Advances in Crop Science and Technology

Soleimanifard et al., Adv Crop Sci Tech 2015, 3:4
http://dx.doi.org/10.4172/2329-8863.1000190

Research Article | Open Access

Production of Kefiran in Kefir Grains and its Effects on the Rheological Properties Low Protein Wheat Dough and Quality of France Bulky Bread

Mansooreh Soleimanifard[1]*, Mehran Alami[2], Faramarz khodaiyan Chegeni[3], Goudarz Najafian[4], Alireza sadeghi mahoonak[5] and Morteza khomeiri[6]

[1]Msc of Food Science and Technology, Agriculture Faculty and Natural Resource of Gorgan, Gorgan. Iran

[2]Department of Food Science and Technology, Agriculture Faculty and Natural Resource of Gorgan, Gorgan. Iran

[3]Department of Food Science and Technology, Agriculture Faculty and Natural Resource of Tehran, karaj, Iran

[4]Department of Food Science and Technology, Seed and Plant Improvement Institute, Iran

[5]Department of Food Science and Technology, Agriculture Faculty and Natural Resource of Gorgan, Gorgan. Iran

[6]Department of Food Science and Technology, Agriculture Faculty and Natural Resource of Gorgan, Gorgan. Iran

Abstract

Kefiran is an exogenous microbial metabolite which is produced principally by lactic acid bacteria and fungi and molds throughout growth. Exo polysaccharide of kefiran was extracted from kefir grains and in status of gel was added at 1, 2, 3% concentrations (w/w flour basis) to wheat flour to evaluate its effects on rheological properties of weak wheat dough. The rheological measurements of the dough were investigated using Farinograph and Extensograph instruments. Results of Farinograph evaluation of dough showed that adding of kefiran and increase in its levels leads to increase in the water absorption capacity, dough development time and departure time, while the dough degree of softening after 20 min and mixing tolerance index were decreased in comparison with the control sample. The study on Extensograph behavior of the dough containing kefiran showed that resistance to extension at 45 and 90 min resting times was increased by increasing the percentage of the added kefiran. Longer fermentation time for each level of kefiran led to decrease of resistance to extension. Significant difference was observed in the resistance to extension of the dough containing different levels of kefiran and the control sample. Addition of kefiran to the dough after 45, 90 and 135 min resting times significantly decreased the extensibility, also with an increase in resting time from 45 to 135 min, the extensibility decreased for both the control and kefiran samples. Generally, addition kefiran at 45, 90 and 135 min resting times led to a significantly increase in resistance to extension ratio. Energy input increased at 45 and 90 min resting times, whereas chaotic effect was shown at time of 135 min restig time. Therefore, kefiran can be used to playing an important role in improving of rheological properties of weak dough and its processing conditions.

Keywords: Kefir grains; Kefiran; Low protein wheat; Dough; Rheology properties

Introduction

Nowadays, additives are extensively used in the baking industry for several desirable properties, such as improving bread quality, enhancing nutritional value, retarding staling and preventing its spoiling. Collar et al. [1] studied the influence of carboxy methyl cellulose and hydroxypropylmethylcellulose on dough and wheat bread performance and their interaction with α-amylase and emulsifiers. Wheat dough is a viscoelastic material which exhibits an intermediate rheological behavior between a viscous liquid and elastic solid [2] This viscoelastic material is probably the most dynamic and complicated rheological system and its properties are correlated with proofing time of dough, loaf volume and quality attributes of final product Kenny et al.[3] and Schiraldi et al. [4] studied the use of guar gum and locus bean for improving the fresh bread quality, although did not find an evident for anti-staling role. Also, Carboxy methyl cellulose and guar gum have been added in rye bread recipes to improve the quality of that bread [5]. Gurkin [6] recommended the use of combined carboxy methyl cellulose and gum Arabic to get excellent water-binding properties, and in the case of tortillas, to prevent stickiness. Guarda et al. [7] tested the influence of gums such as k-carrageenan, sodium alginate, hydroxyl methyl cellulose (HPMC) and xanthan on the physicochemical properties of bread, and reported that water absorption increased by the addition of gums, the highest Water absorption observed in HPMC. Bread making quality with different hydrocolloids showed that HPMC reduced the crumb hardness, gave a softer crumb than control sample and had the highest quality. Shalini and Laxmi [8] tested the effect of guar gum, carboxy methyl cellulose, hydroxypropylmethylcellulose and carrageenan on the quality of Chapatti bread. They reported an increase in water absorption and an renovation in Chapatti softness by the addition of hydrocolloids. The most improvement was created by CMC and guar gum, respectively. Smitha et al. [9] investigated the effect of Arabic, guar, xanthan, carrageenan and hydroxypropylmethylcellulose (HPMC) on the pasting properties and rheological properties of wheat dough. They reported that addition of hydrocolloids resulted in increasing of water absorption, strength and elasticity of the dough, also microstructural characteristics of dough with hydrocolloids showed that the starch granules were coated with gum. Ketabi et al. [10] studied effect of microbial exopolysaccharides in the sourdough on the rheological properties of dough, and reported

***Corresponding author:** Mansooreh Soleimanifard, Msc of Food Science and Technology, Agriculture Faculty and Natural Resource of Gorgan, Gorgan, Tel: 09376674901; E-mail: Mansoore.soleimani@yahoo.com.

Received April 20, 2015; **Accepted** September 21, 2015; **Published** September 28, 2015

Citation: Soleimanifard M, Alami M, Chegeni FK, Najafian G, Mahoonak AS, et al. (2015) Production of Kefiran in Kefir Grains and its Effects on the Rheological Properties Low Protein Wheat Dough and Quality of France Bulky Bread. Adv Crop Sci Tech 3: 190. doi:10.4172/2329-8863.1000190

addition of polysaccharides to the dough increase the water absorption and decrease the dough softening after 20 min, also, resistance to extension after 45, 90 and 135 min resting time was decreased by increasing the percentage of the added polysaccharides.

A survey of literature reveals that no data are available on the effect of kefiran on the rheological properties of low protein wheat dough. Therefore, this study was conducted to assess how addition of kefiran affects the rheological properties of weak wheat dough. The results of the research will be useful in identifying the kefiran for improving the dough characteristics.

Materials and methods

Materials

Wheat whole Mill flour obtained from the Through Sardari wheat sample (was collected from 10 districts of Kourdestan province, Iran) using a lab Mill (Model 279002, Brabender, Germany), was used for the study. The characteristics of the flour such as moisture content (method 44-16), ash content (method 08-01), dry gluten (method 38-10), falling number (method 56-81B), Zeleny index and SDS-sedimentation value (method 56-61A) were determined using the methods of AACC [11], and protein were determined using the NIR (Inframatic, 8612, Perten, Sweden) according to the AACC 44–16 standard methods [11].Initial kefir grains purchased locally were used in this study. kefiran (1, 2 and 3%), sodium chloride (Golha, Iran), commercially available refined corn oil (Behpak, Iran) and instant yeast (Lesaffre, Wolczyn, Polland) were used to prepare the dough formulations.

Methods

Starter culture and fermentation medium: Fresh kefir grains, used as starter culture in this study, were obtained from household (Tehran, Iran). The grains were maintained at 20°C and were reactivated by successive subcultures in skimmed milk and dry milk (Golestan, Iran). Kefir grains, washed with sterile water, were inoculated (10 g) into 100 ml of milk. After incubation at 24°C for 24 h, the grains were separated from the fermented product by filtration through a plastic sieve (sanitized by immersion in 70% ethanol, and then washed with sterile water) and were washed prior to the next culture passage (subculture). Subcultures were repeated several times in order to increase kefir grain biomass [12].

Isolation and quantification of kefiran: Exopolysaccharide in the kefir grains were extracted by the method of Piermaria et al. [13] In brief, a weighed amount of kefir grains was treated in boiling water (1:10 w/w) for 30 min with discontinuous stirring. The mixture was centrifuged (Hanil Science Industrial, South Korea) at 10000 g min at 20°C. The polysaccharide in the supernatant was precipitated by adding of an equal volume of cold ethanol and left at 20 C for overnight. The mixture was centrifugedat 10000 g for 20 min at 4°C. Pellets were dissolved in hot water and the precipitation procedure was reported twice. The precipitate was finally dissolved in hot distilled water (kefiran solution) [12].The resulting solution was concentrated by the freeze dryer (Operon, South Korea) and under vacumm oven (Memmert), yielding a crude polysaccharide. The samples were tested for the absence of other sugars and proteins by high-performance liquid chromatography and the phenol–sulphuric acid method [14].

Rheological characteristics: Rheological characteristics of dough including water absorption (WA), dough development time (DDT), dough stability (S), departure time (DT), mixing tolerance index (MTI), time to breakdown (TB), degree of softening after20 min (DOS) and Farinograph quality number(FQN)were determined by using Brabender Farinograph (Duisburg, Germany) according to the AACC 54–10 standard methods [11]. Resistance (R), extensibility (E) and resistance to extension ratio (R/E) were determined by Brabender Extensigraph (Duisburg, Germany) based on AACC 54–21 standard methods [11].

Bread making process: The baking tests were carried out in an electric oven (Model T 6200, Heraeus, Germany). Basic dough recipe on 100 g flour basis consisted of instant yeast 1.5%, Sugar 1.5%, salt 1.5% and the amount of water required to reach 500 Brabender Unit (BU) of consistency. Kefiran was added when required at 1, 2 and 3% (flour basis). Firstly, instant yeast dissolved in warm water (35 0C) and other ingredients were added, then the mixture was blended with a speed mixer (Model K45SS, Hobart Corporation, USA) for 3 min. Kneading was carried out manually. After kneading, dough fermented at 30°C and relative humidity 75% for 30 min in a fermentation cabinet. The dough formed was divided into 4 parts and was molded. Meddle proofing was done at temperature 300°C and relative humidity 80% for 15 min. Molded dough placed in baking pans that had already been pomade with corn oil; panning of the pan is necessary to avoid the sticking of the bread to the pan after baking. The bread dough was weighed into desired sizes that correspond to the final loaf sizes. The weighed dough was molded into hemisphere shape prior to being placed in a baking pan. Final proofing was done at a temperature of 35°C and relative humidity 90% for 60 min, while baking was done at a temperature of 220°C (428 0F) for 15 min using an electric oven. The baked breads were allowed to cool for 1-2 hr, then packaged into polyethylene bags and stored at 20 ± 5°C for 1-3 days.

Technological evaluation of bread: Physicochemical characteristics of breads including weight, volume (rapeseed displacement), specific volume index (v/m), width/ height ratio of the central slice, moisture content [15] crumb texture and cooking loss were assessed. Crumb firmness was determined according to the AACC approved method 74-09 [11] using the instron (Model TESTO 405-V1, Germany) at temperature of (20 ± 5)°C. A 20 mm thick slice was compressed with a 25 mm aluminum plunger up to 40% at 100 mm/min with force of 30 N. Bread firmness was taken as the force required for compression of the bread sample by 25%. The texture of the bread slice was performed after 24, 48 and 72 hr storage at (20 ± 5)°C. Three replicates from three different sets of baking process were analyzed.

Sensory evaluation: Sensory analysis was carried out by a panel of trained judges using semi-structured scales scoring 1 (lowest) to 5 (highest). The attributes evaluated were visual appearance, aroma, flavor, and crunchiness. For each one of the attributes, average of judge responses was calculated. Overall acceptability was calculated by weighted arithmetic mean, given the following weight to each attributes: visual appearance 35%, flavour 15%, aroma 15%, and crunchiness 35%, according to the influence of each attribute on acceptance of the product by consumers. Breads were considered acceptable if their mean value for overall acceptability were equal or above 3 (neither like nor dislike) [7].

Results and Discussion

Quality characteristics of wheat flour

The wheat flour used had the following characteristics:10.80% protein (moisture content, 14%), 0.61% ash, 8.37% dry gluten, 350 falling number, 47 (mm) SDS-Sedimentation height, 29 Zeleny index and 15% moisture content. These characteristics indicate that the wheat flour selected for the study was of medium-strength quality.

Kefiran and farinograph results

The Farinograph characteristics of dough containing different amount of kefiran is shown in (Table 1).The standard Farinograph curve obtained for the pure wheat flour used in this study, showed water absorption (WA) of 50.6% (Figure 1). Highest absorption was observed when adding 3% kefiran, this effect has been attributed to the hydroxyl groups in the hydrocolloid structure which allow more water interactions through hydrogen bonding [7, 16-18]. The time required for the dough development (DDT) increased with adding of kefiran, nevertheless 3% kefiran was promoted the highest effect (Table 1). Comparison of different levels of exopolysaccharide with the control sample showed that dough stability did not changed greatly. Rosell et al. [2] reported that dough resistance was increased by using kappa carrageenan or hydroxyl propyl methyl cellulose. Comparison of different levels of kefiran with the control sample showed that dough stability did not change significantly and there was no significant difference between samples containing 1–3% kefiran concentration. Ketabi et al. [10] reported that dough stability was not different for microbial exopolysaccharides in the sourdough. The departure time, which equals the sum of arrival time plus the stability, was clearly increased by addition exopolysaccharide. The results showed that kefiran at 3% level, was promoted the highest effect. In our research, increase in 1 and 2% kefiran proportions did not significantly modify degree of softening after 20 min (DOS) but addition of polysaccharides to the dough significantly increased the dough toughness at 3% polysaccharide concentration (Table 1). The mixing tolerance index, which is the drop in consistency measured after 5 min, did not change in level of 1% exopolysaccharide in comparison with the control sample, while decreased from 85 to 64 BU, and 64 to 61 BU, with the addition of kefiran at levels of 2 and 3%, respectively. These data indicate that addition of kefiran increased the strength of the dough and this effect is attributed to a strong interaction between kefiran and gluten. The width of the Farinograph curve is a measure of dough cohesiveness and elasticity. The elasticity of dough, when 500 BU of consistency is reached, was affected differently by levels ofkefiran. The highest elasticity of the wheat flour was observed at 1% kefiran concentration (70 BU), and the lowest with 3% kefiran (50 BU). The time breakdown significantly increased with the addition 3% of kefiran proportion. The Farinograph quality number, which is an empirical, single-figure and quality score, is dependent upon two characteristics of the Farinogram curve such as the development time and the rate at which the dough breaks down after the peak time. The Valorimeter value increased with adding of kefiran. Therefore, the Farinography properties are improved by adding of kefiran to wheat flour as indicated in (Figure 1 and Table 1).

Extensography results

The effects of the addition of kefiran on the Extensograph measurement during a time span 45, 90 and 135 min resting time are

Exopolysaccharide (%)	WA* (%)	DDT (min)	S (min)	DT (min)	DOS (BU)	MTI (BU)	TB (min)	FQN
0.00	50.60^{c}±4.38**	1.25^{b}±0.04	3.50^{a}±0.67	4.25^{b}±0.23	85.00^{a}±7.01	75.00^{a}±6.25	6.25^{b}±0.49	47.00^{c}±2.45
1.00	60.00^{b}±5.52	1.50^{b}±0.01	3.50^{a}±0.59	4.50^{b}±0.67	85.00^{a}±7.34	75.00^{a}±6.45	5.50^{c}±0.38	48.00^{bc}±2.01
2.00	61.10^{ab}±5.45	2.00^{ab}±0.00	3.50^{a}±0.59	5.00^{ab}±0.37	87.00^{a}±8.63	64.00^{b}±5.23	5.75^{bc}±0.68	51.00^{ab}±4.59
3.00	63.20^{a}±8.21	3.00^{a}±0.00	3.75^{a}±0.12	5.75^{a}±0.17	70.00^{b}±10.56	61.00^{b}±7.75	7.40^{a}±0.43	53.00^{a}±4.32

*Values are the average of duplicate; WA: water absorption; DDT: dough development time; S: stability;DT: Departure Time; DOS: degree of softening; MTI: mixing tolerance index; TB: time to breakdown and FQN: Farinograph quality number.

**Mean values ± standard deviation; values are the average of three replicates from four different dough samples; different letters in the same column indicate significant differences ($p \le 0.05$)

Table 1: Farinograph properties of wheat dough with kefiran.

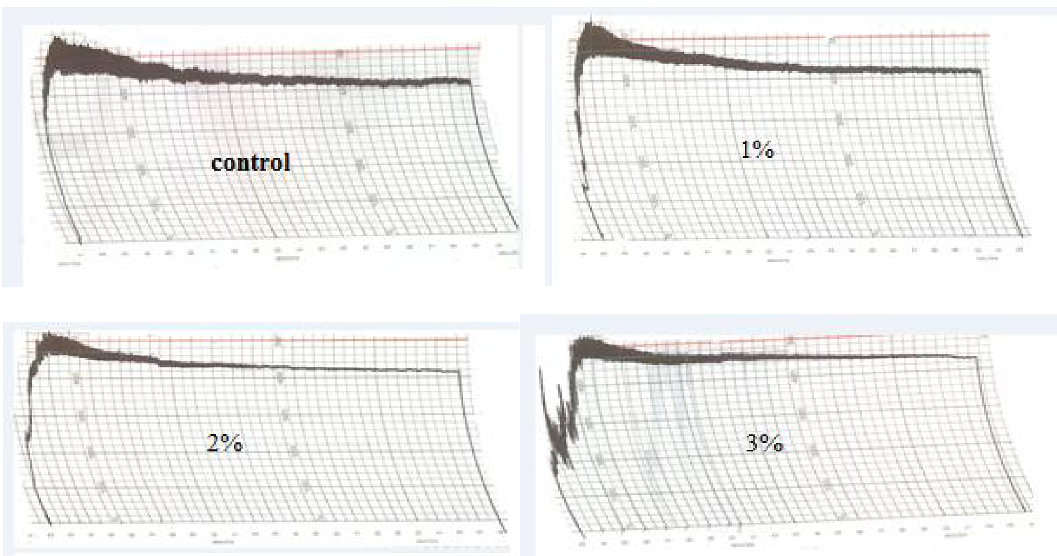

Figure 1: Effect of kefiran on Farinography properties of wheat flour dough (flour basis).

shown in (Table 2). These results showed that by adding 1% kefiran, there was a reduction in resistance to extension (R) after 45 min rest time and this phenomenon was similar for 90 and 135 min resting times. With an increase in resting time from 45 to 135 min, the R values decreased for both the control and kefiran samples. There were significant differences in the resistance to extension of the dough containing different levels of kefiran and the control sample. Mettler and Seibbel [5] reported a slender reduction in dough elasticity by adding hydrocolloids like carboxy methyl cellulose (CMC) and guar to the dough. The proof of phenomenon was mainly due to the influence of hydrocolloid addition on the resistance parameter. Rosell et al. [16] reported that dough resistance was very different for various hydrocolloids. For example, dough resistance was increased by addition of xanthan or alginate, whereas it was decreased by using kappa carragenan or hydroxypropil methylcellulose. The mean comparison of extensibility at three different fermentation times was also shown in Table 2.With addition of kefiran, there was an overall reduction in dough extensibility (E), with the increase in rest time from 45 to 135 min probably owing to the water-binding ability of kefiran, and this coincided with earlier findings Rosell et al. [16] With addition kefiran, significantly difference was observed between treatments containing 1 and 2% kefiran proportions with controlafter 45 and 90 min of resting times, while this significant difference did not show after 135 min of resting. Rosell et al. [17] and Courtin and Delcour [19] reported the similar behavior after addition of different hydrocolloids to the dough. They indicated that extensibility could be decreased by addition of soluble and non-soluble polysaccharides to the dough. The resistance to extension ratio (R/E) of the dough containing different levels of kefiran is also shown in (Table 2). Analysis of Extensograph results showed that kefiran increased the resistance to extension ratio, also analysis through the time indicated negative stability of the dough containing kefiran and control sample, whereas Rosell et al. [16], Courtin and Delcour [19] and Ketabi et al.[10] reported the converse results in relation to effect of kefiran on resistance to extension ratio. Among the different levels kefiran tried at 45 and 90 resting times, 3% kefiran showed the highest resistance to extension ratio, but no obviously inclination in resistance to extension ratio of dough containing different levels of kefiran and control was observed at 135 resting time. This indicates that as the dough does rest, formation of a cohesive and resistant gluten network was prevented through formation of inter molecular bonding between gluten and fields of kefiran, which stretch the dough weaker and less resistance. Statistical analysis in this study showed that energy (A) input (Table 2) significantly increased at three different fermentation times by addition of kefiran. These specific happenings show that a higher resistance to reach the rending point is obtained after kefiran were adequately hydrated. These results agreed with earlier findings Ketabi et al. [10] and Rosell et al. [16]. Generally, with increasing fermentation times it is noticed that the energy necessary for the deformation was decreased, except for the dough containing 3% kefiran at 90 min resting time, which showed a significantly increase in energy input.

The cooking loss results

Cooking loss, represent weight loss due to evaporation of water in bread baking which is economically important. Adding kefiran led to reducing baking losses. Hence, the final weight of bread samples increased. This effect is due to greater absorption of water by kefiran and reducing evaporation of water during evaporation. Also, significant difference was observed in the cooking loss of the samples containing different levels of kefiran and the control sample (Table 3).

Bread technological properties

Bread volume increased up to a certain hydrocolloid concentration; with further rise of the exopolysaccharide levels the loaf volume decreased. The volume of bread increased with addition 1% and 2% kefiran compared with the control samples, respectively. The bread volume containing of 2% kefiran concentration increased significantly compared to the control sample and 1% kefiran concentration. However, with increasing kefiran concentration from 2% to 3%, an increasing of bread volume was observed. For different hydrocolloids, further to its water retention properties because of its hydrophilic nature, it also includes hydrophobic groups which influence additional properties including increased between two or more faces activity within the dough system during proofing, and forming gel networks on becoming hot during the bread making process. Such network structures serve to increase viscosity and to further strengthen the boundaries of the expanding cells in the dough, thus increase gas retention through baking, and therefore lead to a better loaf volume. The specific volume index and spread ratio of bread, improving the slice shape and volume of the resulting fresh bread, significantly did not change with the addition of kefiran. The results obtained with Kefiran different from previous findings of smitha et al. [9] who observed great effect on quality of wheat bread regarding the loaf volume and spread ratio, respectively. The adding of kefiran at levels of 1% and 2% significantly produced an increase in the porosity (Table 4).

Exopolysaccharide (%)	Resistance (R) (BU)			Extensibility (E)(mm)			R/E			Area (A)(cm^2)		
	45	90	135	45	90	135	45	90	135	45	90	135
0.00	178^c±5.68	140^b±10.28	140^a±10.15	137^a±3.45	125^a±5.45	125^a±5.34	1.29^b	1.12^b	1.12^a	39^c±2.15	24^c±0.18	19^a±2
1.00	155^d±2.29	120^c±10.19	95^c±5.75	120^b±10.18	115^b±5.53	85^c±7.30	1.29^b	1.04^b	1.11^a	73^b±5.24	72^b±10.17	10^{ab}±5.63
2.00	195^b±8.27	145^b±5.45	95^c±5.63	105^c±9.61	103^c±3.186	85^c±5.56	1.85^b	1.40^b	1.11^a	75^{ab}±11.54	70^b±9.28	9^b±2
3.00	345^a±18.18	220^a±18.38	130^b±12.56	100^c±9.23	95^c±7.37	92^b±8.44	3.45a	2.31^a	1.41^a	83^a±13.46	109^a±15.42	14^{ab}±0.41

Mean values ± standard deviation; the same superscripted letter is indicating non-significant ($p \le 0.05$) difference in a given column

Table 2: Effect of different levels of kefiran on the Extensograph parameters.

Exopolysaccharide (%)	Initial mold weight (g)	Difference between dough mold and bread (g)	Cooking loss (%)
0	40.54^a±0.21	9.17^a±0.18	29.26^a±0.27
1	40.87^a±0.24	7.84^b±0.43	23.84^b±0.27
2	40.69^a±0.35	7.53^b±0.28	22.28^b±0.56
3	40.33^a±0.43	7.37^b±0.53	18.27^c±0.43

*Different letters in each column shows statically values ($p \le 0.5$)

Table 3: Effect of kefiran on cooking loss of bulk bread.

Influence of adding of kefiran on the properties of stored bread

Some characteristics force-distance (deformation) curve achieved from compression examinations applied or crumb of loaf breads are demonstrated in (Figure 2). Regarding the hardness increase during storage (Figure 5), Breads crumb containing 3% kefiran concentration, gave the lowest values, depicting a better influences as best level of anti-staling agent (kefiran). Conversely, samples of control showed the highest hardness increase after 24, 48 and 72 hr of storage, and the minor influence was promoted by the adding of 1% kefiran concentration. Compared to control formulation, firmness was affected with the adding of kefiran. In previous researches, it has been found that adding of HPMC, CMC, carrageenan and alginate brings about crumb softening of wheat bread, while state of being included of xanthan results in an increase of crumb hardness [15]. Hardness increase pursued the same tendency than crumb hardness of fresh bread, which agrees with previous researches of Amero and Collar [1]. who described that hardness of the fresh bread crumb correlates with crumb hardness at any point of the storage time. Bread staling is a very complex process that cannot be elucidated by a single influence, amylopectin retrogradation, reorganization of polymers within the amorphous region, loss of moisture content, distribution of water content between the amorphous and crystalline zone, and crumb macroscopic structure must likely participate in the staling process Davidou et al. [20], Rojas et al. [17]

Evaluation of bread

The effects of kefiran on the sensory attributes, was performed by 10 semi-trained panelist and was judged each specific sensory characteristic as acceptable with scores higher than 3 (neither like nor dislike), are shown in Table 5. An increase in the scores of all sensory attributes and the overall acceptability of the breads was found with the

Samples	Weight	Volume	Specific volume	Width/height ratio	Porosity
Exopolysacchari d (%)	31.07^{b}± 3027	68.30^{c}±6.64	2.19^{a}±0.04	0.38^{a}±0.013	3.2^{b}±0.080
1	33.03^{a}±4.38	75.00^{b}±10.25	2.27^{a}±0.17	0.38^{a}±0.015	3.5^{b}±0.62
2	33.16^{a}±4.17	76.80^{ab}±9.36	2.31^{a}±0.12	0.39^{a}±0.015	4.1^{ab}±0.73
3	32.96^{a}±3.58	78.00^{a}±12.12	2.36^{a}±0.21	0.45^{a}±0.012	4.7^{a}±0.43

*Different letters in each column shows statically values (p ≤ 0.5)

Table 4: Effect of Kefiran gel on technological properties of Sardari semi bulk bread.

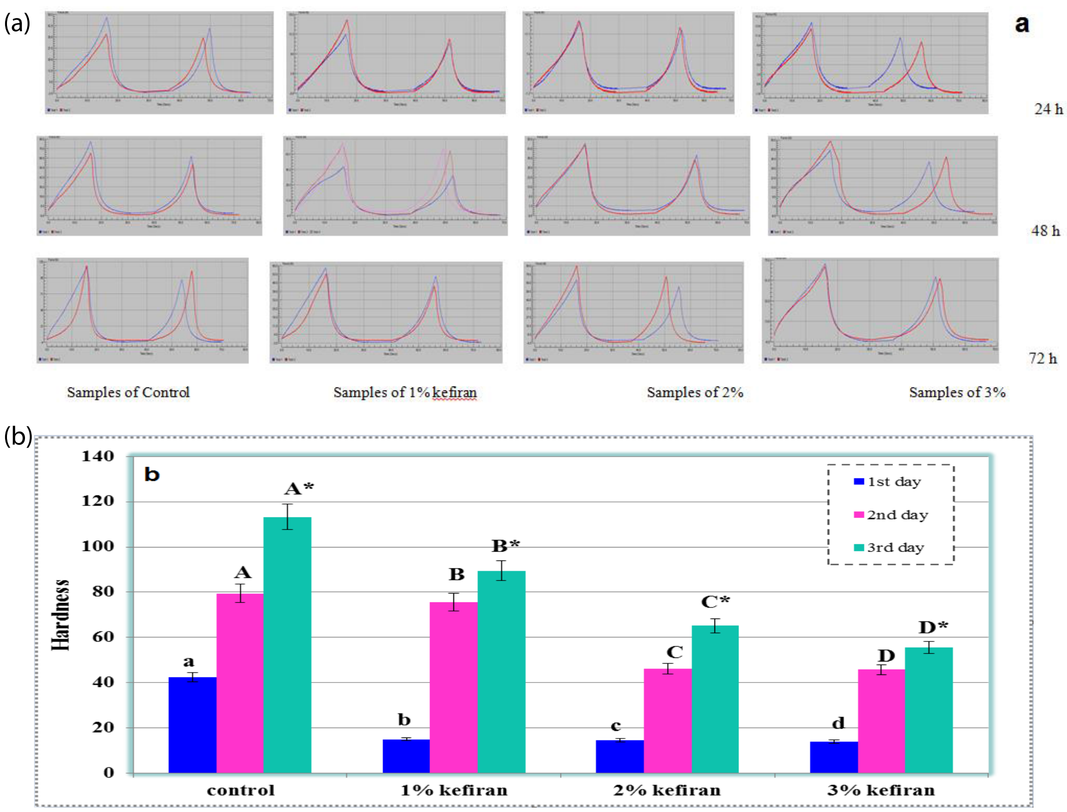

Figure 2: Effect of kefiran addition on compression force–distance (6mm) curves of crumb of bulk breads after storage for 1,2 and 3 day at 25 °C.
(a) on crumb firmness of bulk breads after storage for 1 and 3 days at 5 _C
(b). Curves are means of two replicates for each bread formulation. Values of firmness are the averages of two replicates and error bars represent standard deviation; mean values for the 1st day of storage with a common small letter are not significantly different (P < 0.05), mean values for the 2nd day of storage with a common capital letter and mean values for the 3rd day of storage with a stared capital letter are not significantly different (P < 0.05).

Exopolysaccharide (%)	*Visual appearance	Aroma	Flavour	Crunchiness	Overall acceptability
0	3.48^{b}	4.00^{b}	1.6^{b0}	3.50^{c}	3.283^{d}
1	4.04^{a}	4.30^{ab}	2.90^{a}	3.90^{bc}	3.859^{c}
2	4.25^{a}	4.70^{ab}	3.33^{a}	4.20^{ab}	4.162^{b}
3	4.07^{a}	4.85^{a}	3.50^{a}	4.80^{a}	4.357^{a}

Five point hedonic scale ratings: 5=like extremely and 1=dislike extremely
Overall acceptability was calculated by weighted arithmetic mean, given the following weight to each attributes: visual appearance 35%, aroma 15%, flavour 15%, and crunchiness 35%

Table 5: Influence of kefiran on the sensory wheat bread evaluation.

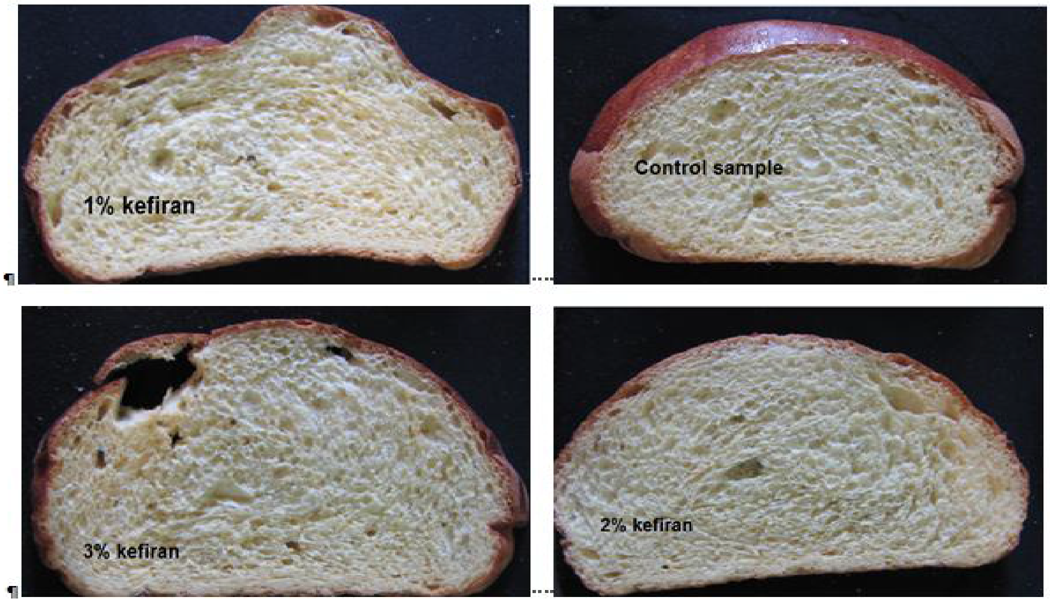

Figure 3: Effect of kefiran addition on internal structure of fresh bulk bread.

addition of kefiran. After adding kefiran, the visual appearance, aroma and flavour of breads containing kefiran were improved, but significant difference did not observed in breads containing kefiran. Kefiran increased the crunchiness, indicating their softening effect on the bulk bread, and overall acceptability of bulk breads from 3.283 to 4.357. Addition of kefiran brought about a marginal increase in the sensory scores for visual appearance, aroma and flavour. It can be concluded from these data that kefiran improved the overall quality of bulk bread. The highest improvement in the overall quality score (from 3.283 to 4.357) was brought about by 3% kefiran concentration (Figure 3).

Conclusion

Kefiran, a high molecular weight polysaccharide obtained from kefir grains, increased water absorption capacity of wheat flour dough whereas degree of softening and mixing tolerance index were decreased. Also, the strength and elasticity of the dough increased with kefiran and other rheological properties of wheat flour dough are affected to different extent by kefiran added.

Acknowledgements

This research was financially supported by Agriculture Faculty and Natural Resource of Gorgan (Gorgan, Iran) and Seed and Plant Improvement Institute of Alborz Province (Karaj, Iran).The authors would like to gratefully acknowledge Mr. Mehran Ghasemlou, Mrs. Sara Moayedi and Monire Rahimi for their cooperation during this study.

References

1. Collar C, Martinez JC, Rossel CM (2001) Lipid binding of fresh and stored formulated wheat breads. Relationships with dough and bread technological performance. Food Science and Technology International 7: 501-510.
2. Rosell CM, Foegeding A (2007) Interaction of hydroxypropylmethylcellulose with gluten proteins: Small deformation properties during thermal treatment. Food Hydrocolloids 21: 1092-1100.
3. Kenny S, Wehrle K, Dennehy T, Arendt EK (1999) Correlations between empirical and fundamental rheology measurements and baking performance of frozen bread dough. Cereal Chemistry 76: 421-425.
4. Schiraldi A, Piazza L, Brenna O, Vittadini F (1996) Structure and properties of bread dough and crumb: calorimetric, rheological and mechanical investigations on the effects produced by hydrocolloids, pentosans and soluble properties. Journal of Thermal Analysis 47: 1339-1360.
5. Mettler E, Seible W (1993) Effect of emulsifiers and hydrocolloids on whole wheat bread quality: a response surface methodology study. Cereal Chemistry 70: 373-377.
6. Gurkin S (2002) Hydrocolloids – ingredients that add flexibility to tortilla processing. Cereal Food World 47: 41–43.
7. Guarda A, Rosell CM, Benedito C, Galotto MJ (2004) Different hydrocolloids as bread improvers and antistaling agents. Food Hydrocolloids 18: 241-247.
8. Shalini G K, Laxmi A (2007) Influence of additives on rheological characteristics of whole-wheat dough and quality of Chapatti (Indian unleavened Flat bread. (Food Hydrocolloids 21: 110-117.
9. Smitha S, Jyotsna Rajiv, K Hyrunnisa B, Indrani D (2008) Effect of Hydrocolloids on rheological, microstructural and quality characteristics of parota- an unleavened Indian flat bread. Blackwell Publishing 39: 267-283.
10. Ketabi A, Soleimanian-Zad S, Kadivar M, Sheikh-Zeinoddin M (2008) Production of microbial exopolysaccharides in the sourdough and its effects on the rheological properties of dough. Food Research International 41: 948- 951.

11. AACC (2002) AACC Nos. 08-01, 38-10, 44-16, 56-81B, 56-61A. Approved Methods of the American Association of Cereal Chemists, The Association, St. Paul, MN.

12. Rimada PS, Abraham AG (2001) Polysaccharide production by kefir grains uring whey fermentation. Journal of Dairy Research 68: 653–661.

13. Piermaria JA, Pinotti A, Garcia MA, Abraham AG (2009) Films based on kefiran, an exopolysaccharide obtained from kefir grain: Development and characterization. Food Hydrocolloids 23: 684–690.

14. Dubois M, Gilles KA, Hamilton JK, Rebers PA, Smith F (1956) Colorimetric method for determination of sugars and related substances. Analytical Chemistry 38: 350–352.

15. AACC (1983) AACC Nos (8th edn.) 08-01, 44-15A, 46-13, 54-20. Approved Methods of the American Association of Cereal Chemists, The Association, St. Paul, MN.

16. Rosell CM, Rojas JA, Benediti de Barber C (2001a) Influence of hydrocolloids on dough rheology and bread quality. Food Hydrocolloids 5: 75–81.

17. Rosell CM, Rojas JA, Benedito C (2001b) Combined effect of different antistaling agents on the pasting properties of wheat flour. European Food Research and Technology 212: 473–476.

18. Friend CP, Waniska RD, Rooney LW (1993) Effects of hydrocolloids on processing and qualities of wheat tortillas. Cereal Chemistry 70: 252-256.

19. Courtin CM, Delcour JA (2002) Arabinoxylans and endoxylanases in wheat flour bread- making. Journal of Cereal Science 43: 225-243.

20. Davidou S, Le Meste M, Debever E, Bekaert D (1996) a contribution to the study of staling of white bread: effect of water and hydrocolloid. Food Hydrocolloids 10: 375-383.

Citation: Soleimanifard M, Alami M, Chegeni FK, Najafian G, Mahoonak AS, et al. (2015) Production of Kefiran in Kefir Grains and its Effects on the Rheological Properties Low Protein Wheat Dough and Quality of France Bulky Bread. Adv Crop Sci Tech 3: 190. doi:10.4172/2329-8863.1000190