EUROPEAN ACADEMIC RESEARCH
Vol. VIII, Issue 2/ May2020

Impact Factor: 3.4546 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

The Effect of Gum Arabic and Guar Gum as Natural Improvers on Rheological and Sensory Properties of Sudanese Bread

MOUSA OTHMAN YAHYA ALHAKAMI[1]
University of Bahri. College of Applied and Industrial Sciences.
Department of Food Technology. Khartoum. Sudan
KAUTHER SIR ELKHATIM ALI
University of Bahri. College of Applied and Industrial Sciences.
Department of Biotechnology. Khartoum. Sudan
BAHA ELDIN MOHAMED IDRIS
University of Bahri. College of Agriculture
Department of Crop Sciences. Khartoum. Sudan
AMNA ELSIDDIG ALI
University of Bahri. College of Applied and Industrial Sciences.
Department of Food Technology. Khartoum. Sudan

Abstract

Sudanese wheat is generally of poor bread making quality, which is attributed to the low protein and gluten quantity and, this has an effect on the water absorption of flour, which is reflected on the rheological properties of the dough. In this studyeight samples of Sudanese flour were manufactured by adding (1, 2 and 3 g of Gum Arabic), (0.2, 0.3 and 0.5 g of Guar Gum), to conduct the rheological tests of the dough and to improve the baking tests and sensory properties of Sudanese bread. The farinograph results showed the best development time of dough which recorded (3.8 min) in the sample containing 0.2g of (GG), and the longest period of stability (5.9min) in the sample containing a mixture of 2g (GA) and 0.2g (GG). The degree of dough softening was recorded (79min) in the sample containing a mixture of 2g (GA) and 0.2g (GG), which was significantly increased with (GA) and decreased by adding of (GG). The results of the

[1]Corresponding author Mousahakami2021@gmail.com

extensograph were significantly affected (P≤0.05) by the addition of natural improvers (Gum Arabic and Guar Gum).However, the highest energy rate (118cm2), resistance to extension (971BU), maximum extensibility (1013mm) and the ratio number (11.2%) was recorded in the sample containing a mixture of 2g (GA) and 0.2g (GG). The results of the sensory evaluation indicated that the bread samples were significantly affected (P≤0.05) by adding a mixture of 2g Gum Arabic and 0.2g guar gum which was the best in appearance, colour, taste, texture, flavour and overall acceptability compared with other samples.

Key words: Guar Gum, Gum Arabic, natural improvers, rheological, bread.

INTRODUCTION:

Bread is baked product made from wheat or rye. Bread is an important staple food in both developed and developing countries. In the Sudan, the consumption of wheat bread is increasing in both rural and urban area as consequence of changing taste, on venience and consumer subsidies. However, bread is being made from imported wheat, which is not suitable for cultivation in the tropical area for climatic reasons. Bread is a product with great nutritional value, consumed worldwide (Bowles and Demiate, 2006). In order to improve the bread quality, many additives are used in bakery, and each one has a different effect over the wheat flour behavior.Hydrocolloids are widely used as additives in the food industry, because they are functional for modifying the rheology and texture of aqueous suspensions (López and Jiménez, 2015). Hydrocolloids induce structural changes in main components of wheat flour systems along bread making steps and bread storage (Collar *etal.,* 1999; Guardaet *etal*., 2004; Bárcenas and Rosell, 2005;). The presence of hydrocolloidsinfluenced melting, gelatinization, fragmentation, and retrogradation starch processes (Dziezak, 1991; Davidouet *etal*., 1996; Rosell*etal*., 2001a; Funamiet *etal*., 2005; López and Jiménez 2015).

Effect of hydrocolloids on gluten characteristics nature of protein-polysaccharide interactions can vary widely due to wide variations in biopolymer structure and solvent conditions. Depending on these conditions, macromolecular interactions may be specific or non-specific, weak or strong, and repulsive or attractive (Tolstoguzov, 2003: Pahwa *et al.,* 2016). Sidhu and Bawa, (2004) who studied the effect of Acacia gum incorporation on the bread making and showed that, the Rheofermentometer maximum dough height and maximum height of CO2 production increased by 2.1 and 19.6 mm respectively at 0.1% Acacia gum level followed by further increase with level of gum Volume of bread improved by all the levels of gum addition.The objective of this study was to evaluate the effects of adding different concentrations of Guar gum and Gum Arabic on rheological and sensory properties of bread making.

MATERIALS AND METHODS

The materials used in this study were:

Wheat grains: (*Triticum aestivum*) Sudanese wheat (Imam) obtained from Gazeera. Sudan.

Yeast: Instant dry yeast was obtained from local market.

Water: tap water at 100° to 110° F was used.

Sugar: Sucrose. Finely granulated, white, commercial grade was used.

Salt: NaCl finely granulated, obtained from the local market was used.

Shortening: partially hydrogenated vegetable oil (Crisco) which purchased from the local market was used for bread making.

Natural Improvers Gum Arabic and Guar gum were obtained from north kordofan.

METHODS

Bread baking: Flat-bread formulation was prepared by mixing a total of 1000 g of flour, defatted Gum Arabicand Guar Gum, and other ingredients as showed in Table 1. Dough was fermented for 30 min at 35 °C and 55% relative humidity followed by proofing for 20 min, molding, and placed in pans (22×6×7 cm). The dough was let to proof for another 30 min followed by baking at 220°C for 20 min in a rotary oven. Bread was allowed to cool on racks and sensory evaluated.

Table 1. Flat bread ingredients

Ingredients	Parts	Weight (g)
Flour	100.0	1000
Sugar	5.0	3
Yeast	3.0	5.86
Salt	2.0	4.77
Water	73.6	668.18ml
Oils	30g	30g
Bread improver (Chemicals improvers)	0.03	4.66
Gum Arabic (Natural improvers)	1, 2 and 3%	1, 2and 3
GuarGum(Natural improvers)	1, 2 and 3%	0.2, 0.3 and0.5
Mixed (Gum Arabic and Guar gum)		2 Gum Arabic 0.2Guar Gum

Farinograph characteristics:

The rheological properties of the dough prepared from wheat flour and mixed of Gum Arabic and Guar Gum were measured and blends using the bra bender farinograph according to the (AACC, 2000).The titration curve: Bra bender farinograph was operated as described in the AACC method (2000). Titration curve was used for the assessment of the water- absorption for each flour sample. A sample of 300 gran (14% moisture) was weighed and transferred into a cleaned mixer. The farinograph was switched on 63 rpm for one minute, then the distilled water was added from especial burette (the correct water absorption can be calculated form the deviation, 20 units deviation correspond to 0.5% water, if the consistency, is higher than 500 F. U. more water is needed and vice - versa). When the consistency is constant, the instrument was switched off and the water drawn from the burette indicates water absorption of the flour in percentage. A sample of 300g was weighed, and then introduced into the mixer; the farinograph was switched on such as before. The Water absorption, Dough development time (peak time), Dough stability and Dough softening were determined.

Extensograph characteristics:

Extensograph method was used according to the (AACC, 2000). The extensograph was set and operated at 30ºC. The dough for extensograph was prepared as for the farinograph, but the amount of water used for mixing was 2% less due to the addition of 2% salt and the dough was mixed for 5 min only. Two pieces of dough (150g each) were weighed, molded on the balling unit, rolled with dough roller into cylindrical test pieces, fixed in the dough holder, and stored in the rest cabinet for 45 min. The dough piece was placed on the balance arm of extensograph and stretched by stretching. The behavior of the dough was recorded on a curve via extensograph which showed energy, resistance to extension, extensibility and ratio testthat performed at 45, 90, and 135 min intervals.

Baking Test:
Wheat flour containing Gum Arabicand guar gum was used for baking bread according to the method of Badiet *etal.,* (1978)

Bread Weight: The weight of the loaf bread was recorded.

Bread Specific Volume: The specific volume of the loaf was calculated according to the AACC method (2000) by dividing volume by weight (g).

Sensory evaluation of bread:
The loaves were sliced with an electric knife and prepared for sensory evaluation on the same day. 10 trained panelists carried out the sensory evaluation of bread samples (color, taste, texture, flavour and overall acceptability). Sensory evaluation was done on the same day that the bread were prepared. The panelists were asked to record their evaluation scores on the sheet. The data obtained was statistically analyzed for significant deference among the various treatments.

Statistical Analysis: The analysis of variance was performed to examine the significant effect in all parameters measured SPSS, (2002). Significant attribute were further analyzed using Duncan's Multiple Range Test (DMRT) at 5% level of significant, as described by (Duncan's, 1955).

RESULTS AND DISCUSSION

Results in (Table 2) showed a slight decrease in water absorption by addition of Gum Arabic and Guar Gum. The higher level of water absorption was recorded in control sample (55.9%), while the lowest water absorption recorded (53.1%) in both samples of (3g GA) and (2g AG – 0.2g GG). Singh and Bawa, (2004) stated that a slight increase in water absorption by addition of 0.1 and 0.2% of gum acacia while at higher levels, the increase was marginal. Approximately with Rodge *etal.,* (2012) who studied the effect of hydrocolloids (guar gum) incorporation on the quality characteristics of bread, and found that water absorption of sample containing 0.25 percent of guar gum was 61.2 per cent which increased with increase in concentration of guar gum and reached up to 64.5 per cent in sample having 1 percent of guar gum. The increase in water absorption capacity of dough may be due to ability of guar gum to absorb water in their interrelated network and interaction with starch granules. Higher water absorption capacity of dough represents consistency, which is desirable in bread making. Therefore, it was found that increase in concentration of guar gum linearly increase water absorption capacity of dough. These results were expected due to structural modification of dough for incorporation of guar gum, which allows more water absorption due to hydrogen bonding (Ogneanet*etal.,* 2006). This property of hydrocolloids has been attributed to the hydroxyl groups in the hydrocolloids structure that allows more water interactions through hydrogen bonding (Guarda*etal.,* 2004; Friend *etal.,* 1993). Increased water absorption of the dough may be due to the hydrophilic nature.

Dough development time.

Dough development time was increased in sample containing 2g GG (3.8%), while the lowest recorded (1.4%) in samples with 3g (GA). Furthermore, the dough development time in sample containing (2g GA and 0.2g GG) recorded 2.2% (Table 2).The dough development time (min) was determined from farinograph as the time required for a curve to reach at its full development or maximum consistency showing the highest peak. High peak value is associated with strong wheat which has long mixing time (Rodge *et al.,* 2012).With respect to dough development time, it was found to be correlated inversely with the concentration of guar gum, and higher dough development time i.e. 6.20 min. while the sample containing 1 per cent of guar gum found to have lowest dough development time (5.60 min) (Pahwa*etal.,* 2016; Rodge *etal.,*2012). Dough development time was increased from 1.0 to 1.5 min at all gum levels (Singh and Bawa, 2004).Study also similar with Ghanbari1and Farmani, (2013) stated the dough development time necessary to reach the maximum consistency, also found that, the dough development time was increased with hydrocolloids HPMC 4.2 to 4.3min and Xanthan increased dough development time from 4.1 to 4.3min, except the κ-carrageenan gum decreased dough development time from 4.1 to 3.9min,Stronger dough has higher dough development time and there is a positive correlation between dough protein content and dough development time (Pomeranz, 1988).

Smitha*etal.*, (2008) reported that dough development time increased with the addition of xanthan and decreased by the addition of Gum Arabic , Guar Gum, κ-carrageenan, and HPMC.

Dough stability

The result in (Table 2) showed that, the time (min) of dough stability was significantly different between all treatments. The longest time was found (5.9min) in sample containing (2g GA and 0.2g of GG), while the lowest recorded (2.6min) in control samples. Furthermore, this is the time (min) that top of the curve remains above the 500 Brabender Units line and was measured from the arrival time to the departure time. Greater tolerance would indicate that the flour can stand for more mixing and the longest fermentation conditions (Rodge *et al.,* 2012).Other similar studies with Ghanbari1and Farmani, (2013) found that, the xanthan gum at 0.5% level showed significant increase from 7.7 to 8.9 in dough stability. Lowest stability was produced by adding 0.5% κ-carrageenan. Degree of softening 10 min remained unchanged at all the levels of gum. The useful properties of gum are largely due to the physical effects and primarily involve its interaction with water. Gum interacts with protein molecules to provide suspension and solution stability while it provides viscous and emulsification effects due to lipid molecules (Singh and Bawa, 2004).

Stability of dough is the function of gluten development, the increase in concentration of guar gum enhanced the gluten development and hence the stability of dough increased with the increase in concentration. Dough which contains high guar gum concentration exhibited higher tolerance index to over mixing. This advantage is preferred on industrial scale (Sim*etal.,* 2009).Stability of dough, indicating that the time the curve remains at 500 BU (Brabender Units, 500 BU= 1.1 Nm) and showing the flour mixing tolerance, had an obvious change by hydrocolloids addition. Dough with proper stability showed good gluten network forming (Pomeranz, 1988).

Degree of softening

The data in (Table2) showed a slight decrease of softening degree by the addition of (GA) and increased with addition of (GG). The higher level of softening degree recorded (104 min) in both samples containing 3g (GA) and control samples, while the lowest softening degree found (90min) in sample containing 0.5g GG. Furthermore, the softening degreein sample containing mixture with (2gGA and 0.2g GG) recorded 79min.Moazzezi *etal.,* (2012) investigated the effect of CMC (0.1% and 0.5%–w/w) on the rheological and staling properties of traditional Barbari bread. In comparison to control, the flat bread containing 0.5% CMC showed higher water absorption capacity (69.35%), lower degree of softening (19.0B.U), and higher quality properties (113.0).Degree of softening 10 min remained unchanged at all the levels of gum. The useful properties of gum are largely due to the physical effects and primarily involve its interaction with water. Gum interacts with protein molecules to provide suspension and solution stability while it provides viscous and emulsification effects due to lipid molecules (Singh and Bawa, 2004). By such interactions, gums perform their useful functions related to viscosity, solution stability, and suspend ability (Glicksman, 1969).

Table 2.The effect of the addition of Gum Arabic and Guar gum on rheological proprieties.(Farinograph results).

Treatment	Gum concentration |kg flour	Water absorption (%)	Dough development time (min)	Dough Stability (min)	Degree of softening
Control		55.9±0.05^{a}	1.5±0.03^{ef}	2.6±0.03^{e}	104±0.3^{a}
Gum Arabic	1.0 g	54±0.03^{bc}	2±0.3^{cd}	5.1±0.03^{c}	104±0.3^{a}
	2.0 g	53.1±0.03^{e}	2.3±0.03^{bc}	5±0.3^{c}	78±0.3^{fg}
	3.0 g	53.6±0.03^{cd}	1.4±0.03^{fg}	4.1±0.03^{d}	103±0.3^{b}
Guar Gum	0.2 g	54.5±0.03^{b}	3.8±0.03^{a}	5.6±0.03^{b}	87±0.3^{d}
	0.3 g	54±0.06^{bc}	1.8±0.03^{de}	4.2±0.03^{d}	84±0.3^{e}
	0.5 g	54.5±0.3^{b}	2.5±0.03^{b}	5.1±0.03^{c}	90±0.3^{c}
Gum Arabic& Guar gum	2.0 g & 0.2 g	53.1±0.03^{e}	2.2±0.03^{bc}	5.9±0.03^{a}	79±0.3^{f}

*Mean values ± SE within column having different superscripts letters are significantly different (P≤ 0.05).

Results in (Table 3) showed significant increase in energy by addition of Gum Arabic and Guar gum. The higher level of energy was recorded (118cm2) in sample, containing (2g GA and 0.2g GG) compared to control sample (83 cm2).The results of extensograph revealed that, during fermentation of bread samples at 45, 90, and 135min, bread samples with 0.5% of CMC showed the highest amounts of energy, as compared to other experimental samples (Pahwa *etal.,* 2016). According to Smitha *etal.,* (2008) the energy or work output necessary for the deformation at 135 minutes was reduced by the addition of some hydrocolloids (Gum Arabic, guar, HPMC and κ-carrageenan), with the exception of xanthan. Rosell *etal*., (2001b) also reported that addition of some hydrocolloids (HPMC, alginate and k- carrageenan) decreased the energy for the deformation, with the exception of xanthan gum.The previous study with Sahari *etal*., (2014) showed that, the energy or work input required for the deformation increased by addition of Persian gum. Dough containing 3% Persian gum showed the highest energy. Moreover, at each time measured (after 45, 90, and 135min), control sample showed the lowest energy. The effect observed agree with increased energy, when they added xanthan and K-carrageenan to the dough (Guarda *etal*., 2004).The results in table (3) revealed that significantly different to resistance extension, extensibility, max (BU) was highly by addition of Gum Arabic, while decreased the sample of Guar Gum. The higher level of resistance extension was recorded

(971mm) in dough sample, containing (2g GA and 0.2g GG) compared to the control sample.

Maximum dough extension and ratio number

Respectively recorded (1013Bu) and (11.2%) in sample containing (2g GA and 0.2g GG) compared with other samples. Ghanbari and Farmani, (2013 found the dough containing 0.2% HPMC was 153.0mm had longer or the same extensibility, whereas dough samples containing 0.2% κ-carrageenan 139.0mm or xanthan 134.0mm had shorter ($P \leq 0.05$). Addition of xanthan to the dough formulation was more effective than κ-carrageenan in terms of reduction in dough extensibility. The difference of the effect of hydrocolloids may be attributed to their different chemical structure and functionality. The addition of xanthan into dough formulation can strengthen the dough by forming a strong interaction with the flour protein (Rosell *etal.,* 2001a; Collar et al., 1999; Pressini, 2011).When used as a dough additive, κ-carrageenan has an ability to interact with gluten proteins, too (Leon, 2000).

Table 3.The effect of the addition of Gum Arabic and guar gum on rheological proprieties (Extensograph results).

Treatment	Gum concentrations (g)	Energy(cm^2)	Resistance extension	Extensibility (mm)	Maximum (BU)	Ratio number (%)
control		83 ± 0.3^{f}	6.1 ± 0.03^{c}	596 ± 0.3^{f}	97 ± 0.3^{ef}	590 ± 0.3^{c}
Arabic gum	1.0 g	96 ± 0.3^{b}	5.7 ± 0.03^{d}	627 ± 0.3^{c}	109 ± 0.3^{bc}	591 ± 0.3^{c}
	2.0 g	91 ± 0.3^{d}	6.7 ± 0.06^{b}	664 ± 0.6^{b}	99 ± 0.3^{e}	636 ± 0.3^{b}
	3.0 g	94 ± 0.3^{c}	5.6 ± 0.03^{de}	613 ± 0.3^{d}	110 ± 0.3^{ab}	580 ± 0.3^{d}
Guar gum	0.1 g	86 ± 0.3^{e}	4.9 ± 0.03^{f}	540 ± 0.6^{h}	111 ± 0.6^{a}	504 ± 0.3^{g}
	0.2 g	94 ± 0.3^{c}	5.7 ± 0.03^{d}	609 ± 0.3^{e}	108 ± 0.3^{cd}	564 ± 0.3^{e}
	0.3 g	86 ± 0.3^{e}	4.9 ± 0.03^{f}	565 ± 0.3^{g}	108 ± 0.6^{cd}	522 ± 0.3^{f}
Gum Arabic & Guar gum	2.0g &0.2g	118 ± 0.3^{a}	11.2 ± 0.05^{a}	1013 ± 0.3^{a}	91 ± 0.3^{g}	971 ± 0.3^{a}

*Mean values ± SE within column having different superscripts letters are significantly different ($P \leq 0.05$).

Weight of bread:

The results in (Table 4) showed significantly decrease of weight bread by addition of Gum Arabic and Guar Gum. The higher mean of weight was recorded (110.6g) in control sample A (without improvers),followed by sample B containing chemicals improvers (108±0.3g), while the lowest obtained (108±0.2g) in sample C containing (2gGum Arabicand 0.2g Guar Gum) compared to control sample. Indicated that, there was a significant ($p<0.05$) increase in weight of bread by the addition of natural improvers gum. The results showedthe increase in the yield of bread and improvement in softness due to highest water binding capacity of gums (Sidhu and Bawa, 2002).

Backing tests

The results in (Table 4) showed significant increase in specific volume of bread by addition of Gum Arabic and guar gum. The higher mean of specific volume was recorded (3.4cm3⁄g) in sample C containing (2g GA and 0.2g GG) compared to control sample, followed (3.1cm3⁄g) by sample B containing chemicals improvers, while the lowest obtained (2.4cm3⁄g) in control A sample (without improvers).Similarly, with Rodge *etal.,* (2012) who found that, the best specific volume of the bread samples was 3.25 cm3/g while the control sample was 2.25cm3/g. The texture of the bread changed from soft up to 0.3% level to very soft for 0.4 and 0.5% addition of gum, also the bread firmness evaluation revealed an increase in softness of crumb by the incorporation of gum (Sidhu, 1999). The interactions between lipids and proteins and influence of fat enhanced dough expansion during proofing (Rosell *et al.,* 2011).

In addition, Pojic *etal.,* (2015) studied the bread supplementation with hemp seed cake and then found the bread-specific volume ranged from 2.66 cm3⁄g to 1.44 cm3⁄g.

Table 4. Effect of addition of natural improvers (Gum Arabic and guar gum) on specific volume and weight of bread.

Item	Specific volume of bread (cm^3/g)	Weight of bread (g)
A	2.4 ± 0.06^{c}	110.6 ± 0.4^{a}
B	3.1 ± 0.08^{b}	108 ± 0.3^{b}
C	3.4 ± 0.3^{a}	108 ± 0.2^{b}

*Mean values ± SE within the row having different superscripts letters are significantly different ($P\leq 0.05$).

A≡ Control sample (without improvers); B≡ Sample containing chemicals improvers; C≡ Sample containing natural improvers (2g GA and 0.2g GG).

Sensory proprieties of bread making

With respect to the organoleptic evaluation of the bread produced, revealed that, the best appearance score 4.6 was showed in samples C containing (2g GA and 0.2g GG), while the worst score recorded 3.4 in control sample A (Table 5). The general appearance of bread was significantly different with addition of natural improvers. In same table, the result revealed that appearance of bread was slightly decreased during storage after one day ($P \geq 0.05$).Generally gum was affected on the colour, its golden brown for all the sample of bread making (Sidhu and Bawa, 2004).

The best color score (4.2) was showed in samples C containing (2g G A and 0.2g GG), while the worst score recorded (3.6) in both control sample A and the sample containing chemicals improvers in Table 5. Colour of bread was significantly ($p \leq 0.05$) different with addition of natural improvers. As well as the result found that colour of bread was slightly decreased during storage after one day ($P \geq 0.05$).Rodge *etal.,* (2012) stated that crust colour is an important parameter concerning the consumer acceptability towards bread. It revealed from the means that the treatments showed significant variations in the colour of crust. The colour of crust depends upon extent of caremelization of sugar present in the bread sample. The colour of bread crust is a function reducing sugars as these reducing sugars during baking caramelized to produce dark brown color of bread (Whistler and Bemiller, 1959).Table (5) showed the taste score of bread samples there was significantly ($p < 0.05$) different with addition of natural improvers. The best taste score (3.9) was showed in samples C containing (2g GA and 0.2g GG), while the worst score recorded (3.3) in control sample A (without improvers). Furthermore, the result found that taste of bread was slightly decreased during storage after one day ($P \geq 0.05$).Regarding other similar studies with addition of 0.2% HPMC hydrocolloids in bread manufacturing showed the highest taste scores, while bread with 0.2% κ-carrageenan received the score lower than control bread (Ghanbari, and Farmani, 2013).The addition of Gum Arabic and guar gum positively affected this parameter. Increase of loaf volume was observed about 19.7% and 20.8% respectively in comparison to control sample. Generally, the shape and cambering of loaves are important qualitative parameters because spelt bread tends to become flat. Cambering of wheat spelt loaves was markedly influenced by guar gum, the addition of xanthan gum non-affected cambering of final products (Schober *et al.,* 2002).

The best texture score (4.4) was showed in samples C containing (2g GA and 0.2g GG), while the worst score recorded (2.9) in control sample A (Table 5). Texture of bread was significantly ($p \leq 0.05$) different with addition of natural improvers. Furthermore the result found that texture of bread was slightly decreased during storage after one day ($P \geq 0.05$).The texture of the bread changed from soft up to 0.3% level to very soft for 0.4 and 0.5% addition of gum acacia(Sidhu and Bawa, 2004). Bread firmness evaluation revealed an increase in softness of crumb by the incorporation of gum (Sidhu, 1999).According to Ghanbari and Farmani, (2013) who found that all gum-added bread received higher scores shape than all evaluated parameters expect sample bread containing xanthan gum received the smallest.Ghanbari, and Farmani, (2013) stated that, the attributes evaluated were shape and form lower and upper surface characteristics, void and porosity, chew-ability, and texture (firmness or softness).Addition of hydrocolloids, with the exception of 0.2% xanthan, resulted in significantly higher scores regarding softness, as compared with the control bread. HPMC and κ-carrageenan improved overall acceptability of bread ($P \leq 0.05$).Tavakolipour and Kalbasi (2006) in their investigation about Lavash bread showed that dough samples containing CMC and HPMC at 1% level had significantly better organoleptic attributes (firmness, softness, and chew-ability) than the control bread. The addition of guar gum increased loaf volume, bread score, and reduced crumb firmness (Rodge *et al.,* 2012).
Table 5 showed that the best flavor score (4.5) was recorded in samples C containing (2g GA and 0.2g GG), while the worst score recorded (3.6) in both control sample A and the sample B containing chemicals improvers. Moreover, the result showed that flavour of bread was slightly decreased during storage after one day.

Table 5 showed that overall acceptability score of bread samples was significantly ($p \leq 0.05$) different with addition of natural improvers. The best overall acceptability score (4.8) was showed in samples C containing (2g GA and 0.2g GG), while the worst score recorded (3.1) in control sample A (without improvers).During storage after one day the result found that overall acceptability of bread was slightly decreased.

Regarding Ghanbari and Farmani, (2013) found that, the overall acceptability of bread containing xanthan gum had the lowest score (among hydrocolloids-added bread), being the worst at the highest concentration (0.5% xanthan). Tavakolipour and Kalbasi (2006) in their investigation about Lavash bread showed that dough samples containing CMC and HPMC at 1% level had significantly better organoleptic attributes (firmness, softness, and chew-ability) than the control bread. Smitha *etal.,* (2008) reported that addition of hydrocolloids improved the overall quality of bread and the highest improvement in the overall quality was brought about by guar gum , Gum Arabic,hydroxypropyl methylcellulose (HPMC) ,xanthan and carrageenan respectively.

Table 5.The effect of the addition of natural improvers (GumArabic and Guar Gum) on organoleptic properties of bread making

Items	Storage time	A	B	C
Appearance*	Day1	3.4 ± 0.2^{c}	3.8 ± 0.2^{b}	4.6 ± 0.2^{a}
	Day2	1.7 ± 0.2^{e}	3.2 ± 0.2^{d}	3.8 ± 0.2^{b}
Colour**	Day1	3.6 ± 0.9^{d}	3.6 ± 0.9^{d}	4.2 ± 0.9^{b}
	Day2	1.6 ± 0.9^{e}	5 ± 0.9^{a}	4.1 ± 0.9^{bc}
Taste*	Day1	3.3 ± 0.2^{d}	3.6 ± 0.2^{b}	3.9 ± 0.2^{a}
	Day2	1.6 ± 0.2^{f}	2.7 ± 0.2^{e}	3.4 ± 0.2^{c}
Texture*	Day1	2.9 ± 0.18^{e}	3.6 ± 0.18^{c}	4.4 ± 0.18^{a}
	Day2	2 ± 0.18^{f}	3.5 ± 0.18^{cd}	3.9 ± 0.18^{b}
Flavour*	Day1	3.6 ± 0.22^{b}	3.6 ± 0.22^{b}	4.5 ± 0.22^{a}
	Day2	1.9 ± 0.22^{e}	3 ± 0.22^{d}	3.5 ± 0.22^{c}
Overall acceptability*	Day1	3.1 ± 0.17^{e}	4.1 ± 0.17^{b}	4.8 ± 0.17^{a}
	Day2	1.7 ± 0.17^{f}	3.3 ± 0.17^{d}	3.8 ± 0.17^{c}

*Mean values ± SE within the row & column having different superscripts letters are significantly different ($P\leq 0.05$).
A≡ Control sample (without improvers); B≡ Sample containing chemicals improvers; C≡ Sample containing natural improvers (2GA and 0.2g GG).

CONCLUSION

This study concluded that all from examined water absorption, stability, degree of softening, energy, resistance to extension, maximum extensibility and ratio number was significantly the best affected by addition of mixture of (2g Gum Arabic and 0.2g Guar Gum). In addition, the backing test likes specific volume of the bread was increased by adding natural improvers, where the weight decreased in the sample of the mixture of Gum Arabic and Guar Gum. The results of the sensory evaluation indicated that the bread samples were significantly affected ($P\leq0.05$) by adding natural improvers and storage period. The sample containing a mixture of (2g Gum Arabic and 0.2g Guar Gum) was the best in appearance, colour, taste, texture, flavour, and overall acceptability compared with other samples.

REFERENCES

1. AACC (2000). Approved methods of American Association of Cereal Chemists. The10th Ed. The Association, St. Paul, MN.
2. Badi, S. M.; Elfaki, H. A. and Perten, H. (1978). Evaluation of Sudanese wheat varieties. Sudan. *J. Food Science and Technology*. Vol. 10: 5-11.
3. Bárcenas, M. E.andRosell, C. M. (2005). Effect of HPMC addition on the microstructure, quality and aging of wheat bread. Food Hydrocolloids, 19(6), 1037-1043.
4. Bowles, S. andDemiate, I. M. (2006). Physicochemical characterization of the soymilk by product - okara. Food Science and Technology (Campinas.), 26(3), 652-659.
5. Collar, C.;Andreu, P.;Martínez, J. C. and Armero, E. (1999). Dptimization of hydrocolloid addition to improve wheat bread dough functionality. A response surface methodology study.
6. D'Appolonia, B.L. (1993). Wheat endosperm protein and their impact on human kind. Wheat Kernal Proteins Molecular and Functional Aspects; University of Tuscia: Viterbo, 1994; 19–26.
7. Davidou, S.; LeMeste, M.;Debever, E. and Bekaert, D. (1996). Acontribution to the study of staling 400 of white bread effect ofwater and hydrocolloid. *Food Hydrocolloids*, 10(4), 375-383.
8. Duncan's, D.B. (1955).Multiple range and f test .Biometrics,11:142.
9. Dziezak, J. D. (1991). A focus on gums. Food Technology, 45(3), 115-132. *Food Hydrocolloids*, 13(6), 467-475.
10. Friend, C. P.; Waniska, R. D. and Rooney, L. W. (1993). Effects of Hydrocolloids on Processing and Qualities of Wheat Tortillas. Cereal Chem., 70: 252-256.
11. Funami, T.;Kataoka, Y.;Dmoto, T.;Goto, Y.;Asai, I. and Nishinari, K. (2005). Effects of non-ionic polysaccharides on the gelatinization and retrogradation behavior of wheat starch. Food Hydrocolloids, 19(1), 1-13.
12. Ghanbari, M. and Farmani, J. (2013). Influence of Hydrocolloids on Dough Properties and Quality of Barbari: Iranian Leavened Flat Bread.*J. Agr. Sci. Tech.* Vol. 15: 545-555.

13. Glicksman, M. (1969). Gum Technology in Food Industry; Academic Press: New York,; 97–111.
14. Griswold, R. (1992). The experimental study of foods. Indian University.
15. Guarda, A., Rosell, C. M., Benedito, C. and Galotto M. J. (2004). Different Hydrocolloids as Bread Improvers and Antistaling Agents. Food Hydrocol., 18: 241-247.
16. Ihekorone, A. I. and Negoddy, P.O. (1985).Integrated food since and technology for the tropics. Mac. Millan. Pub. London.
17. Kulp, K. (1981). Oxidation on baking process. Technical Bulletin American Institute of Baking, 3, 1–5.
18. Kurek, M. A., Wyrwisz, J., Piwińska, M., &Wierzbicka, A. (2015). Influence of the wheat flour extraction degree in the quality of bread made with high proportions of β-glucan. *Food Science and Technology (Campinas.)*, 35(2), 273-278.
19. Laztity, R. (1980) Correlation between chemical structure and rheological properties of gluten. Ann. Technological Agriculture, 29, 339–361.
20. Leon, A., Ribotta, P., Ausar S., Fernandez C., Landa C. and Beltramo D. (2000). Interaction of Different Carrageenan Isoforms and Flour Component in Bread Making. *J. Agric. Food Chem*., 48: 2634- 2638.
21. López, E.P and Jiménez, P.L. (2015) Effect of different proportions of brea gum in the functional characteristics of wheat flour starch: impact on the physical quality of bread. Food Science and Technology ISSN 0101-2061.
22. Mandala, I.G.; Karabela, D. and Kostaropoulos.A. (2007). Physical properties of breads containing hydrocolloids stored at low temperature. I. Effect of chilling Article in Food Hydrocolloids 21(8):1397-1406
23. Moazzezi, S.;Seyedain, S. M. and Nateghi, L. (2012). "Rheological properties of barbari bread containing apple pomace and carboxy methyl cellulose," *Life Science Journal*, vol.9, No.3,pp. 1318–1325.
24. Ognean, C. F.; Darie, N. and Ognean, M. (2006). Hypocaloric and Hypoglucidic Food. On dough rheology and bread quality. Food Hydrocolloids 15: 75-81
25. Pahwa, A; Amarjeet Kaur, A. and Puri, R. (2016). Influence of Hydrocolloids on the Quality of Major Flat Breads: A Review. Hindawi Publishing Corporation *Journal of Food Processing* Volume 2016, Article ID 8750258, 9 pages

26. Peressini, D.; Pin, M.; Sensidoni, A. (2011). Rheology and Bread making Performance of Rice-buckwheat Batters Supplemented with Hydrocolloids, *Food Hydrocolloids*, **25**:340-349.
27. Pojic, M.; Hadnadev, T. D.; Hanadev, M.; Rakita, E and Brlek, T. (2015). Bread supplementation with hemp seed cake: a by-product of hemp oil processing. *Journal of Food Quality*. ISSN 1745-4557.
28. Pomeranz, Y. (1988). Wheat chemistry and Technology. 3rd Ed. American Association of Cereal Chemist, Inc. St. Paul, Minnesota, U.S.A.
29. Rajabzadeh, N. (1991). *Iranian Flat Breads Evaluation*. Iranian Cereal and Bread Research Institue, Publication no. 71, Tehran, Iran. (In Persian).
30. Ravi, R. and Rao, H.P. (1995) Factors influencing the response of improvers to commercial Indian wheat flours. Journal of Food Science and Technology, 32, 36–41.
31. Rodge, A.B.; Sonkamble, S.M. and Salve, R.V. (2012). Effect of Hydrocolloid (guar gum) Incorporation on the Quality Characteristics of Bread. *J Food Process Technol* 2012, 3:2
32. Rosell, C. M.; Rojas, J. A. and Benedito, C. (2001a). Influence of Hydrocolloids on Dough Rheology and Bread Quality. Food Hydrocol., 15: 75-81.
33. Rosell, C. M.; Rojas, J. A. and Benedito, C. (2001b). Combined Effect of Different Antistaling Agents on the Pasting Properties of Wheat Flour. Eur. Food Res. Technol., 212: 473-476.
34. Rosell, C. M., Rojas, J. A., &Benedito de Barber, C. (2011). Influence of hydrocolloids on dough rheology and bread quality. *Food Hydrocolloids*,15(1), 75-81.
35. Schober, T. J.; Clarke, I.; Kuhn, M. (2002). Characterization of functional properties of gluten proteins in spelt cultivars using rheological and quality factor measurements. Cereal Chem. 79 (3), 408- 417.
36. Shewry, P.R. and Tathum, A.S. (1994). Wheat endosperm protein and their impact on human kind. Wheat Kernal Proteins Molecular and Functional Aspects; University of Tuscia: Viterbo, 19–26.
37. Sidhu, G. P.S and Bawa A. S. (2002). Dough characteristics and baking studies of wheat flour fortified with xanthan gum, *International Journal of Food Properties*, 5:1, 1-11, DOI: 10.1081/JFP-120015588
38. Sidhu, G. P.S and Bawa, A. S. (2004) Effect of Gum Acacia Incorporation on the Bread Making Performance of Punjab Wheat *International Journal of Food Properties*. Vol. 7, No. 2, pp. 175–183,

39. Sidhu, J.S. (1999).Effect of Improvers and Hydrocolloids on the Rheological and Baking Properties of Wheat Flour. Ph.D. thesis, Guru Nanak Dev University, Amritsar-143005, India,
40. Sim, S.Y.; Cheng, L.H.; Noor Aziah, A.A. (2009). Effects of selected food gums on wheat flour or dough properties. *As. J Food Ag Ind* 2: 937-947.
41. Singh, J. P. S. and Bawa, A. S. (2004) Effect of Gum Acacia Incorporation on the Bread Making Performance of Punjab Wheat, *International Journal of Food Properties*, 7:2, 175-183, DOI: 10.1081/JFP-120025394
42. Smitha, S., Rajiv, J., Begum, K. and Indrani, D. 2008. Effect of Hydrocohhoids on Rheological, Microstructural and Quality Characteristics of Parotta: An Unleavened Indian Flat Bread. *J. Tex. Studies*, 39: 267- 283
43. Tavakolipour, H. and Kalbasi-Ashtari, A. (2006). Influence of Gums on Dough Properties and Flat Bread Quality of Two Persian Wheat Varieties. *J. Food Process Eng.*, **30**: 74-87.
44. Tolstoguzov, V. (2003). “Some thermodynamic considerations in food formulation,” Food Hydrocolloids, vol. 17, no. 1, pp. 1–23,
45. Whistler, R. andBemiller, J. (1959) “Industrial gums”.Academics press, New York.