen.

Table (1): The ingredient used in kishk (tarhana) preparation.

Ingredients Amount	**(g)**
Hulless barley flour	750
Yoghurt (from cow's milk)	600
Artichokes	(0,100,150,200)
Tomato paste	112
Green pepper	75
Red pepper	75
Onion	180
Yeast	15
Paprika	15
Salt	60

*Mugula *et al*., (2003)

Soups preparation:

Kishk (tarhana) powder (20 g) mixed with 200 mL distilled water (20 ºC) and simmered for 12 min over medium heat with constant stirring (prepared in Laboratory of Food Technology Research, Sakh Agriculture Research Station, ARC).

Chemical analysis:

Moisture, ash and crude fat contents of flour and kishk (tarhana) samples were determined according to (AACC, 1990). Nitrogen content of the samples were determined by the Kjeldahl Method (AACC, 1990) and converted to protein content by a factor of 6.25. Starch was determined by the Ewers method (AOAC method 14.032) (AOAC, 1980). Dietary fibre measured using the methods described by Prosky *et al*. (1985). pH was determined according to the method of Mensah, (1997). Acid formation during fermentation samples was determined according to (Anonymous, 1981) and expressed as a percent of total lactic acid. β-Glucan contents of barley flours and kishk samples were determined by the McCleary Enzymatic Method (McCleary & Glennie-Holmes, 1985; McCleary & Codd, 1991) by using Megazyme β-Glucan and Glucose Assay Kits (Megazyme Ltd., Australia). The total titratable acidity of the samples was calculated as lactic acid as described by Kirk and Sawyer (1991). The mineral elements contents of the samples were determined by inductively coupled plasma spectroscopy, ICP‑AES (Vista series, Varian International AG, Switzerland). Dry samples were digested using closed vessel microwave digestion oven (MARS 5, CEM Corporation, and USA) with concentrated nitric acid and sulfuric acid. Concentrations were determined by ICP‑AES (Bubert and Hagenah, 1987). Phytic acid was measured by a colorimetric method according to Haugh and Lantzsch (1983). Phytic acid in the sample was extracted with a solution of HCl (0.2 N) and precipitated with solution of Fe (III) ammonium iron (III) sulphate. 12 H_2O.

Determination of colour:

Colour of the samples was evaluated by measuring the L (100 = white; 0 = black), a (+, red; -, green) and b (+, yellow; -, blue) values using a Hunter Lab Colour QUEST II Minolta CR-400 (Minolta Camera, Co., Ltd., Osaka, Japan) with illuminate D63 as reference. Values are the mean of three determinations (Mensah, 1997).

Viscosity:
Viscosity of soup was then measured at 100 rpm and 60 ºC using a Rapid Visco Analyzer (RVA‑4) (Newport Scientific, NSW, Australia) with data analysis software (Thermocline) was used to analyze soup samples. The last viscosity values of kishk soups prepared in this study has been determined by RVA soup method (Anonymous, 1981).

Total phenolic content (TPC):
The total phenolic content (TPC) was determined according the Folin–Ciocalteu specterophotometric method (Sharma and Gujral, 2010). Samples (200 mg) were extracted with 4 ml acidified methanol (HCl/methanol/water, 1:80:10, v/v/v) at room temperature (25 ºC) for 2 h. An aliquot of extract (200 ll) was added to 1.5 ml freshly diluted (10-fold) Folin–Ciocalteu reagent. The mixture was allowed to equilibrate for 5 min and then mixed with 1.5 ml of sodium carbonate solution (60 g/l). After incubation at room temperature (25 ºC) for 90 min, the absorbance of the mixture was read at 725 nm (Shimadzu, UV-1800, Japan). Acidified methanol was used as a blank. The results were expressed as l g of ferulic acid equivalents (FAE) per gram of sample.

Sensory analysis:
Seven panelists, who are familiar with the characteristics of kishk, evaluated kishk soup. The soup was filled to porcelain bowl at 50 ºC and served to panelists under daylight room conditions. Color, flavor, consistency, cohesiveness, sourness, grittiness and overall acceptability of kishk soup were evaluated using a 5-point scale with "1" being "dislike extremely", "3" being "acceptable" and "5" being "like extremely" Rickard and Thompson, (1997).

Statistical analysis
Analysis of variance (ANOVA) was carried out using Microsoft Excel software and Fishers least significant difference (LSD) test was used to describe means with 95% ($p < 0.05$) confidence. The Pearson correlation coefficients were calculated by SPSS statistical software (SPSS Inc., Chicago, Illinois, USA) at a probability level of $p > 0.05$.

RESULTS AND DISCUSSION

Chemical composition of kishk (tarhana) samples before and after fermentation as dry basis:

Chemical composition of kishk (tarhana) samples before and after fermentation are presented in Table (2). The moisture content of kishk samples varied between treatments before and after fermentation were 36.7% - 38.3% and 21.9% - 24.1%,

respectively. It was previously reported that the variation in moisture content of samples was due to the properties of ingredients used in the formulation and fermentation time, this results were agreement with (Temiz & Pirkul, 1990). The ash contents of samples were between 2.5% – 3.2% and 2.6% - 3.1%, respectively.

Table (2): Gross chemical composition of kishk samples before and after fermentation (on dry weight basis).

Artichokes (g)	Moisture (%)	Ash (%)	Protein (%)	Fat (%)	Carbohydrate (%)	Fibre (%)	Starch (%)	β-Glucan (%)
Before fermentation								
0	36.7^{c}	2.5^{c}	12.5^{c}	4.3^{ab}	80.7^{b}	25.6^{b}	62.8^{b}	4.4^{a}
100	37.3^{b}	2.7^{bc}	12.1^{c}	4.2^{bc}	81.0^{a}	25.9^{b}	62.5^{ab}	4.5^{a}
150	37.8^{b}	2.8^{b}	11.6^{d}	4.2^{bc}	81.4^{a}	26.3^{b}	61.5^{a}	4.3^{a}
200	38.3^{a}	3.2^{a}	11.4^{d}	4.0^{c}	81.4^{a}	27.0^{a}	61.2^{a}	4.2^{a}
After fermentation								
0	21.9^{g}	2.6^{bc}	17.3^{a}	4.6^{a}	75.5^{d}	21.7^{d}	55.6^{d}	3.2^{b}
100	22.5^{f}	2.7^{b}	17.0^{a}	4.5^{a}	75.8^{d}	21.5^{d}	56.0^{cd}	3.1^{b}
150	23.2^{e}	2.9^{ab}	16.6^{b}	4.3^{ab}	76.2^{c}	22.0^{d}	56.4^{c}	3.0^{b}
200	24.1^{d}	3.1^{a}	16.2^{b}	4.2^{bc}	76.5^{c}	22.8^{c}	56.3^{c}	2.8^{b}

Means with the same letter within a column are not significantly different by least significant difference (LSD) analysis *(P> 0.05*).

Sample had the variation in ash content of kishk before and after fermentation was due to the variation of ingredients used in the formulation. Add different ratios of artichoke led to a significant decrease in kishk protein content of 12.1% to 11.4% before the fermentation process while, fermentation process led to a significant increase in protein content about from 4.8% - 5.8% approximately. While each of carbohydrates, fibers, starch and β-Glucan decreased after the fermentation process. This is due to increase the cells growth of the yogurt bacteria and yeast in kishk during the fermentation process due to the use of yeast cells and bacteria Yogurt as an energy source. These results were agreement with (Temiz and Pirkul, 1990).

Some analytical results of kishk samples before and after fermentation (on dry weight basis):

The total phenolic compounds, phytic acid, acidity and pH in kishk samples before and after fermentation are presented in Table (3). The total phenolic compounds were significant increased with increasing artichokes in samples from 3928 to 4832 μg FAE/g while, the fermentation process was not significant change. Madhujith and Shahidi (2009) reported total that phenolic compounds (TPC) value ranging from 2.63 to 4.51 mg of ferulic acid equivalents (FAE)/g in barley. Bonoli *et al.* (2004) reported that total phenolic content ranging from 0.18 to 0.68 mg gallic acid/g flour in barley flour. Fermentation process lead to significant decreased of phytic acid and pH from 1.2 to 0.1% and 6.2 to 4.7, respectively. While, addition artichoke to samples lead to significant decreased slightly of phytic acid and pH especially, when add 200 g. In addition, acidity was significant increased with fermentation process from 0.8 to 1.6 % while, the addition of 200 g of artichokes

lead to significant decrease acidity of 0.3%. These results agreement with the report Handan Erkan *et al.* (2006).

Minerals content of kishk samples before and after fermentation:

Minerals content in kishk samples before and after fermentation are presented in Table (4). Observed that the fermentation process has no significant effect on the content of the kishk of elements but, found a significant increase of all the elements with increasing the amount of artichoke in the samples were (47.1 to 48.3), (124.5 to 144.9), (496.7 to 503.2), (6.1 to 7.4), (674.3 to 711.1), (3.1 to 3.6) and (1.8 to 2.5) mg/100g for Ca, Mg, P, Na, K, Fe and Zn, respectively. These results were agreement with report by Tamim *et al*. (1997).

Table (3): Some analytical results of kishk samples before and after fermentation (on dry weight basis).

dry basis.

Artichoke (g)	Total phenolic* (µg FAE/g)	Phytic acid (%)	Acidity (%)	pH
Before fermentation				
0	3928^{d}	1.1^{ab}	0.8^{c}	5.8^{b}
100	4289^{c}	1.2^{a}	0.7^{cd}	5.9^{ab}
150	4467^{b}	1.2^{a}	0.7^{cd}	6.1^{a}
200	4832^{a}	1.0^{b}	0.5^{d}	6.2^{a}
After fermentation				
0	3925^{d}	0.3c	1.6^{a}	4.7^{c}
100	4270^{c}	0.2cd	1.5^{a}	4.8^{c}
150	4468^{b}	0.3c	1.4^{ab}	4.8^{c}
200	4825^{a}	0.1d	1.2^{b}	4.9^{c}

Means with the same letter within a column are not significantly different by least significant difference (LSD) analysis *(P> 0.05*).

* = DPPH radical scavenging activity.

Table (4): Minerals content (mg/100g) of kishk samples before and after fermentation (on dry weight basis).

Artichokes (g)	Ca	Mg	P	Na	K	Fe	Zn
Before fermentation							
0	47.1^{c}	124.5^{c}	496.7^{b}	6.1^{c}	674.3^{d}	3.1^{c}	1.8^{b}
100	47.8^{b}	129.4^{c}	498.3^{b}	6.5^{bc}	687.5^{c}	3.1^{c}	2.0^{b}
150	48.0^{ab}	134.7^{b}	499.1^{a}	6.9^{b}	700.2^{b}	3.5^{a}	2.2^{a}
200	48.3^{a}	144.9^{a}	503.2^{a}	7.4^{a}	711.1^{a}	3.6^{a}	$2,5^{a}$
After fermentation							
0	47.3^{bc}	124.4^{c}	496.5^{b}	6.0^{c}	674.2^{d}	3.2^{bc}	1.9^{b}
100	47.6^{b}	129.6^{c}	498.1^{b}	6.6^{b}	687.4^{c}	3.4^{b}	2.1^{b}
150	48.1^{ab}	134.7^{b}	499.0^{a}	6.9^{b}	700.1^{b}	3.4^{b}	2.2^{ab}
200	48.5^{a}	145.0^{a}	502.2^{a}	7.5^{a}	711.0^{a}	3.7^{a}	2.4^{a}

Means with the same letter within a column are not significantly different by least significant difference (LSD) analysis *(P> 0.05*).

Color analysis of kishk samples:

The color of kishk samples measured using the L* a* b* color are presented in Table (5). The differences between color values of kishk samples were significant. Artichokes zero had the highest L* value (75.6). The L* values of artichoke kishk were 73.5, 71.9 and 68.5 for 100, 150 and 200 g, respectively.

Table (5): Color analysis of kishk samples.

Artichokes (g)	*L**	*a**	*b**
0	75.6^{a}	3.4^{d}	16.8^{a}
100	73.5^{b}	3.6^{c}	$15,3^{b}$
150	71.9^{c}	3.9^{bc}	14.9^{bc}
200	68.5^{d}	4.3^{a}	13.3^{c}

Means with the same letter within a column are not significantly different by least significant difference (LSD) analysis *(P> 0.05*).
*L, whiteness; a, redness, greenness; b, yellowness and blueness.

Redness, a*, was recorded between 3.1 and 4.3 and yellowness, b*, was found to be between 13.3 and 16.8. The *L** and *b** values of zero artichokes kishk were the highest when compared to the artichokes of the samples. The use of barley flours (zero artichoke) affected the color values of kishk samples. In contrary to the color values of kishk samples determined using spectrophotometer, sensory color values of kishk soup samples containing barley flours were not significantly different and most of the soups were comparable in terms of sensory color values. These results were agreement with report Handan *et al*. (2006)

Viscosity of kishk soup detremination:

The last viscosity values a Rapid Visco Analyzer (RVA soup index) of kishk soups are presented in Table 6. Viscosity is an important quality criterion in soups. The viscosity values of kishk soups showed variation between 15.2 and 17.6 RVU. RVA soup index values of hulless barley flour (zero), 100, 150 and 200 artichoke kishk samples were significantly different. Since different the amount of artichoke used in kishk preparation vary in their water absorption properties, viscosity values can be different from each other.

Table (6): Viscosity (RVA soup index) values of kishk soup samples.

Artichokes (g)	RVA soup index (RVU)
0	17.6^{a}
100	16.7^{b}
150	15.9^{c}
200	15.2^{d}

Means with the same letter are not significantly different by least significant difference (LSD) analysis *(P> 0.05*).

Although there were some statistically significant differences in the RVA soup index values of different kishk samples, the differences were not substantial to affect the related sensory characteristics drastically. All of the soups were comparable in terms of mouthfeel and consistency values as determined by sensory analysis (Table 7).

Sensory evaluation results of kishk soups:

Sensory analysis results of soups made from kishk samples are presented in Table (7). Effect of different artichoke amount in kishk soups on all sensory properties was statistically significant. The results show that the best sensory properties were in samples non-containing artichoke while less were in samples containing 200 g artichoke. The results of the overall acceptability showed that utilization of barley flours and little amount of artichoke between 100 - 150 g in kishk preparation resulted in acceptable soup properties in terms of most of the sensory properties.

Table (7): Sensory evaluation results of kishk soups

Artichokes (g)	Colour	Taste	Odor	Mouth-feel	Overall acceptability
0	4.1^{b}	4.5^{a}	4.8^{a}	4.4^{a}	4.6^{a}
100	4.0^{b}	4.1^{b}	4.3^{b}	4.2^{ab}	4.4^{a}
150	3.7^{a}	3.6^{a}	4.0^{b}	4.1^{ab}	4.0^{b}
200	3.3^{ab}	3.2^{b}	3.7^{a}	3.9^{b}	3.5^{c}

Means with the same letter are not significantly different by least significant difference (LSD) analysis.

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الملخص العربى

تقييم حساء جاف من الشعير المتخمر مع بعض الخضراوات.

محمد على بسيوني عقبة، السيد عوض شعبان عبد الرسول، محمد عبد الحميد حسن جمعة

معهد بحوث تكنولوجيا الاغذية . مركز البحوث الزراعية . مصر.

قُيم الحساء الجاف للكشك المتخمر المعد من طحين الشعير غير منزوع النخالة، بالإضافة لكميات مختلفة من الخرشوف هي صفر و100 و150 و200جم. بهدف الاستفادة من محتوى الشعير من الألياف خصوصاً الذائبة منها كمركب البيتا جلوكان المفيد فى تغذية مرضى البول السكرى والكوليسترول، وكذلك من محتوى الخرشوف من مضادات الاكسدة خصوصاً مركب السلمارين المفيد فى علاج مرضى الكبد. أوضحت النتائج أن كل من إضافة الخرشوف وعملية التخمر أدتا إلى زيادة معنوية في محتوى الكشك من الرطوبة والرماد والالياف والنشا وانخفاض في كل من البروتين والدهون، بينما لم تؤثر إضافة الخرشوف على محتوى الكشك من البيتا جلوكان، بينما أدت عملية التخمر إلى نقص معنوي فيه بنسبة 27.3٪. كما أدت إضافة 100 و150 و200 جم خرشوف إلى ازدياد الفينولات الكلية إ بنسبة 9.2 و13.7 و23.0٪ على التوالي وكل العناصر المعدنية، بينما لم تؤثر عملية التخمر عليها، بل أدت إلى انخفاض معنوي بواقع 90٪ من حامض الفيتك. تبين من النتائج أيضا ان اللزوجة كانت 17.6 و16.7 و15.9 و15.2 RVA والقبول الحسي العام كان 4.6 و4.4 و4.0 و3.5 درجة من أصل 5 وذلك بإضافة صفر، 100، 150 ،200 جم خرشوف على التوالي. من تلك النتائج يتبين لنا أن الكشك المعد من طحين الشعير الغير منخول بمفرده او بإضافة 100أو ٢٠٠ جم خرشوف كان أفضل المكونات لإنتاج حساء مقبول حسياً وله قيمة غذائية وعلاجية عالية.