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Research Article

Effect of Some Organic Acids and it's Mixtures as Mold Inhibiters on the Quality of Wheat Flour and Bread Making

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Abstract

Preservatives are most commonly used to control mold growth in baked goods so that the preservatives as an antimicrobial agent used to preserve food by preventing growth of microorganisms and subsequent spoilage. There are classifications of preservatives which were chemical and natural permitted chemical mold inhibitors in bread include acetic acid (E260), ascorbic acid (E300), propionic acid (E280) and it's Mixtures. The present review concludes the predominant efficacy and it's effects of preservatives in wheat flour and Flat bread (balady bread) by the chemical, physical, Rheological properties and sensory evaluation. Protein content of flours was ranged from (11.40%) to (12.20%). The use of 0.04% propionic acid wheat flour had the high protein content (12.20%) while the control wheat flour was the low protein content (11.40%). The ascorbic wheat treatment (2.0%) flour showed protein content of (10.7%) and had the high Wet and dry gluten and hydration ratio (25.2, 8.5 and 1.96% respectively) compare to other samples. Data showed that the acetic acid (0.04%) dose of wheat flours was more good suitable properties for making beard than the other wheat flour treatments. However Sensory evaluation of flat bread (balady bread) were shown that acetic (0.06%) balady bread had highest total scores (85.1%) than the control balady bread 75.5% while the lowest one was ascorbic (2%) balady bread (55.0%).

Keywords: Preservative; Propionate; Acetate; Ascorbic; Wheat; Storage; Chemical; Physical and Rheological Properties; Sensory Evaluation; Flat Bread; Balady Bread

Introduction

Flour is a product made from grains that has ground into a fine powder consistency. Flour that provides the primary structure to make any bread. Commonly available flours are made from grains such as oats, and other grains, while wheat flour that is most commonly using for making bread. Grains gives its starch and protein which is necessary for the production of any bread. Quantity of the protein in the flour give the indicator of the quality of any dough and any bread. While bread made from wheat flour, which containing high protein is good for quality bread a specialty bread flour. If one uses a flour was low form (9.0%) to (11.0%) protein content to produce bread, it take a long mixing time to develop gluten strength properly. Mixing time leads to oxidization of the dough which give the finished of any product white crumb colour, however backers preferred the cream colour. Wheat flour was addition into starch contains, 3 water soluble protein groups, such as albumin, globulin, proteoses, and 2 non-water soluble protein groups, such as glutenin and gliadin. Mixing flour with water, let the water soluble proteins dissolve and leaving the gliadin and glutenin to form the structure of the dough. When the water soluble proteins work by kneading, the glutenin forms strands of long thin chainlike. The data of strands produced by these 2 proteins are known as gluten [1].

Stability of bakery products against the attacking by fungi is mainly by using preservatives. Preservatives use to reduce or prevent wastage of food through spoilage which caused by fungi. Long shelf life enables varieties of products to be keeping safe in the homes and stores. Chemical mould inhibiter preservatives can be control the growth of moulds by preventing its metabolism, by denaturing the protein of its cell, or by physical damage to its cell membrane. Propionic and Sorbic acid or their salts are preservatives which have been proved increases of the shelf life of bakery products. Calcium propionate and Propionic acid are usually employed at concentrations of 0.2 and 0.1% respectively. So mould can be inhibited for more days and can be prevented, Sorbic acid is effective as control mould growth in bakery products at doses 0.125% to 0.3%. The most problems of the spoilage is yeasts in bread usually from post-baking contamination, slicing machines, bread coolers, conveyor belts and racks have been identified as sources. Yeast spoilage is visible growth characterized on the surface of all products. *Pichia butonii* is the most frequent and troublesome yeast which is known as Chalk mould [2].

The first defense against aflatoxins is at the farm and the starts with implementation of good agricultural practices to prevent infection. Preventives strategies could be implemented from pre through postharvest. Preharvest strategies include maintenance of proper planting/growing condition (field conditioning, crop rotation, irrigation, soil testing), antifungal chemical treatments (acetic acid and propionic acid), and adequate insect and weed prevention. Postharvest measures include drying as dictated the moisture of the harvested grains, appropriate storage conditions, and use of transport vehicles that are dry and must be free of visible fungal growth. While implementation of these precautions go a long way to stop reducing aflatoxin contamination of foods, they alone don't solve the problem and should be an integral part of an integrated HACCP-based management system [3].

Wheat are harvested at a moisture which can be allow the growth of molds and mycotoxin production. Grains if it dried to the safe moisture from (11%) to (13%), the fungal growth will be inhibited and the toxin production will be inhibited too. *Aspergillus flavus* toxins are responsible for an annual loss of 25% of global crops through contamination. These acids are used as acid or sodium salts to prevent the bad taste and odor of the free acids [4].

Objective of the Study

The objective of this study is to investigate the effectiveness of some organic acids and it's mixtures as preservatives to control fungal pollution in the imported wheat grains and to evaluate and determine the effective doses which can be used as fungicide and it's effect on quality of flour and baking production for wheat flour during storage.

Materials and Methods

Materials

Imported Russian Wheat variety was obtained from Alexandria government, All samples from one Company since 2019.

Media and Reagents of the following solutions and media were used for mold enumeration and identification such as Peptone water, Rose Bengal chloramphenicol agar (Biolife, Italy).

Preservatives

The Propionic acid (E280) for synthesis (Cat. No.800605) (99% Merck, Germany). Ascorbic acid (Vit.C) (E300) for synthesis (Cat. No.800269) (99% Merck, Germany).Acetic acid (E260) (Glacial) (Cat. No.100063) (100% Merck, Germany). Mixtures of them (Propionic acid: Acetic acid: Ascorbic acid) by this ratio (0.625: 0.250: 0.125) for Mix 1; (0.250: 0.250: 0.500) for Mix 2 and (0.375: 0.250: 0.375) for Mix 3 by serial.

Methods

Preparation of wheat flours

The sampling and grain quality testing were carried out according to [5]. The measurement of the moisture, air conduction and humidity in silos under investigation were carried out according to [6]. The estimation of infested wheat was investigated according to [7].

The thirteen kg of wheat sample used in this investigation was stored 90 days at temperature 25°C and relative humidity less than 62% According to [5]. At the end of storage period wheat sample was cleaned mechanically to remove dirt, dockage, imparters and other strange grains by Carter Dockage Tester According to [8]. Wheat samples were tempered to 16.5% moisture and allowed to conditioning for 24 hours, then milled by Laboratory mill CD1 auto Chopin According to [9]. The extraction rate of any flour sample was adjusted to recurred rate (72% extraction).

Bread processing

Different samples of flour used to produce different Flat bread (Balady bread) according to the formula showed in table 1.

Type of bread	Flour	Moisture	Yeast	Salt
Egyptian flat (Balady bread)	1000gm	14%	20gm	Nacl 5gm

Table 1: Flat bread (Balady bread) formula.

Egyptian flat breads preparation

Wheat flour (82% extraction) was baked to Flat Balady bread loaves using straight dough methods [10]**.** The Balady bread formula consists show in table 1. The ingredient were mixed for 20 min. After mixed with water according to alveograph Chopin test by using Mixer gostol-gopan Perten. Then the dough was left for 30 min., the dough was divided in to 150gm. Pieces that were arranged on a wooden board previously sprinkled with fine layer of bran. Then kept for 20 min at 30°c and 85% relative humidity. The pieces were flattened to about 20 cm diameter proofed at 30°C and 85% relative humidity for 30 min. And then baked at 400 - 500°C for 1 - 2 min. in a pilot oven in Regional Center for Food and Feed, Agriculture Research Center, Cairo, Egypt.

Analytical methods

Physical properties

The cleanliness, Dockage, Shrunken and Broken, Foreign Materials, Total Damaged kernels and Total Defects were separated and determined manually (Hand Picking). Test weight pound per bushel, Test weight P/B = (Kg/Hectoliter) +1.278 according to [8]. The Thousand kernel weights were determined by counting the kernels in a 10g wheat sample [9]. The Wet and Dry gluten and Falling Number were determined according to [11]. Chemical properties.

Moisture Content, Crude Protein, Ash, Crude Fiber, and Fat were determined according to [7,11]. The Nitrogen Free Extract (N.F.E) was calculated by difference. Rheological properties.

All samples were tested by alveograph measures. (in Regional Center for Food and Feed, Agriculture Research Center, Cairo, Egypt.) to determine the rheological properties of the different types of flour according to [9]. Sensory evaluation Egyptian flat bread (Balady bread).

The Balady bread loaves were organoleptically evaluated According to [12]. The fresh sample was delivered to 100 panelists 2 hours after baking Statistical analysis.

The data of three replicates were computed for the analysis of standard division (S.D) among the means were determined by Duncan's multiple range test using [13].

Experiment

The effect of some organic acids and it's their mixtures on quality of flour then baking production of stored wheat flour samples: A thirteen kg of wheat 18% moisture content equally divided into 10 sterile Erlenmeyer flasks; Organic acids used in this study were added to the wheat sub samples with different inclusion rates (0.02%, 0.03%, and 0.04%) for Propionic acid, (0.04%, 0.05% and 0.06%) for Acetic acid, (1%, 2% and 3%) for Ascorbic acid and Mixtures of them by this ratio (0.625 : 0.250 : 0.125) for Mix 1; (0.250 : 0.250 : 0.500) for Mix 2 and (0.375 : 0.250 : 0.375) for Mix 3 by serial. One flask was left without any addition and used as control. A one kg was withdrawn from each flask at (zero time) and after 90 days to estimate the effect of the type of organic acid on quality of flour and baking production.

Results and Discussion

Wheat kernels

Chemical composition of Russian wheat kernel

The chemical compositions of wheat kernels are given in table 2. The wheat moisture content of Russian was (11.0%). This low moisture content was suitable for storage and wheat would be less prone to microbial attack [14]. Regarding the protein content which consider and important criterion while considering the wheat quality, Russian wheat had the highest protein content (11.70%). Protein content is a key factor in determining the suitability of wheat for different products and in many areas of the world it is a fundamental criterion for establishing the economic value of wheat [15]. Our results are in agreement with result obtained by [16] who reported content of red winter wheat ranged from (13%) to (15%) and for soft whiter it was (10%) to (12%). The nitrogen free extracts (NFE) percentage is ranged 72.57%. Additionally, Russian wheat had low fat percentage (0.08%) and low ash content (1.67%). The results of fiber showed that the Russian wheat had high value (2.98%).

Wheat	Russian Wheat
M.C	11.0
Protein %	11.7
Fat %	0.08
Ash %	1.67
Fiber %	2.98
Nitrogen free extracts %	72.57
Total caloric values %	337.80

Table 2: Proximate analysis of Russian wheat kernels.

NFE = Nitrogen free extracts.

Extraction of different wheat flour obtained from different wheat treatments.

The results table 3 show that the flour yield was different slightly among test samples and ranged from (65.9%) to (70.46%). So data present that the Mix3 wheat treatment and control had the highest flour yield (70.46%) while the propionic wheat treatment (0.04%) had the lowest flour yield (65.9%). On the other hand the acetic wheat treatment (0.06%) had the highest coarse bran (17.58%) while the ascorbic wheat treatment (3.0%) had the lowest coarse bran (14.26%). However, the acetic wheat treatment (0.06%) had highest fine bran (15.87%) while the ascorbic wheat treatment (2.0%) had the lowest fin bran (11.82%) and the highest semolina (2.83%). However, these differences may be partially attributed refer to different growing and environmental conditions prevailed during growing periods [17].

Chemical composition of Russian wheat flour (72% extraction) obtained from thirteen different treatment wheat kernels before storage

The chemical composition of wheat flour prepared from thirteen different treatments wheat kernels before storage were shown in table 4. Moisture content was ranged from (13.5%) (acetic wheat treatment (0.05 and 0.06%) flour to (14.9%) (ascorbic wheat treatment (3.0%) flour. Result indicted that chemical compositions of flour were different in all investigated samples. On the other hand, propionic wheat treatment (0.03 and 0.04%) flour had the highest protein content (11.2%) and ascorbic wheat treatment (3.0%) flour lower nitrogen free extract (73.51%) compare to other samples, however the propionic wheat treatment (0.04%) flour had the lowest ash content (0.58%). On other hand ascorbic wheat treatment (1.0%) flour and control had the highest fat content (0.06%) compare to other studied samples. Fiber is ranged from 0.10% (acetic wheat treatment (0.06%) flour to 0.13% (control) flour. These results agree with result obtained by [18].

Wheat Flour	Ascorbic			Propionic			Acetic			Mixtures			Control
	1%	2%	3%	0.02%	0.03%	0.04%	0.04%	0.05%	0.06%	1	2	3	
Coarse Brain %	16.68	15.41	14.26	17.04	16.0	16.7	17.06	15.08	17.58	16.58	15.46	16.18	15.68
Fin Bran %	12.03	11.82	13.34	12.13	14.01	12.8	15.04	14.41	15.87	13.04	13.40	14.50	13.03
Semolina %	1.29	2.77	2.4	2.83	1.08	2.0	2.0	1.21	2.75	2.04	1.68	2.38	1.29
Flour yield %	70.0	70.0	70.0	68.0	69.0	68.5	65.9	69.3	69.8	68.32	70.46	67.44	70.0

Table 3: Extraction of Russain wheat flours from thirteen different treatment wheat kernels before storage.

Physicochemical properties of Russian wheat flour (72 and extraction) obtained from thirteen different treatment wheat kernels before storage

The data in table 5 showed that the highest starch damage was observed in propionic wheat treatment (0.04%) flour (5.33%) while it was low in ascorbic wheat treatment (2.0%) flour (5.2%). These results are in agreement with those obtained by [19] who reported that damaged starch was created during milling. Typical damaged starch levels in bread flours are 5 to 10%. Results from tables 4 and 5 indicated that the increase in protein content wasn't

Wheat Flour Treatment	Ascorbic			Propionic			Acetic			Mixtures			Control
	1%	**2%**	**3%**	**0.02%**	**0.03%**	**0.04%**	**0.04%**	**0.05%**	**0.06%**	**1**	**2**	**3**	
Moisture Content	14.6	14.7	14.9	13.9	14.0	13.9	13.9	13.5	13.5	14.0	14.1	14.5	14.7
Protein %	10.9	10.7	10.7	10.9	11.2	11.2	11.07	11.0	10.7	10.93	10.96	10.83	10.6
Fat %	0.06	0.05	0.04	0.04	0.04	0.03	0.05	0.05	0.04	0.05	0.05	0.04	0.06
Ash %	0.74	0.77	0.74	0.66	0.60	0.58	0.64	0.62	0.62	0.68	0.66	0.64	0.78
Fiber %	0.12	0.12	0.11	0.12	0.11	0.11	0.12	0.11	0.10	0.12	0.11	0.11	0.13
Nitrogen free extracts %	73.58	73.66	73.51	74.02	74.05	74.18	74.22	74.72	75.04	74.22	74.12	73.88	73.73
Total caloric values %	338.46	337.89	337.2	340.04	341.36	341.61	343.33	343.33	343.32	341.05	340.77	339.40	337.86

Table 4: Chemical composition of Russian wheat flour (72% extraction) obtained from thirteen different treatment wheat kernels before storage.

accompanied by the increase in wet and dry gluten contents. The ascorbic wheat treatment (2.0%) flour showed protein content of (10.7%) and had the higher wet, dry gluten and hydration ratio (25.2, 8.5 and 1.96% respectively) compare to other samples. Falling number values were ranged from 300 to 361 sec. Ascorbic wheat treatment (1.0%) flour had the highest value (361 sec.) where the ascorbic wheat treatment (3.0%) flour had the lowest value (300 sec.). Economic European community recommended that the falling number of flour should exceed than 230 sec [20]. Egyptian stander no. 1419/2006 of white flour for production of bread [21] has the following requirement which the falling number should exceed than 200 sec. and also, Egyptian stander no. 1649/2004 for durum wheat [22]. Table 5 show that can be concluded the percentage of sediment ranged from 30 to 32% and that the ascorbic wheat treatment (2.0%) flour and propionic wheat treatment (0.03%) flour had the highest sediment ratio which good to produce bread. Table 5 also showed that, different treatments of wheat had the highest value of whiteness color (propionic wheat treatment (0.03%) flour) 32.0% than the other treatments wheat which was less whiteness. Flour color has a direct effect on crumb color and combines with crumb structure to influence crumb " brightness. " Bleached bread flour is characterized a typical white creamy color [19].

Wheat flour		Ascorbic			Propionic			Acetic			Mixtures			Control
		1%	**2%**	**3%**	**0.02%**	**0.03%**	**0.04%**	**0.04%**	**0.05%**	**0.06%**	**1**	**2**	**3**	
Starch damage %		5.23	5.2	5.24	5.3	5.31	5.33	5.3	5.32	5.31	5.28	5.28	5.29	5.21
Gluten quantity	Wet%	24.8	25.2	24.2	24.9	24.9	24.6	24.3	24.7	23.9	24.7	24.8	24.2	23.6
	Dry%	8.1	8.2	8.1	8.1	8.1	8.2	8.1	8.2	7.7	8.1	8.1	7.9	7.6
	Hydration ratio	2.06	1.96	1.98	2.07	2.07	2.0	2.0	2.01	2.1	2.04	2.01	2.02	2.11
	Index%	79.6	98.8	98.3	97.6	97.6	99.2	98.4	98.4	98.3	97.96	98.2	98.6	97.4
Protein sediment%		31.0	32.0	31.0	31.0	32.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	30.0
Falling Number Sec.		361	318	300	337	338	322	347	331	347	34.8	32.9	32.3	388
Flour Colour%	White	31.5	32.0	31.5	31.4	32.1	31.1	31.1	31.5	31.4	31.3	31.9	31.3	31.0
	Yellow	14.7	14.2	14.6	14.7	14.0	14.5	14.4	14.5	14.4	14.6	14.2	14.5	15.2

Table 5: Physicochemical properties of Russain wheat flour (72% extraction) obtained from thirteen different treatment wheat kernels before storage.

Rheological properties of Russian wheat flour (72% extraction) obtained from thirteen different treatment wheat kernels before storage

Alveograph has been used to measure and evaluate wheat flours of bread making and using air pressure to inflate a thin sheet of doughsure to inflate a thin sheet of dough. Alveogragh measure the resistance to expansion and the extensibility of dough by providing the measurement for maximum over pressure, average abscissa at rupture and index of swelling and deformation energy of dough [23]. The highest water absorption (63.0%) was observed in control wheat flour followed by ascorbic (3%) wheat flour (62.4%) while propionic (0.04%) wheat flour had the lowest water absorption (58.5%). Water absorption was considered to be an important characteristic flour. Stronger wheat flours have the ability to absorb and retain more water as compared to weak flours. Higher water absorption is required for good bread characteristics which remain soft for a longer time. Results in table 6 and figure 1 showed that the Tenacity (P) values were different between all cultivars and ranged from 114 mm H_2O to 178 mm H_2O. The control flour had the highest value (178 mm H_2O) while the three of propionic wheat treatment flour had the lowest value (114 mm H_2O). For L, a value of 100 mm is generally regarded as good, but for some applications like biscuit making, it the minimum accepted so that the propionic wheat. Treatment (0.04%) flour (54 mm) was the highest value control flour (21mm) was the lowest value. G can be interpreted in the same way as L which ranged between (10.2 ml) to (14.6 ml). The P/L value is increasingly used in the wheat trade. A value of 0.50 corresponds either to resistant and very extensible dough or dough that is less resistant and only moderately extensible (the most common case). A value of 1.50 corresponds to very strong and moderately extensible dough. The milling industry requires balanced wheat. With a P/L in the 0.50 - 0.80 range so that the control flour (8.48%) had the highest value while propionic wheat treatment (0.04%) flour (2.11%) was the lowest. Baking strength (W) showed that the propionic wheat treatment (0.04%) flour (234 jol) had the highest value while control and acetic wheat treatment (0.05%) flour (173 jol) was the lowest. The different alveograph curve measurements give information about the strength and extensibility of dough. The P values of standard wheat range from 60 to 80 mm H_2O and of very good quality wheat from 80 to 100 mm H_2O, the values for extra strong wheat are higher than 100 mm H_2O. W was the most widely used characteristic because it summarizes all the others. French wheat is designated according to their W value in 4 - 10 jol for forage wheat and poor quality wheat, W was below 150, for standard quality wheat, W is above 170, for good quality wheat, W ranges from 250 to 300 and for strong improving wheat, W is above 350 [24].

Effect of some organic acids used as preservative for Russian wheat flour (72% extraction) obtained from thirteen different treatment wheat kernels after storage

Chemical composition after storage

The chemical composition of wheat flour prepared from thirteen different treatments wheat kernels were shown table 7. Mois-

Wheat flour		Ascorbic			Propionic			Acetic			Mixtures			Control
		1%	2%	3%	0.02%	0.03%	0.04%	0.04%	0.05%	0.06%	1	2	3	
Water absorption		61.7	62.3	62.4	60.1	58.7	58.5	58.6	59.6	59.7	60.1	60.2	60.2	63.0
Alveograph test	Tenacity Mm H_2O (P)	140	143	148	114	114	114	139	140	140	131	132	134	178
	Expandability mm (L)	28	29	33	46	48	54	29	29	29	34	35	39	21
	Swelling ml (G)	11.8	12	12.8	15.1	15.4	16.4	12	12	12	13	13.1	13.7	10.2
	Banking strength Jol (W)	178	189	204	203	210	234	179	173	177	187	191	205	173
	Configuration rate % (P/L)	5.0	4.93	4.48	2.48	2.38	2.11	4.79	4.83	4.83	3.85	3.77	3.44	8.48

Table 6: Rheological properties of Russian wheat flour (72% extraction) obtained from thirteen different treatment wheat kernels before storage.

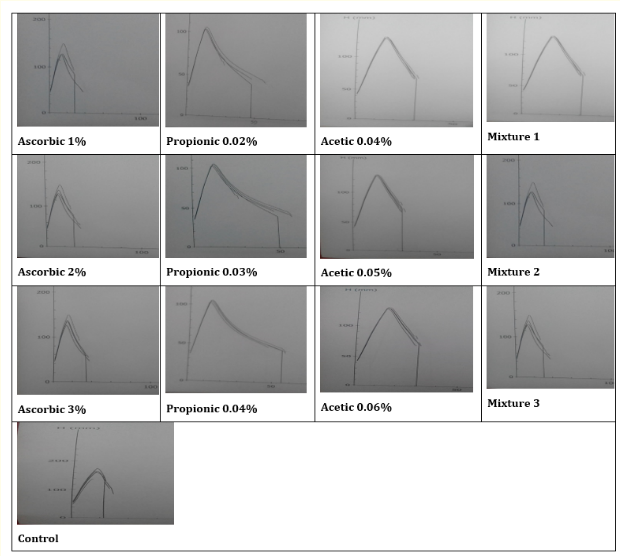

Figure 1: Alveograph results for investigated samples before storage.

ture content is ranged from (11.5%) (0.06% acetic wheat flour) to (13.0%) (0.03% propionic wheat flour). Result indicted that chemical compositions of flour are different in all investigated samples. Auio., *et al*. (2001) found that the chemical composition of 4 different flour types were ranged from (13.3 to 14.2%) for moisture, (11.8 to 14.2%) for protein, (0.62 to 0.89%) for ash and (27.2 to 3.7%) for wet gluten. On the other hand, (0.04% propionic wheat flour) had the high protein content (12.20%) and nitrogen free extract (74.30%) compare to other samples, however control had highest fat content compare to other studied samples. On the other hand the 0.04% propionic wheat flour had the lowest ash content. These obtained results are in agreement with [31] who reported that wheat grains (sakha - 69) contained: 10.67% crude protein, 76.45% total carbohydrates, (1.10%) crude fat, (1.67%) ash content, (1.01%) crude fiber, and 0.20 mg/100g total acidity. These agree with result obtained by [18].

Physicochemical properties after storage

The data in table 8 showed that the highest starch damage was observed in (0.05% acetic wheat flour) (5.30%) while it was low

Wheat Flour Treatment	Ascorbic			Propionic			Acetic			Mixtures			Control
	1%	2%	3%	0.02%	0.03%	0.04%	0.04%	0.05%	0.06%	1	2	3	
M.C	12.5	12.7	12.8	12.9	13.0	12.7	11.9	11.6	11.5	12.5	12.4	12.3	12.0
Protein%	11.8	11.5	11.9	11.9	12.0	12.2	12.02	12.0	11.9	11.9	11.8	12.0	11.4
Fat%	0.05	0.04	0.03	0.03	0.03	0.02	0.04	0.04	0.03	0.04	0.04	0.03	0.06
Ash%	0.97	0.98	0.99	0.76	0.72	0.68	0.74	0.72	0.72	0.82	0.81	0.80	0.77
Fiber%	0.11	0.11	0.10	0.11	0.10	0.10	0.11	0.10	0.09	0.11	0.10	0.10	0.12
Nitrogen Free Extracts %	74.47	72.26	74.18	74.3	74.15	74.3	75.01	75.54	75.76	74.63	74.85	74.77	73.65
Total caloric values%	345.53	337	344.59	345.07	344.87	346.18	348.48	350.52	350.91	346.48	346.96	374.35	340.74

Table 7: Chemical composition of Russian wheat flour (72% extraction) obtained from thirteen different treatment wheat kernels after storage.

in (2.0% ascorbic wheat) (5.17%). It is well known that dough derives its properties from the constituents of flour. The most important components are the protein, carbohydrates, lipids water. From table 8 it can be concluded that the percentage of sediment ranged from (29.8 to 31%) and that the (2% ascorbic and 0.03 propionic wheat flour) had the highest sediment ratio which good to produce bread. Results from table 8 indicated that the increase in protein content was not accompanied by the increase in wet and dry gluten contents. The (2% acetic wheat flour) showed protein content of (11.80%) and had the high wet, dry gluten, index and hydration ratio (25.30, 8.60, 98.9 and 1.94% respectively) compare to other samples. The failing number values were ranged from (311 to 390 sec). The control wheat flour the highest value (390 sec.) where the (3% ascorbic wheat flour) had the lowest value (311 sec.). Economic European community recommended had the failing number of flour should exceed than 230 sec [20]. Egyptian stander no. 1419/2006 of white flour [21] for the failing number should exceed than 200 sec. and also, Egyptian stander no. 1649/2004 for durum wheat [22]. Table 8 also showed that the different varieties of wheat had the highest value of whiteness colour (0.03% propionic wheat flour) was (32.2%). Flour color has a direct effect on crumb color and combines with crumb structure to influence crumb " brightness". Bleached bread flour is characterized by a typical white creamy color [19].

Wheat flour		Ascorbic			Propionic			Acetic			Mixtures			Control
		1%	2%	3%	1%	2%	3%	1%	2%	3%	1	2	3	
Starch damage %		5.20	5.17	5.22	5.25	5.28	5.29	5.25	5.3	5.28	5.23	5.25	5.26	5.18
Gluten quantity	Wet%	24.9	25.3	24.5	24.4	25.0	24.8	24.1	24.9	24.0	24.5	25.1	24.4	23.7
	Dry%	8.2	8.6	8.2	8.2	8.2	8.3	8.3	8.1	8.0	8.2	8.3	8.2	7.7
	Hydration ratio	2.03	1.94	1.98	1.97	2.02	2.04	1.9	2.07	2.0	1.96	2.01	2.01	2.07
	Index%	98.1	98.9	98.5	98.6	97.8	98.5	98.6	98.6	98.5	98.4	98.4	98.5	97.6
Protein sediment%		30.0	31.0	30.0	30.0	31.0	30.0	30.0	30.0	30.0	30.0	31.0	30.0	29.8
Falling Number Sec.		365	321	311	339	340	330	350	335	351	33.1	332	331	390
Flour Colour%	White	31.6	32.1	31.6	31.5	32.2	31.0	31.2	31.6	31.5	31.4	31.6	31.4	31.1
	Yellow	14.6	14.1	14.5	14.6	13.9	14.5	14.3	14.4	14.3	14.5	14.1	14.4	15.1

Table 8: Physicochemical properties of Russain wheat flour (72% extraction) obtained from thirteen different treatment wheat kernels after storage.

Rheological properties after storage

Alveograph has been used to measure and evaluate thirteen different treatments wheat flours of bread making. The highest water absorption (63.1%) was observed in control wheat flour followed by ascorbic (3%) wheat flour (62.6%) while propionic (0.04%) wheat flour had the lowest water absorption (58.6%). Results in table 9 and figure 2 showed that the Tenacity (P) values different between all cultivars and ranged from (115 mm H_2O) to (180 mm H_2O). The control flour had the highest value (180 mm H_2O) while the 3 of propionic wheat treatment flour had the lowest value (115 mm H_2O). For L, a value of 100mm was generally regarded good, but for some applications like biscuit making, it was the minimum accepted so that the propionic wheat treatment (0.04%) flour (55 mm) was the highest value while control flour (22 mm) was the lowest value. G can be interpreted in the same way as L which ranged between (10.3 ml) to (16.5 ml). The P/L value is increasingly used in the wheat trade. A value of 0.50 corresponds either to resistant and very extensible dough or dough that was less resistant and only moderately extensible (the most common case). A value of 1.50 corresponds to very strong and moderately extensible dough. The milling industry requires balanced wheat, i.e. with a P/L in the (0.50 - 0.80) range so that the control flour (8.18%) had the highest value while. Propionic wheat treatment (0.04%) flour (2.09%) was the lowest. Baking strength (W) showed that the propionic wheat treatment (0.04%) flour (235 jol) had the highest value while ascorbic wheat treatment (1.0%) flour (80 jol) was the lowest. These results are differed somewhat from those commonly encountered [25] which estimated that protein content had little influence on dough tenacity (P) and that about (15%) of the variation in dough extensibility (L) and dough strength (W) were explained by protein content. Hard wheat may also produce non -extensible dough due to a higher degree of starch damage. Grain hardness was highly correlated with alveograph characteristics P, P/L and W, in agreement with the results of [26].

Wheat flour		Ascorbic			Propionic			Acetic			Mixtures			Control
		1%	2%	3%	0.02%	0.03%	0.04%	0.04%	0.05%	0.06%	1	2	3	
Water absorption%		61.9	62.5	62.6	60.3	58.9	58.6	58.8	59.8	59.8	60.3	60.4	60.3	63.1
Alveograph test	Tenacity Mm H_2O (P)	141	144	149	115	115	115	140	141	141	132	133	135	180
	Expandability mm (L)	29	30	34	47	49	55	30	30	30	35	36	40	22
	Swelling ml (G)	11.91	12.1	12.9	15.2	15.5	16.5	12.1	12.1	12.1	13.07	13.23	13.83	10.3
	Banking strength Jol (W)	80	190	206	205	212	235	178	175	178	154	192	206	175
	Configuration rate % (P/L)	4.86	4.8	4.38	2.44	2.44	2.09	4.66	4.7	4.7	3.98	3.98	3.05	8.18

Table 9: Rheological properties of Russian wheat flour (72% extraction) obtained from thirteen different treatment wheat kernels after storage.

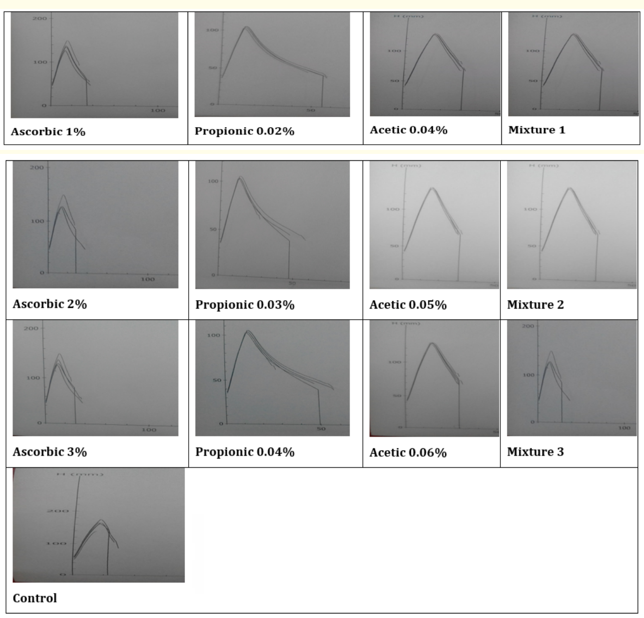

Figure 2: Alveograph results for investigated samples after storage.

Physical properties of flat bread (Balady bread) made from Russian wheat flour (82% extraction) obtained from thirteen different treatment wheat kernels after storage

Flat bread

Marking bread

The results showed that the different values were observed in all physical properties of flat bread (balady bread) making such as weight after baking, volume, specific volume and loaf volume in table 10. The yeast used for leavening bread was Saccharomyces cerevisiae, the same species used for brewing alcoholic beverages. This yeast ferments carbohydrates in the flour, including any sugar, producing carbon dioxide. Most bakers in U.S.A leaven their dough with commercially produced baker's yeast. Baker's yeast has the advantage of producing uniform, quick, and reliable results, because it is obtained from a pure culture. Artisan bakers produce their own yeast by preparing a ' growth culture' which they then use in the making of bread. When this culture is kept in the right conditions, it will continue to grow and provide leavening for many years [27]. Additionally, table 10 presented that the weight after baking for among of balady bread were ranged between (120 to 135 gm). Which ascorbic (1%) balady bread had heaviest weight (135 gm) for all among of balady bread while propionic (0.03%) balady bread has less weight (120 gm). In the other side the volume after baking is different because the acetic (0.04%) balady bread had a highest volume (883 cm^3) followed by propionic (0.02%) balady bread 644 cm^3 while ascorbic (2%) balady bread had lowest volume 191 cm^3, so that specific volume is related to the volume too because the acetic (0.04%) balady bread had highest volume 7.10 cm^3/g followed by propionic (0.02%) balady bread (4.95 cm^3/g) while ascorbic (2%) balady bread had lowest volume (1.53 cm^3/g), however loaf volume for acetic (0.04%) balady bread had lowest loaf volume 0.14 g/cm^3.

And more air inside it, then following by propionic (0.02%) balady bread (0.20 g/cm^3) while ascorbic (2%) balady bread had highest loaf volume 0.65 g/cm^3 and less air inside it.

Bread treatments		Doses %	Weight after baking gm	Volume after baking cm^3	Specific volume cm^3/g	Loaf volume g/cm^3
Propionic		0.02	130.0	644.0	4.95	0.20
		0.03	120.0	453.0	3.77	0.26
		0.04	130.0	575.0	4.42	0.23
Acetic		0.04	125.0	883.0	7.10	0.14
		0.05	125.0	425.0	3.40	0.29
		0.06	128.0	453.0	3.54	0.28
Ascorbie		1	135.0	303.0	2.24	0.45
		2	125.0	191.0	1.53	0.65
		3	127.0	247.0	1.94	0.51
Mixtures	1	1	130.0	610.0	4.69	0.21
	2	1	121.0	356.0	2.94	0.34
	3	1	128.0	425.0	3.32	0.30
Control		0	130.0	453.0	3.48	0.28

Table 10: Physical properties of flat bread (balady bread) made from Russian wheat flour (82% extraction) obtained from thirteen different treatment wheat kernels after storage.

Sensory evaluation

Sensory evaluation of flat bread (balady bread) which made from thirteen different wheat treatment flour are shown in table 11. The balady breads were evaluated subjectively for their top and bottom layer, interior, aroma, taste, and chew attributes. The sun of panelists' scores of these attributes for each bread was considered as an index for quality. The breads were also evaluated objectively for layer thickness, texture, and color. Sensory data showed significant differences among breads for all attributes except taste. All breads were scored acceptable or better. Top as well bottom layers of all breads showed similar thickness and texture except that Hillsdale bread was slightly tougher than that of Tecumseh. Color measurements of bread exterior surfaces varied among varieties and associated with flour type [28]. It can noticed that acetic (0.06%) balady bread had highest total scores than the control balady bread (85.1 and 75.5% respectively) while the lowest one is ascorbic (2%) balady bread (55.0%). Bread prepared from different wheat treatments flour were subjected to sensory evaluation for crust colour, crust characteristic, crumb colour, taste and flavor, grain and texture and chewing each their mean scores were calculated (Table 11). Highest mean score for crust colour were obtained by control (8.0) and (acetic 0.06%) (9.2) balady bread whereas ascorbic (1%) balady bread got the lowest score (5.0). The low score of ascorbic (1%) balady bread may be due to high fiber and ash content, which affect the colour of bread since consumers prefer creamy colour and not dark brown bread. In case of taste and flavor, acetic (0.06%) and propionic (0.04%). Balady bread were at the top (16.0) followed by acetic (0.04%) and Mix 3 balady bread (15.0) and found to be least (10.0) for ascorbic (2%) and acetic (0.05%) balady bread. Maximum crust characteristic score (8.5) was attained by acetic (0.06%) balady bread while propionic (0.03%) balady bread received the minimum score (5.0). acetic (0.05%) and Mix 2 balady bread obtained the least score (11.0) for crumb colour whereas acetic (0.06%) balady bread received the highest score (18.4). The differences in colour, taste and flavor of all the were attributed to the differences in hardness/softness of wheat grains and other factors like wheat varieties and milling characteristics of wheat. For grain and texture, highest mean score (16.0) was obtained by acetic (0.04 and 0.06%) balady bread followed by control balady bread (15.0). As regards chewing, acetic (0.06%) balady bread got the maximum score (17.0) and ascorbic (3%) and propionic (0.04%) balady bread obtained the minimum score (12.0). A wheat and taste is desirable with a non sticky, soft chewing feel in mouth. With respect to overall acceptability of chapattis, highest score (85.1) was obtained by acetic (0.06%) balady bread and thus regarded as more acceptable than other wheat flour while lowest score (55.0) was obtained by ascorbic (2%) balady bread thus considered least acceptable. Flour quality parameters which contribute desirable characteristics to Russian Balady bread were determined. Hard red winter wheat variety was selected and milled into (90%) extraction flours. This results are parley with results obtained by [29,30].

Bread treatments		Doses %	Crust colour 10	Crust c haracteristics 10	Crumb colour 20	Grain and texture 20	Taste and flavor 20	Chewing 20	Total scores 100
Propionic		0.02	6.5[ab]	7.0[a]	15.0[ab]	13.0[a]	14.0[a]	14.0[a]	69.5
		0.03	5.5[a]	5.0[a]	12.0[a]	13.0[ab]	12.0[a]	13.0[a]	60.5
		0.04	6.5[bc]	8.0[a]	14.8[ab]	13.0[a]	16.0[a]	12.0[b]	70.3
Acetic		0.04	8.0[a]	8.0[a]	16.0[a]	16.0[a]	15.0[a]	16.0[a]	79.0
		0.05	6.5[a]	6.5[a]	11.0[a]	14.0[a]	10.0[a]	13.0[a]	61.0
		0.06	9.2[a]	8.5[a]	18.4[a]	16.0[a]	16.0[a]	17.0[a]	85.1
Ascorbie		1	5.0[b]	6.5[a]	11.0[ab]	14.0[a]	13.0[a]	13.0[a]	62.5
		2	6.0[a]	5.0[a]	10.0[a]	12.0[ab]	10.0[a]	12.0[a]	55.0
		3	7.5[ab]	7.0[ab]	13.0[b]	13.0[a]	13.0[a]	12.0[b]	65.5
Mixtures	1	1	6.5[bc]	7.1[a]	14.0[b]	14.3[a]	14.0[a]	14.3[a]	70.2
	2	1	6.0[a]	5.5[a]	11.0[a]	13.0[ab]	10.7[a]	12.7[b]	58.9
	3	1	7.7[ab]	7.8[a]	15.4[ab]	14.0[a]	15.0[a]	13.7[a]	73.6
Control		0	8.0[a]	7.5[a]	16.0[a]	15.0[a]	14.0[a]	15.0[a]	75.5

Table 11: Sensory evaluation test for flat bread (balady bread) made from Russian wheat flour (82% extraction) obtained from thirteen different treatment wheat flour after storage.

Conclusion

Generally, the results showed that the best wheat grains treatment and wheat flour Preservative were the acetic acid in 0.05% dose and Mix 1 which gave better results than the others. This can be due the anti-microbial effect on the chemical, physical, Physicochemical and Rheological properties were good effect for making toast bread. So we recommended to use of the acid which are environmentally safe and allowed from codex as food grade additives to preserve the wheat grains and wheat flour it safe for human.

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