Preparation of Bio Yoghurt Cereal Fermented Milk

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ABSTRACT

This work aimed to produce probiotic fermented milk supplemented with cereals using three different concentrations (3, 5 and 7%) of whole wheat flour (wwf) and whole barley flour (wbf) and bioyoghurt starter ABT-2, CHB Hansen. The changes in the chemical composition ,microbial and sensory evaluation of fresh products during two weeks of storage at 5-7˚C were determined. The rate of decreasing in pH and increasing in acidity of wheat flour fermented bioyoghurt was lower than that in control either in fresh or after storage period. The same trend was found during the storage of barley fermented bioyoghurt but the rate of pH decreasing and acidity increasing was higher in wbf than that in wwf fermented bioyoghurt .Total protein and fiber were increased in cereal fermented bioyoghurt in accordance to the % of wheat or barley flour added. On the other hand the soluble protein/total protein was increased during storage in both because of protein degradation by microorganism. The effect of both wheat or barley flour showed higher viscosity in the fresh product and after storage. The log 10 cfu/gm of control in fresh product and after 14 days of storage were 6.545 and 6.220 respectively which decreased to 5.819 and 5.114 on lithum chloride sodium propionate medium. Adding whole flour by 3% increased the log 10 cfu/gm in the fresh products and after 14 days of storage to 6.5556 and 6.255 resp, on LCSP medium. The same trend of enhancing probiotic culture by adding whole flour was noticed when furthermore 3% wbf was added. Non of the undesirable microorganism were detected (coliform, yeast and mould) in fresh or stored products. 3% bioyoghurt wheat flour and 5% whole barley flour exhibit the best acceptance dependent on the sensory evaluation.

INTRODUCTION

Functional foods are defined broadly as foods that provide more than simple nutrition; they supply additional physiological benefit to the consumer .According to the Functional Food Science in Europe, a food can be regarded as "functional" if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects ,in a way that is relevant to an improved state of health and well- being and / or reduction of risk of disease (Saarela, 2007). These functional foods are approved on the basis of scientific evidence for reducing risk of disease but it is not intended to act as disease treatment .Functional foods must remain foods, and they must demonstrate their effects in amounts that can normally be expected to be consumed in the diet (Diplock et al., 1998).

Probiotics are usually defined as microbial food supplements with beneficial effects on the consumers. Most probiotics found in the group of organisms known as lactic acid – producing bacteria and are normally consumed in the form of fermented milks or other fermented foods. Some of the beneficial effect of lactic acid bacteria consumption include improving intestinal tract health , enhancing the immune system ,synthesizing and enhancing the bioavailability of nutrients , reducing symptoms of lactose intolerance, decreasing the prevalence of allergy in susceptible individuals, reducing risk of certain cancers, anticholesterolaemic effects, prevention of genital and urinary tract infections Savadogo et al.,(2006). However, for a strain to be considered a valuble dietary adjunct exerting a positive influence, it has to full fill certain criteria .A good probiotic strain for human use could have properties of the following list: Human origin, survival in the upper digestive tract, capable of surviving and growing in the intestine, produce beneficial effects when in the intestinal tract, resistance to acid and bile salts, safe status, production of antimicrobial substances like bacteriocins, and adherence to human intestinal cell lines and colonization (Sander, 2003).

Fermented dairy products are the most commonly used vectors for probiotic. Conventional products such as yoghurt and cultured milk are usually contain bacterial population of around 10^{8} living bacterial cells per gram .The probiotic bacteria may either contribute to fermentation and acidification; i.e., Lactobacillus acidophilus or they can be regarded as pure additives; i.e., Bifidobacterial strains .Their viability during fermentation and storage conditions can be regarded as cardinal points determining the specific quality of the food (Kneifeletal.,1999).

Today, abroad variety of fermented and non-fermented dairy products containing lactic acid bacteria with probiotic function is available on the market .They must be selected for their ability to provide the targeted benefit for the consumer .Historically, fermented milks have been regarded as valuable and sensorically attractive foods which positively influence the intestinal microbial balance of humans (Abd El–Rahman et al, 2000).

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Received April 03, 2013, Accepted June 10, 2013

This work aimed to produce probiotic fermented milk supplemented with cereals such as wheat and barley as a functional food for the purpose of increasing the beneficial values of fermented milk.

MATERIALS AND METHODS

Ingredients:

Dried whole milk (24.4% protein, 28.8% fat, 37.8% carbohydrates, 0.58 %ash and 3.3% moisture) produced from BBA-Lactalis industrie 35230 Bourgarre-France.

Cereals

Whole wheat flour (Triticum restivum): whole grains from the local market were washed, dried and crushed. The gross chemical composition of whole grains after analysis were 9.7% protein, 0.58% fat, 72.85% carbohydrate, 0.87% ash, 10% moisture and 6.0 % crude fiber.

Whole barley flour (Hordeum vulgare): were purchased from local markets. Then washed, dried and crushed. The gross chemical composition of whole grains were 11.7% protein, 1.88% fat, 67.17% carbohydrate, 1.9% ash, 7% moisture and 10.35% fiber.

Starters:– Bio-yoghurt starter (ABT–2) (CHR HANSEN) *Streptococcus thermophilus-20 y, Lactobacillus acidophilus LA- 5, Bifidobacterium BB – 12*

Manufacturing of Bio- yoghurt cereal fermented milk products:

The whole milk powder was reconstituted to obtain 12%T.S. Three levels of cereals powder were used (3,5and 7%) for each whole flour tested. The cereals were added before heat treatments at 85 ºC /15min, then cooled at 40ºc. 3% of starter was added, then distributed in plastic cups (100gm each) and incubated at 37c till complete coagulation, cooled and stored at 5±1ºc.

Chemical and Rheological analysis

The samples were analyzed in triplicates for pH, titratable acidity as lactic acid, volatile acidity, viscosity, acetaldehyde (ppm), were determend, in the fresh products and after 4, 7, 14 days of storage at 5± 1 ºC, while, total solides total protein, carbohydrate, ash, crude fibers and fat content were determined only in the fresh products.

Total solids, pH value, (Accumet® model 810 pH meter, Fisher scientific), Titratable acidity %, Volatile acidity%, total protein%, soluble protein%, Crude fibers% and Ash %were determined according to the methods described in the AOAC (2003).

Viscosity was measured at 20°C using rotary viscometer "Rheotest" Type RV, Dresden, Germany.. The viscosity was expressed in centipoises and calculated by using special formulas and tables supplied with the instrument.

The carbohydrate content was mathematically calculated in the fresh product .The fat was determined in fresh product according to the AOAC (2003) by soxhlet extraction method using petroleum ether (b.p 40-60˚C) for sixteen hours. The ether was evaporated on steam bath and the drying was completed at ambient temperature**.**

The determination of the acetaldehyde was conducted according to the AOAC (2003). The color intensity was measured at 560 nm using Unicum UV 2100 Spectro photometer, USA. The concentration of acetaldehyde was calculated using a stander curve of pure acetaldehyde.

Microbiological Analysis: -

MRS, VRBA and Sabourad agar media were used for enumerating, lactic acid bacteria, coliform group and yeast and moulds according to the standard method of dairy products (1984). Bifidiobacterium Sp. was counted on lithium chloride- galactose- agar according to Lapierra et al., (1992), using double layered plat in an aerobic jar.

Sensory evaluation:

All cereal fermented milk samples were sensory evaluated (flavour, body and texture, and general appearance) by ten staff members of Department of Dairy Science and Technology. Sensory evaluation was carried out using score card estimated by Clark et al (2009) with suggested score guide for designated defect intensitie.

RESULTS AND DISCUSSION

Effects of different wheat and barley flours concentrations on some properties of bio-yoghurt fermented milk were presented in tables (1, 2, 3, 4 and 5) and figures (1, 2, 3, 4, 5, and 6) during the storage at 5±1°C for 14 days. It was clear that the pH of control bio-yoghurt was decreased gradually from 4.97 to 4.48, while the titratable acidity was increased from 0.755 to 0.882 after 14 days of storage. The addition of wheat flour at 3, 5, and 7 % for preparing the cereal- bio-yoghurt had slight affect the pH and acidity% of these products .The pH of 3% whole wheat was 4.94 and after 14 days. The corresponding values were 4.99 to 4.65 and 5.17 to 4.85 for 5% and 7% cereals bio-yoghurt respectively. The rate of decreasing in pH was lower than that found in control bio-yogurt .Also the rate of increasing the acidity was less than that of control. The acidity of 3, 5, 7% wwf-cereal bio-yoghurt were 0.793, 0.803 and 0.898 after one day and 0.898, 0.868 and 1.003 after 14 days respectively. The same trend was found during the storage of barley bio- yoghurt, but the rate of pH decreasing and acidity increasing was higher in barley yoghurt than that in wheat bio- yoghurt. These results are in agreement with that obtained by Abou-Donia et al., (1991) during the preparation of cereal culture milk.

The total protein was increased in cereal-fermented bio-yoghurt with increasing the % of wheat or barley flour added depending on the % of protein in each. The protein content was 9.7% in wheat flour and 11.7% in barley flour.

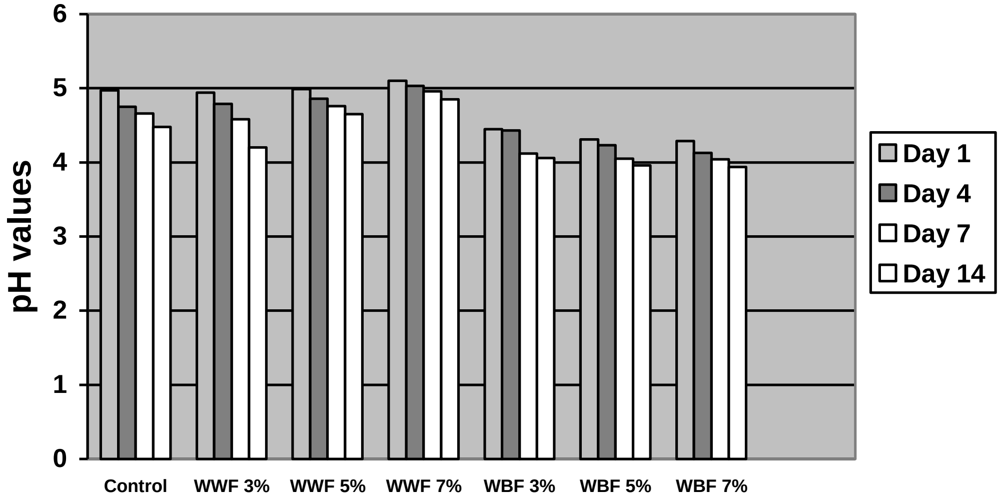
Soluble Protein/total protein increased during storage and it was higher in wheat flour Bio-yoghurt fermented milk than that in barley bio-yoghurt fermented milk.

Table 1. Effect of different wheat flour concentrations on some chemical properties of bio-yoghurt cereal fermented milk during storage

Sample	Storage Period (days) at 5±1°C	pH	Acidity as lactic acid %	SP/TP %
Control	1	4.97	0.755	4.060
	4	4.75	0.805	
	7	4.66	0.823	5.383
	14	4.48	0.882	6.736
Whole wheat	1	4.94	0.793	4.932
Flour	4	4.79	0.848	
3%	7	4.58	0.853	6.117
	14	4.20	0.898	8.018
Whole wheat	1	4.99	0.803	5.115
Flour	4	4.86	0.823	
5%	7	4.76	0.838	6.821
	14	4.65	0.868	8.220
Whole wheat	1	5.17	0.898	4.431
Flour	4	5.03	0.906	
7%	7	4.96	0.928	7.749
	14	4.85	1.003	9.408

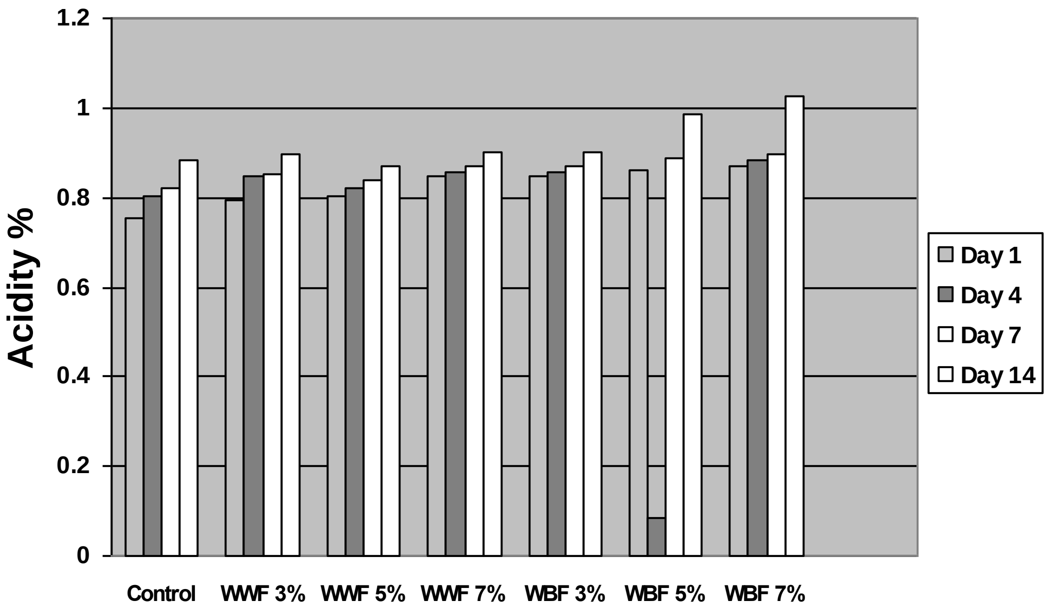
Table 2. Effect of different barley flour concentrations on some chemical properties of bio-yoghurt cereal fermented milk during storage

Sample	Period (days) at Storage 5±1°C	pH	Acidity as lactic acid %	SP/TP %
Control	1	4.97	0.755	4.060
	4	4.75	0.805	
	7	4.66	0.823	5.383
	14	4.48	0.882	6.736
Whole barley	1	4.45	0.847	3.724
Flour	4	4.43	0.857	
3%	7	4.12	0.872	6.151
	14	4.06	0.902	7.393
Whole barley	1	4.31	0.862	3.577
Flour	4	4.23	0.867	
5%	7	4.05	0.887	5.211
	14	3.96	0.987	6.498
Whole barley	1	4.29	0.872	4.336
Flour	4	4.13	0.882	
7%	7	4.04	0.897	5.402
	14	3.94	1.027	6.492



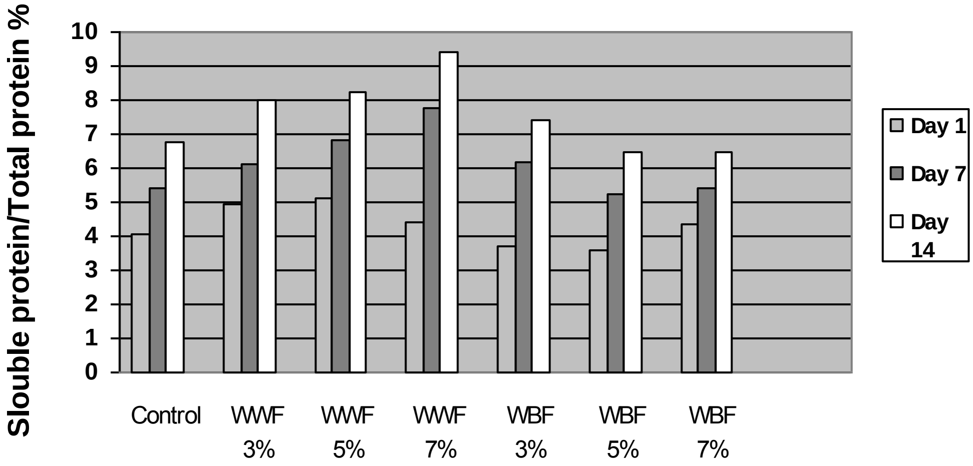
WWF: Whole wheat flour
WBF: Whole barley flour

Fig 1. Effect of different wheat and barley flour concentrations on pH of bio-yoghurt cereal fermented milk product during storage



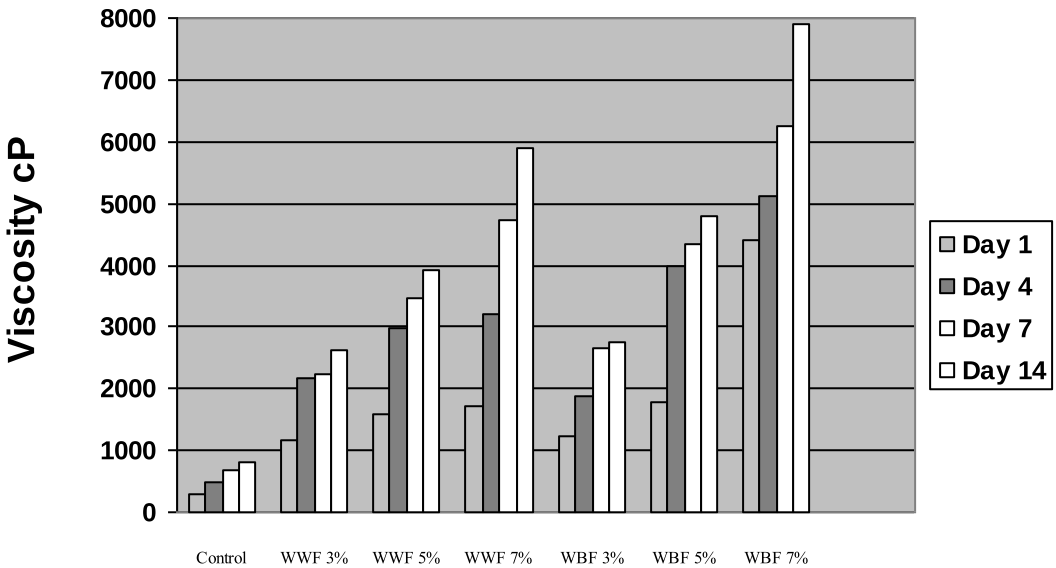
WWF: Whole wheat flour
WBF: Whole barley flour

Fig 2.Effect of different wheat and barley flour concentrations on acidity of bio-yoghurt cereal fermented milk product during storage



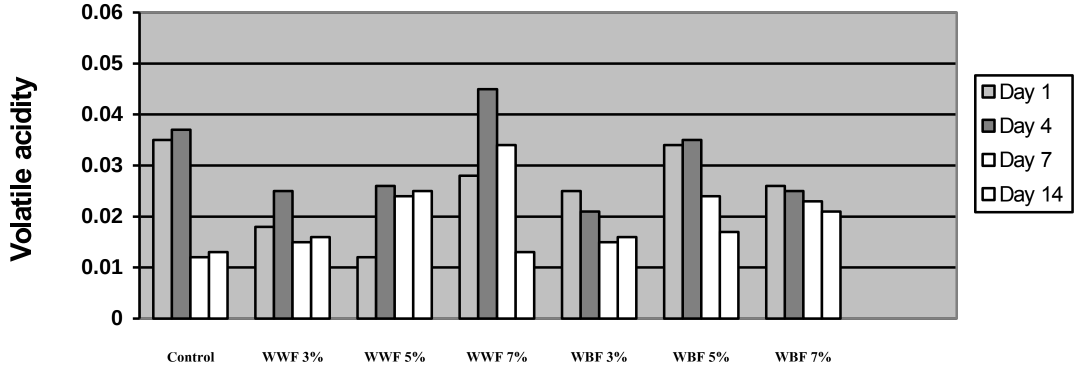
WBF: Whole barley flour
W W F: Whole wheat flour

Fig 3. Effect of different wheat and barley flour concentrations o soluble protein/total protein of bio-yoghurt cereal fermented milk product during storage



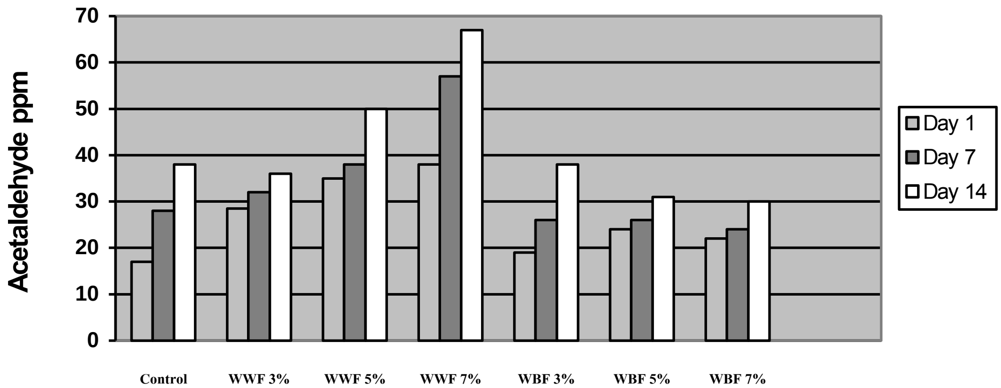
WWF: Whole wheat flour.
WBF: Whole barley flour.

Fig 4. Effect of different wheat and barley flour concentrations on viscosity of bio-yoghurt cereal fermented milk product during storage



WWF: Whole wheat flour.
WBF: Whole barley flour.

Fig 5. Effect of different wheat and barley flour concentrations on volatile acidity of bio-yoghurt cereal fermented milk product during storage



W W F: Whole wheat flour
W B F: Whole barley flour

Fig 6. Effect of different wheat and barley flour concentrations on acetaldehyde of bio-yoghurt cereal fermented milk product during storage

The viscosity of bio-yoghurt and bio-yoghurt cereal fermented milk was presented in tables (3, 4) and figs (4).The data revealed that the addition of whole wheat or whole barley flours had a great effect on viscosity. The viscosity in fresh bio-yoghurt was 302.87 cP while it was 1160.54, 1589.25 and 1702.09 cP in fresh whole wheat bio-yoghurt with 3,5and 7% respectively. The corresponding values in fresh whole barley bio-yoghurt were 1240.74, 1778.41 and 4406.25 cP. At the end of storage period (14 days), the viscosity was increased to be 794.77 cP in bio-yoghurt, while the values of viscosity increased to be 2632.47, 3915.31 and 5890.54 cP in 3,5and 7% whole wheat bio-yoghurt and 2767.72, 4794.00 and 7887.15 cP in 3, 5 and 7% in whole barley bio-yoghurt.

Regarding to the data in tables (3, 4) and fig. (5) It was clear that the addition of whole wheat or whole barley flour had slight effect on the volatile acidity during the preparation and storage of bio-yoghurt with different concentrations. The volatile acidity reached 0.035 % in fresh bio-yoghurt and ranged from 0.012 to 0.034 % in cereal bio-yoghurt. The corresponding values after (14 days) of storage were 0.013 % in bio-yoghurt and ranged from 0.013 to 0.025 % in cereal bio-yoghurt.

Data in tables (3, 4) and fig. (6) Showed that the acetaldehyde content in bio-yoghurt slightly affected by the addition of both whole wheat or whole barley flours with different concentrations during the preparation of cereal bio-yoghurt .The acetaldehyde content was 17 ppm in fresh bio-yoghurt and ranged from 19 to 38ppm in fresh cereal bio-yoghurt. The acetaldehyde content reached 38 ppm in bio-yoghurt after 14 days of storage, while it ranged from 36-67ppm in whole wheat flour bio-yoghurt and from 30 to 38 ppm in whole barley flour bio- yoghurt.

Table 3. Effect of different wheat flour concentrations on viscosity, volatile acidity and acetaldehyde of bio-yoghurt cereal fermented milk product during storage

Sample	Storage Period (days) at 5±1°C	Viscosity (cP)	Volatile acidity %	Acetaldehyde (ppm)
Control	1	302.87	0.035	17
	4	479.30	0.037	
	7	687.04	0.012	28
	14	794.77	0.013	38
Whole wheat Flour 3%	1	1160.54	0.018	28.5
	4	2156.95	0.025	
	7	2231.42	0.015	32
	14	2632.47	0.016	36
Whole wheat Flour 5%	1	1589.25	0.012	35
	4	2979.0	0.026	
	7	3452.00	0.024	38
	14	3915.31	0.025	50
Whole wheat Flour 7%	1	1702.09	0.028	38
	4	3201.21	0.045	
	7	4733.73	0.034	57
	14	5890.54	0.013	67

Table 4. Effect of different barley flour concentrations on viscosity, volatile acidity and acetaldehyde of bio- yoghurt cereal fermented milk product during storage

Sample	Storage Period 5±1°C	Viscosity (cP)	Volatile acidity %	Acetaldehyde (ppm)
Control	1	302.88	0.035	17
	4	479.30	0.037	
	7	687.04	0.012	28
	14	794.77	0.013	38
Whole barley Flour 3%	1	1240.74	0.025	19
	4	1880.00	0.021	
	7	2648.76	0.015	26
	14	2767.72	0.016	38
Whole barley Flour 5%	1	1778.41	0.034	24
	4	3979.33	0.035	
	7	4324.00	0.024	26
	14	4794.00	0.017	31
Whole barley Flour 7%	1	4406.25	0.026	22
	4	5111.25	0.025	
	7	6256.87	0.023	24
	14	7887.15	0.021	30

Table 5. Some chemical composition of bio-yoghurt cereal fermented milk product as affected by addition of different concentrations of wheat or barley flour

Sample	Carbohydrate %	Ash %	Crude Fibers %	Fat content %
Control	4.571	0.712	0.000	3.502
Whole wheat Flour 3%	7.075	0.769	0.181	3.542
Whole wheat Flour 5%	8.597	0.807	0.3 14	3.562
Whole wheat Flour 7%	10.629	0.804	0.425	3.555
Whole Barley 3% Flour	6.890	0.796	0.304	3.570
Whole Barley 5% Flour	8.121	0.809	0.565	3.597
Whole Barley 7% Flour	10.534	0.912	0.722	3.630

Roushdy et al (1996) found that the acidity and acetaldehyde content were higher in acidophilus or bifidus buttermilk during storage period .Also Ghaleb et al (1998) and El-Sayed et al (1998) estimated the acetaldehyde in fermented milks and obtained the same results.

Table (5) illustrate the percent of carbohydrate, ash, crude fibers and fat in bio-yoghurt and in cereal bio-yoghurt supplemented with whole wheat flour or whole barley flour in different concentrations. The carbohydrate in control bio-yoghurt was 4.571% Adding 3,5 and 7 whole wheat flour in bio-yoghurt increased this percentage 7.075, 8.597 and 10.629 % respectively, the corresponding values in whole barley bio-yoghurt were 6.890, 8.121 and 10.534 %. This increase was related to the percent of carbohydrate in each cereal used. The percent of fibers in control bio-yoghurt was nil while in cereal bio-yoghurt, the crude fibers were increased gradually depending on the percent of each whole wheat or whole barley added. It ranged from 0.181 to 0.425 in whole wheat bio-yoghurt and from 0.304 to 0.722 in whole barley bio-yoghurt. It was noticed that percent of crude fiber was higher in barley bio-yoghurt than in whole wheat bio-yoghurt because of its higher content of crude fibers which reached 10.35%. The percent of fat did not affected markedly by the addition of both whole wheat flour or whole barley flour while the ash % is slightly increased.

Tables 6 and 7 illustrate the changes in log of c.f.u counts on MRS and on LCSP (Lithium chloride–sodium propionate) in bio-yoghurt with whole wheat flour and with whole barley flour, respectively. The storage of all products either with or without adding cereals had decline. The colony forming units during storage for all concentration of whole cereal flour were used (about 0.3 log cpu/mg) decrease, on both MRS or LCSP medium. Whereas clear decline was noticed on MRS medium in bio-yoghurt without wheat control 0.705 log, (Table 6). On the other hand there were decrease in log c.f.u values in bio-yoghurt with or without whole barley flour (Table7), but there is no similarity in decreasing values between different treatments and among treatments on both MRS medium or LCSP medium. The highest decrease was on MRS cfu/mg (0.721log) in bio-yoghurt with 3% whole barley flour. The corresponding decreasing values were cfu/mg (0.705, 0.351, 0.388log) for 0%, 5% and 7% whole barley flour bio-yoghurt, respectively. Furthermore, non of the undesirable microorganisms (coliform, yeast and moulds) were detected in fresh and stored products through the storage period.

Medina and Jordano (1994) studied the survival of constitutive microflora in one batch of fermented milk containing Bifidobacteria during storage at 7°C .Levels of Streptococcus thermophilus, Lactobacillus bulgaricus and Bifidobacterium spp. in initial population were 2.6×10^{8}, $5.1\times 10^{7}$and 7.4×10^{6} cfu/ml respectively. Streptococcus thermophilus slightly increased after 10 days and then decreased. Numbers of Bifidobacterium and Lactobacillus bulgaricus decreased faster during storage. Samona and Robinson (1994) studied the effect of yoghurt cultures on the survival of three species of Bifidobacterium (Bifidobacterium bifidum, Bifidobacterium longum and Bifidobacterium adolescentis) in reconstituted skim milk (12% total solids) in a combination with 1 of 3 commercial yoghurt cultures. Total counts were recorded for the Bifidobacteria over a growth period of 24h and, for samples culturing to pH 4.6 during storage at 5° C for up to 21 days. The yoghurt organisms tended to inhibit the growth of Bifidobacteria. Subsequent storage in the presence of the yoghurt cultures did not lead to any significant decrease in numbers.

Shin et al. (1998) studied the viability of Bifidobacteria in commercially available milk and yoghurt during refrigerated storage. Initial Bifidobacteria and lactic acid bacterial counts in milk decreased from 5×10^6 cfu/ml to 1×10^6 and 4×10^6 cfu/ml. respectively. In yoghurt, Initial Bifidobacteria and lactic acid bacteria counts were 10^8 cfu/g, respectively. Bifidobacteria in milk and yoghurt remain well above the 10^6 cfu/g recommended dose for consumption to receive health benefits of these organisms and conventionally treated milk during low temperature storage at 4°C for 4 weeks and they found that the survival of encapsulated probiotic bacteria was higher than free cells bacteria was maintained above the recommended therapeutic minimum 10^7 cfu/g throughout the storage. Also, they pointed that the viability of probiotic bacteria in yoghurt from both treatments was not significantly different.

Sensory evaluation of Bio-yoghurt and cereals fermented bio -yoghurt were sensory evaluated and the results were found in tables (8 and 9). The addition of whole wheat flour in 3, 5 and 7% had a different effect on the probiotic fermented products, the best effect in flavor, body and texture, appearance and color was noticed at 3% added whole wheat flour and still the best along the storage period (14days) followed by 5%, while the addition of 7% had the lowest total score because of high viscosity and unnatural color and still not acceptable at the end of storage. On the other hand ,the use of whole barley flour at 5% led to higher scores because of the pleasant taste , body and texture and appearance, followed by 3%in which the body was slightly weak but there was no appearance of any foreign flavor and the slightly increase of acidity enhanced the flavor. After 2 weeks, 5% whole barley flour still had the best scores followed by 3% while in 7% whole barley flour the unnatural flavor was found. The overall accepted product depending on the sensory evaluation in bio-yoghurt while whole barley flour 5% had the best results.

From the above results, it could be concluded that either whole wheat or whole barley flour can be used to produce an acceptable cereal fermented milk product as functional foods which may be suitable for elderly persons or infants weaning foods. This formula has a high nutritional value on fiber beside the presence of probiotic bacteria with a lot of health benefits.

Table 6. Changes in microbial counts(Log c.f.u g^{-1})in wheat flour bio-yoghurt during storage at 5 ± 1°C

Sample	Medium							
	MRS		Lithium chloride – sodium propionate		VRBA		Sabourad	
	Storage period (days)							
	1	14	1	14	1	14	1	14
Control	6.545	6.220	5.819	5.114	_	_	_	_
Whole wheat Flour 3%	6.484	6.176	6.556	6.255	_	_	_	_
Whole wheat Flour 5%	6.554	6.236	6.602	6.301	_	_	_	_
Whole wheat Flour 7%	6.512	6.220	6.611	6.312	-	-	-	-

Table 7. Changes in microbial counts (Log c.f.u g^{-1}) in barley flour bio- yoghurt during storage at 5 ±1 ºC.

Sample	Medium							
	MRS		Lithium chloride –sodium propionate		VRBA		Sabourad	
	Storage period (days)							
	1	14	1	14	1	14	1	14
Control	6.545	6.220	5.819	5.114	_	_	_	_
Whole Barley Flour 3%	6.667	6.502	6.182	5.461	_	_	_	_
Whole Barley Flour 5%	6.699	6.627	6.324	5.973	_	_	_	_
Whole Barley Flour 7%	6.597	6.279	6.531	6.143	_	_	_	_

(-):- Not detected in 0.1 gm

Table 8. Sensory evaluation of wheat flour bio-yoghurt during storage

Sample	Storage Period at 5±1°C (days)	Flavor (10)	Body and texture (5)	Appearance and color (5)	Total (20)
Control	1	9	3	4	16
	7	8	3	4	15
	14	7	3	3	14
Whole wheal	1	9	4	4	17
Flour 3%	7	9	4	4	17
	14	9	4	4	17
Whole wheat	1	9	3	4	16
Flour 5%	7	9	3	4	16
	14	8	3	4	15
Whole wheat	1	8	2	2	12
Flour 7%	7	7	2	2	11
	14	7	2	2	11

Table 9. Sensory evaluation of barley flour bio-yoghurt during storage

Sample	Storage Period at 5±1°C (days)	Flavor (10)	Body and texture (5)	Appearance and color (5)	Total (20)
Control	1	9	3	4	16
	7	8	3	4	15
	14	7	3	3	14
Whole barley	1	9	4	4	17
Flour 3%	7	9	4	4	17
	14	7	4	4	15
Whole barley	1	9	5	4	18
Flour 5%	7	9	5	4	18
	14	8	5	4	17
Whole barley	1	9	3	2	16
Flour 7%	7	9	3	2	16
	14	6	3	2	13

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الملخص العربي

تحضير ألبان متخمرة داعمة للحيوية مدعمة بالحبوب

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نتيجة لزيادة الوعي الغذائي والصحي أصبح هناك حاجة ملحة الى توفير أغذية وظيفية وصحية بصورة مستساغة للمستهلك بحيث تمثل جزء من الوجبة اليومية.

هذا العمل يهدف الى إنتاج ألبان متخمرة داعمة للحيوية كأغذية وظيفية وتدعيمها بمطحون الحبوب الكاملة للشعير والقمح.

وقد إستخدمت ثلاث تركيزات مختلفة من الحبوب المطحونة 3, 5, 7٪ وبادئ البكتريا الداعمة للحيوية وتم دراسة التغيرات في التركيب الكيماوي والميكروبي بالإضافة الى التقييم الحسي للمنتج وذلك خلال فترة الحفظ لمدة أسبوعين على درجة حرارة 5 ± 1°م.

وأظهرت الدراسة إنخفاض في الـ pH وإرتفاع الحموضة في المنتج المتخمر المدعم بمطحون القمح أقل من كل من المدعم بمطحون الشعير والكنترول.

أيضاً زيادة في كل من البروتين الكلي ومحتوى الألياف في المنتج بزيادة نسبة الإضافات من مطحون الحبوب. كما أظهرت نسبة البروتين الذائب الى البروتين الكلي زيادة أثناء التخزين في كل من البيويوغورت المدعمين بمطحون الشعير والقمح وذلك بسبب التحلل البروتيني بواسطة الميكروبات.

أدى إضافة مطحون القمح والشعير الى زيادة اللزوجة. ولم يظهر التحليل الميكروبي نمو أي من الميكروباتالغير مرغوبة مثل التابعة لمجموعة بكتريا الكوليفورم أو الخمائر أوالفطريات حتى نهاية التخزين.

وأظهر التقييم الحسي تقبل واضح للبيويوغورت المدعم بالقمح بنسبة 3٪ والمدعم بالشعير بنسبة 5٪.