Annals of Agric. Sci., Moshtohor **ISSN 1110-0419**
Vol. 54(3) (2016), 609–620 **http://annagricmoshj.com**

Effect of use of the enzymes on the quality of pan bread made from Egyptian wheat flour

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Abstract

The aim of this study is toevaluate the effect of some microbial enzymessuch as Xylanase (XY), glucose oxidase (GO) and α amylase (AM) to improve quality aspects, sensory attributes and rheological properties of pan bread produced from commercial wheat flour (82% ext.). The three enzymes were added by three doses. XY and GO added at 10, 15 and 20 ppm, While AM was added at 5, 10 and15 ppm. The obtained data revealed that the enzymes have been given a marked improvement todough characters and bread quality. Specific volumewas increased with XYby3.5, 3.7 and 3.8%, and by 2.9, 2.9and 3.2 for AM, while it was by 3.1, 3.0 and 3.6 for GO respectively.Compared with a control sample. The staling of breadwas decreasedwith theadding of these enzymes, this decrease was linear with increase the doses of enzymes alike. Adding of any doses of any enzymes had apositive effect of the bread texture profile and this effect were linear, which showeda decreasein the firmness, gamenessand resilience, whilethe cohesiveness, chewiness, and springiness characteristics was decreased, this refers to increase of softness and chewness of bread. Also, this improving was maintained alveogram.

Keywords: Enzymes, Egyptian wheat flour, Alveogragh, Bread staling.

Introduction

The bread is one of the major components of the human diet in most parts of the world.In the recent years a lot of studies focused on the use of many enzymes to improve quality of bakery products and overcome some of the problems. These include gluten-crosslinking enzymes such as (transglutaminase, glucose oxidase and laccase) and polysaccharide and gluten degrading enzymes such as (alpha-amylase, xylanase and protease). For both of them the role and impact, Where all of them affected significantly to viscoelastic properties of dough glucose oxidase and laccase give the results to the contrary. Transglutaminase is impact positively on strengthening of gluten network**(Caballero *et al.*, 2007).** Microbial glucose oxidase (EC 1.1.2.3.4) is currently receiving much attention due to its wide applications in chemical, pharmaceutical, food, beverage, clinical chemistry, biotechnology and other industries **(Aja *et al.*, 2003; Bankar *et al.*, 2009).** Different GO concentrate was used to improve the dough quality (**Bonet *et al.*, 2006**; **Dagdelen and Gocmen 2007**; **Steffolani *et al.*, 2010; Decamps *et al.*, 2012; Shafisoltani *et al.*, 2014**)

The addition of xylanase (EC 3.2.1.8) on the wheat flour produced significant changes on dough rheology and bread quality character**(Mariotti *et al.*, 2013).** XY contribute to the improvement of the technological characteristics of bread made from white wheat flour and whole grain wheat flour. The dosage of 8 g XY per 100 kgflour yielded higher specific volume and lower firmness **(Jaekel *et al.*, 2012).** Allot of studedes are used XY by different concentrates to improving dough **(Collins *et al.*, 2006; Jaekel *et al.*, 2012; Ahmad *et al.*, 2013)**

α-Amylase (EC 3.2.1.1) is an endo-hydrolase belonging to the glycoside hydrolase 13 family and is considered to be one of the primary enzymes responsible for starch degradation **(Majzlova *et al.*, 2013).** In wheat, starch makes up over 70% of total grain dry weight and is made of glucose residues linked by α -1,4 glucosidic bonds and branched via α -1,6 glucosidic linkages **(Ball and Morell, 2003). Giannone *et al.* (2016)**reported that the evolution of textural properties, crumb moisture, and a_w during bread storage confirmed that AM are effective in slowing down bread staling. The significantly greater effect provided by the α-amylase-lipase combination, that positively modified textural and crumb grain properties of bread.

The aim of the present work has been to evaluate effect of different enzymes doses on the properties of wheat flour dough and final product quality. The effect of these different doses on the rheological properties, sensory evaluation and bread quality were evaluated.

Materials and methods

Commercial wheat flour obtained from East of Cairo Mills (Ministry of Supply & Internal Trade). All microbial enzymes are obtained from Sigma Chemical Company (Saint Louis, USA). The flour was stored in a cool atmosphere pending the analysis and manufacturing. Enzymes were stored in a cool

atmosphere and frozen condition which goes along with attached data with the enzyme (xylanase at 8°C) and(glucose oxidase and α amylase at -20°C.).

Processing of Pan Bread

The straight dough method for pan bread production was carried out according to the method described by **(AACC, 2000)**as described in **Table (I).**

Table I. Component of pan bread blends.

Treatment	Flour (g)	Salt (g)	Yeast (g)	Sugar (g)	Corn oil (g)	GO (ppm)	XY (ppm)	AM (ppm)
Control	**100**	**1.0**	**1.5**	**1.5**	**1.5**	**-**	**-**	**-**
T1	**100**	**1.0**	**1.5**	**1.5**	**1.5**	**10**	**-**	**-**
T2	**100**	**1.0**	**1.5**	**1.5**	**1.5**	**15**	**-**	**-**
T3	**100**	**1.0**	**1.5**	**1.5**	**1.5**	**20**	**-**	**-**
T4	**100**	**1.0**	**1.5**	**1.5**	**1.5**	**-**	**10**	**-**
T5	**100**	**1.0**	**1.5**	**1.5**	**1.5**	**-**	**15**	**-**
T6	**100**	**1.0**	**1.5**	**1.5**	**1.5**	**-**	**20**	**-**
T7	**100**	**1.0**	**1.5**	**1.5**	**1.5**	**-**	**-**	**5**
T8	**100**	**1.0**	**1.5**	**1.5**	**1.5**	**-**	**-**	**10**
T9	**100**	**1.0**	**1.5**	**1.5**	**1.5**	**-**	**-**	**15**

The ingredients were mixed thoroughly by hand for one minute, then the dough was further mixed in a laboratory mixer for approximately four minutes. The dough was put into a greased fermentation bowl, and then cut, rolled and placed in a fermentation cabinet for 50 minutes at 37±2°C and 80-85% relative humidity. Then baked in an electric oven at about 220±8°C for 25 minutes. After baking loaves were separated from the metal pan and allowed to cool at room temperature before organoleptic evaluation. The produced pan bread were measured each of weight, volume and chemical composition.

Analytical methods

Moisture, protein, ash, total fat and fibercontents were determined according to (**AOAC, 2000)**. Available carbohydrates were calculated by difference.

Rheological properties (Alveograph)

The Alveograph characteristics of wheat flour were determined in a Chopin NG Alveograph according to **(AACC 2000)**Method 54-30.02. The Alveograph parameters were automatically recorded by Chopin Alveolink-NG software, including the maximum overpressure or tenacity (*P*) needed to blow the dough bubble, the abscissa at rupture (*L*) measuring dough extensibility, the index of swelling (*G*) (measured as the square root of the volume of air necessary to inflate the dough bubble until it ruptures), the deformation energy of dough (*W*) representing the energy necessary to inflate the dough bubble to the point of rupture, the deformation curve (*P*/*L*) and the elasticity index (*Ie*).

Pan bread characteristics:

Specific volume:

Specific volume was determined by Alfalfaseed displacement method **(AACC 2000)**and calculated as the ratio cm^3/g. Specific volume determination was carried out one hour after leaving the oven in triplicate.

Alkaline water retention capacity:

Alkaline water retention capacity was determinated according to the method of **(Yamazaki, 1953)**, as modified by **(Kitterman and Rubenthaler, 1971)**. To lg ofpan bread sample [test tube weighed with dry sample ($w1$)], 5 ml of 0.lN $NaHCO_3$ was added and mixed for 30 set in a Vari-Whirl mixer. The samples were then allowed to stand at room temperature (21ºC) for 20 min, centrifuged (2000 rpm, 15 min), and drained for 10 min at an angle of 10-15º, with the horizontal. Test tubes with their contents were then weighed ($w2$), and the alkaline water retention capacity was calculated as follows:

$$\frac{\text{Alkaline water retention capacity (g)}}{\text{g sample}} = w2 - w1$$

Tixture analyser (Firmness and springiness):

Crumb firmness was determined using AACC method 74-09.01, and an adaption of this method used to determine springiness according to **(Sangnark and Noomhorm, 2004).** The analyses were carried out using a TA-XT2 texturometer with a 25 kg load (stable Micro Systems, Surrey, England) with the p/25 cylindrical aluminium sensor probe. The parameters established were: test option and mode = measurement of the compression force, hold until time, pretest speed = 10 mm/s, test speed = 1.7 mm/s, posttest speed = 10 mm/s, distance = 40%, time = 60 s and auto trigger = 10 g. Fourteen replicates were carried out for each trial.

Sensory evaluation

Sensory evaluation of enzymes-supplemented and control bread was carried out by an expert panel of nine judges according to the 100-point evaluation scheme given by **(Pyler, 1988)** and make some adjustments. The maximum scores of bread

characteristics were: volume (10); shape fitness (10); appearnce (10); color of crust (5); color of crumb (5); cell uniformity (10); moistness (10); chewiness (10);freshness (10); flavor andaroma (10); taste (10) and overall acceptability (100).

Statistical analysis

The statistical analysis was carried out using ANOVA with two factors under significance level of 0.05 for the whole results using **SPSS (ver. 22).** Data were treated as a complete randomization design according to**Steel *et al.* (1997).**Multiple comparisons were carried out applying LSD.

Results and Discussion

Approximate chemical composition of flour

Approximate chemical composition of Egyptian commercial flour (82% extract) was shown in **Table (1).** Commercial flour, followed the types of wheat, which is characterized as a medium strength. That is through a chemical composition (protein content) It does not express truthfully, protein quality (wet and dry gluten) and rheological properties of this flour (alveograph parameters) **(Bell, 1990 andIndrani *et al.*, 2007).**

Table 1. Chemical composition of commercial flour (82% ext.).

Material	Moisture	Protein*	Fat*	Ash*	Fiber*	Available carbohydrate *	Wet gluten	Dry gluten
Wheat flour	14.20 ±0.12	12.92 ±0.15	1.69 ±0.01	1.39 ±0.10	2.53 ±0.17	81.47 ±0.28	28.6 ±0.14	11.2 ±0.25

*** on dry weight basis.**

Chemical composition of pan bread

The results indicated that no significant difference between treatments in the same composite (protein, fat), only a very slight degree, with the exception of a slight difference. Some composition explained lower on some treatments such as moisture,ash and carbohydrates**(Table.2)**.

Table 2. Chemical composition of pan bread

Treatment	Moisture	Protein	Fat	Ash	Total carbohydrates
Control	31.09±0.33^{b}	12.77±0.27^{a}	3.17±0.14^{a}	1.69±0.04^{b}	82.37±0.35^{ab}
T1	30.21±0.22^{de}	12.56±1.60^{a}	3.20±0.13^{a}	1.63±0.01 ^{b}	83.01±1.67^{ab}
T2	25.91±0.17^{g}	11.65±1.10^{a}	3.15±0.08^{a}	1.93±0.02^{ab}	83.88±1.15^{a}
T3	30.91±0.32^{bc}	12.46±0.35^{a}	2.96±0.30^{a}	2.13±0.02^{a}	82.25±0.09 ^{ab}
T4	31.64±0.22^{a}	12.78±0.40^{a}	2.92±0.28^{a}	2.28±0.50^{a}	82.03±0.62^{ab}
T5	28.61±0.11^{f}	12.86±0.07^{a}	3.11±0.28^{a}	2.03±0.02^{ab}	82.01±0.28^{ab}
T6	30.81±0.05^{c}	12.00±0.91^{a}	2.18±0.22^{a}	2.31±0.02^{a}	82.88±0.05^{ab}
T7	31.14±0.11^{b}	12.74±0.4^{a}	3.01±0.90^{a}	2.14±0.02^{a}	82.11±0.41^{ab}
T8	29.83±0.07^{e}	12.86±0.37^{a}	3.15±0.09^{a}	2.21±0.02^{a}	81.77±0.46^{b}
T9	31.34±0.18^{ab}	12.98±0.27^{a}	3.33±0.20^{a}	2.01±0.03^{ab}	81.69±0.10^{b}
LSD	0.48	1.74	0.47	0.38	1.89

Means with the same latter in the same column are not significant different (p>0.05).

T1: 10 ppm GO T2: 15 ppm GO T3: 20 ppm GO
T4: 10 ppm XY T5: 15 ppm XY T6: 20 ppm XY
T7: 5 ppm AM T8: 10 ppm AM T9: 15 ppm AM

Effect of enzymes on bread properties

Freshness of pan bread

Alkaline water retention capacity (AWRC) is a simple and quick test to follow staling of bread. Higher values of AWRC mean higher freshness of

bread **(Yaseen *et al.*, 2010)**. It's clear that the addition of enzymes improved the staling and degree of freshness of pan bread (fig. 1). Results showed that the all treatmentswith all enzymes are showed marked improvement in the freshness of bread. All enzymes indicate the positive linear improving of bread staling with increasing the dose of the enzyme. These results are in agreement with **Caballero *et al.*(2007) andKatina *et al.* (2006)**. They reported that a lot of enzymes such as XY, AMand GO can improve the bread quality (freshness or staling). For each of these enzymes behave in a special attitude towards this improvement. XL and AM enzymescould lead the positive effect on bread staling throw increasing of the monosaccharide and increase the bread ability to retain water. GO lead to increasing the molecular weight of gluten network.

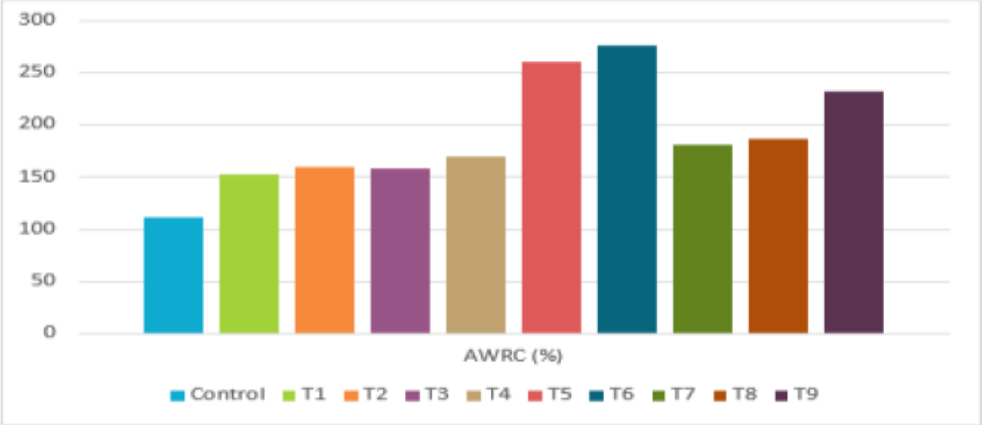

Fig. 1. Alkaline water retention capacity (AWRC) for bread treatments.

Sensory evaluation of pan bread

Data in **Table (3)** and **Fig (2)** indicated that the significant differences between doses in the same treatments. The obtained data indicate that treatments are giving marked($p \leq 0.05$) improvement in all attributes compared with control samples.On the contrary, control sample was recorded lower value with most of attributes. These it may be due to the characters of Egyptian commercial flour (82% ext.) include protein content and protein strength. Enzymes addition showed the effect significantly on attributes of pan bread and these effects was gradually increase with increase the doses of enzymes **(Ahmad *et al.*, 2014 andYang *et al.*, 2014).**

The relation between sensory evaluation and freshness of pan bread it has been clarified through response surface plots as in **Fig(3).** Through the figure illustrated as follows: There is a linear relationship between doses of XY and values of AWRC**.** But,the relation between doses of XY and sensory evaluation was a vacillating **(Shah *et al.*, 2006).** There are also the same as the relationship between AM or GO with AWRCand sensory evaluation with a different amount of linear increase. AM showed a linear positive effect stable on AWRCand non-linear relationship with sensory evaluation.GO clarified a linear relationship with AWRC and achieve the highest value ofsensory evaluation at medium dose **(Caballero *et al.*, 2007)**.

Texture profile analysis

Experimental responses of bread properties are presented in Table (4) as well as compared toSpecific volume as in **Fig 4**. The hardness is a measure of the resistance of bread to deformation. The highest level of hardness was detected in control bread (without enzymes) which indicates a low degree of softness and crispness. A gradual decrease in hardness was observed when XY or AM doses were increased. Low levels of hardness was detected with high doses of AM and XY treatments. The AM negative effect could be due to the increase in starch hydrolysis by enzyme action, consequently increasing the gas production by yeast added. The negative effect of XY on dough hardness could be due to thehydrolysis of water insoluble pentosans **(Leon *et al.*, 2002 andShah *et al.*, 2006)**. The both of enzymes have a positive effect on bread softness. These results is in agreement with **(Ahmad *et al.*, 2013 and Driss *et al.*, 2013).** On the contrary, GO had a linear positive effect on bread hardness, the higher value of the hardness it was with the highest doses of GO. This result is in agreement with **(Steffolani *et al.*, 2010)** .who observed that GO is one of oxidative enzymes which when added to wheat dough The oxidant action of the enzyme led to a cross-link among proteins through disulfide and non-disulfide bonds (high molecular weight glutenin). This undoubtedly is reflected on both the dough strength and bread resistant to extension. These effects are associated with the doses of the enzymes. It could be concluded that the highest improve of all texture parameters was deted in the commercial wheat treated with 20 ppm Go. Followed by the treated with 20 ppm XY and finally that treated with 15 ppm AM.

Table 3. Sensory evaluation of pan bread

Sample	Organolyptic attributes											
	Volume (10)	Shape fitness (10)	Appearance (10)	color		Texture				Flavor & aroma (10)	Taste (10)	Overall acceptability (100)
				Crumb (5)	Crust (5)	Cell uniformity (10)	Moistness (10)	Chewiness (10)	Freshness (10)			
control	6.89 ±0.26^{c}	7.44 ±0.38^{ab}	7.00 ±0.29^{b}	3.67 ±0.17^{a}	3.78 ±0.22^{a}	7.44 ±0.38^{ab}	7.56 ±0.29^{ab}	8.00 ±0.44^{a}	7.44 ±0.24^{ab}	7.44 ±0.41^{ab}	7.89 ±0.35^{ab}	79.33 ±3.82^{ab}
GO 1	7.78 ±0.28^{b}	7.44 ±0.29^{ab}	7.67 ±0.33^{a}	4.11 ±0.2^{a}	3.89 ±0.11^{a}	7.44 ±0.24^{ab}	7.56 ±0.24^{ab}	7.11 ±0.35^{ab}	7.33 ±0.24^{ab}	7.44 ±0.34^{ab}	7.67 ±0.17^{ab}	77.67 ±3.5^{ab}
GO 2	7.67 ±0.17^{b}	7.11 ±0.2^{ab}	7.78 ±0.32^{a}	4.00 ±0.29^{a}	3.89 ±0.31^{a}	7.11 ±0.26^{b}	7.67 ±0.17^{ab}	6.89 ±0.42^{b}	7.22 ±0.36^{ab}	7.67 ±0.37^{a}	7.78 ±0.36^{ab}	76.89 ±2.43^{ab}
GO 3	9.0 ±0.24^{a}	7.67 ±0.33^{a}	8.44 ±0.18^{a}	4.11 ±0.35^{a}	3.78 ±0.28^{a}	6.67 ±0.24^{b}	8.11 ±0.26^{ab}	7.44 ±0.47^{ab}	7.89 ±0.31^{a}	7.67 ±0.41^{a}	8.11 ±0.26^{a}	82.44 ±1.86^{a}
XY 1	7.44 ±0.29^{bc}	6.67 ±0.41^{b}	7.11 ±0.39^{b}	3.78 ±0.32^{a}	4.11 ±0.2^{a}	7.67 ±0.29^{a}	7.56 ±0.29^{b}	6.78 ±0.52^{b}	7.00 ±0.29^{b}	6.78 ±0.32^{ab}	6.89 ±0.26^{b}	74.44 ±2.27^{b}
XY 2	7.89 ±0.31^{b}	7.44 ±0.29^{ab}	7.56 ±0.24^{b}	3.67 ±0.29^{a}	4.22 ±0.15^{a}	7.33 ±0.29^{ab}	7.78 ±0.22^{ab}	7.67 ±0.37^{ab}	7.67 ±0.29ab	7.67 ±0.29^{a}	7.22 ±0.28^{b}	75.67 ±2.8^{ab}
XY 3	8.89 ±0.26^{a}	7.11 ±0.39^{ab}	8.11 ±0.2^{ab}	4.22 ±0.15^{a}	4.33 ±0.24^{a}	7.56 ±0.18^{ab}	8.33 ±0.17^{a}	7.33 ±0.24^{ab}	7.67 ±0.24^{ab}	7.00 ±0.17^{ab}	8.11 ±0.26^{a}	78.78 ±1.61^{ab}
AM1	7.33 ±0.33^{bc}	7.67 ±0.24^{a}	7.33 ±0.17^{b}	4.00 ±0.33^{a}	4.11 ±0.26^{a}	6.33 ±0.29^{c}	7.78 ±0.32^{ab}	6.33 ±0.37^{b}	7.33 ±0.29^{ab}	6.67 ±0.29^{b}	6.67 ±0.17^{b}	71.89 ±1.27^{b}
AM2	7.44 ±0.18^{bc}	6.56 ±0.24^{b}	7.22 ±0.28^{b}	3.89 ±0.2^{a}	3.89 ±0.26^{a}	7.00 ±0.17^{bc}	6.67 ±0.24^{c}	7.00 ±0.33^{ab}	6.56 ±0.24^{b}	6.67 ±0.44^{b}	7.33 ±0.29^{ab}	71.56 ±1.42^{b}
MA3	8.67 ±0.29^{a}	6.89 ±0.35^{ab}	7.89 ±0.26^{ab}	3.89 ±0.35^{a}	4.11 ±0.39^{a}	8.00 ±0.24^{a}	8.00 ±0.29^{ab}	7.78 ±0.22^{ab}	7.11 ±0.42^{ab}	7.33 ±0.37^{a}	7.78 ±0.32^{ab}	81.89 ±2.13^{a}
LSD	0.75	0.9	0.77	0.77	0.71	0.74	0.72	1.08	0.84	0.98	0.79	6.89

Means with the same letter in the same column are not significant differences (p>0.05).

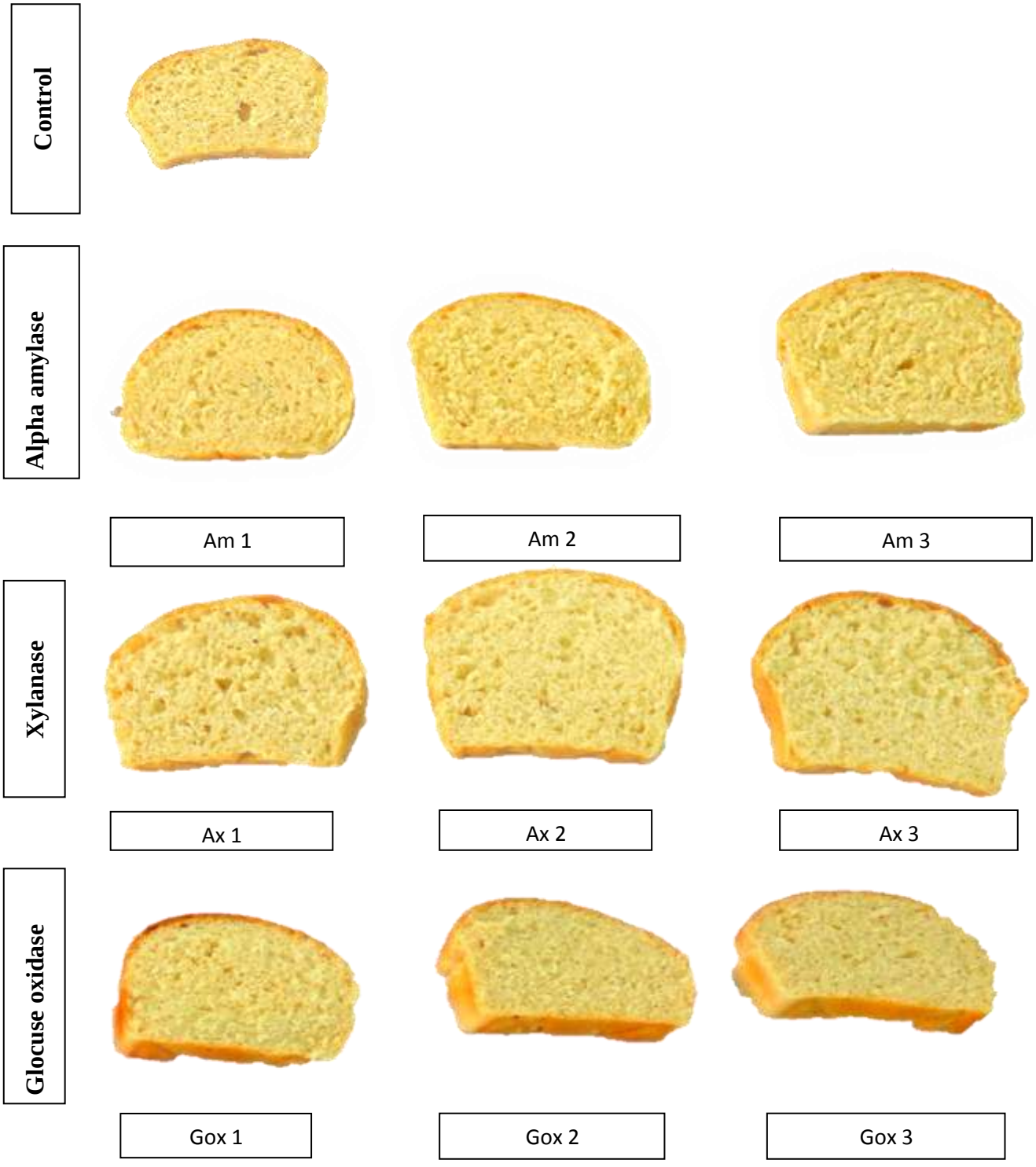

Fig. 2. Effects of different doses of enzymes on pan bread

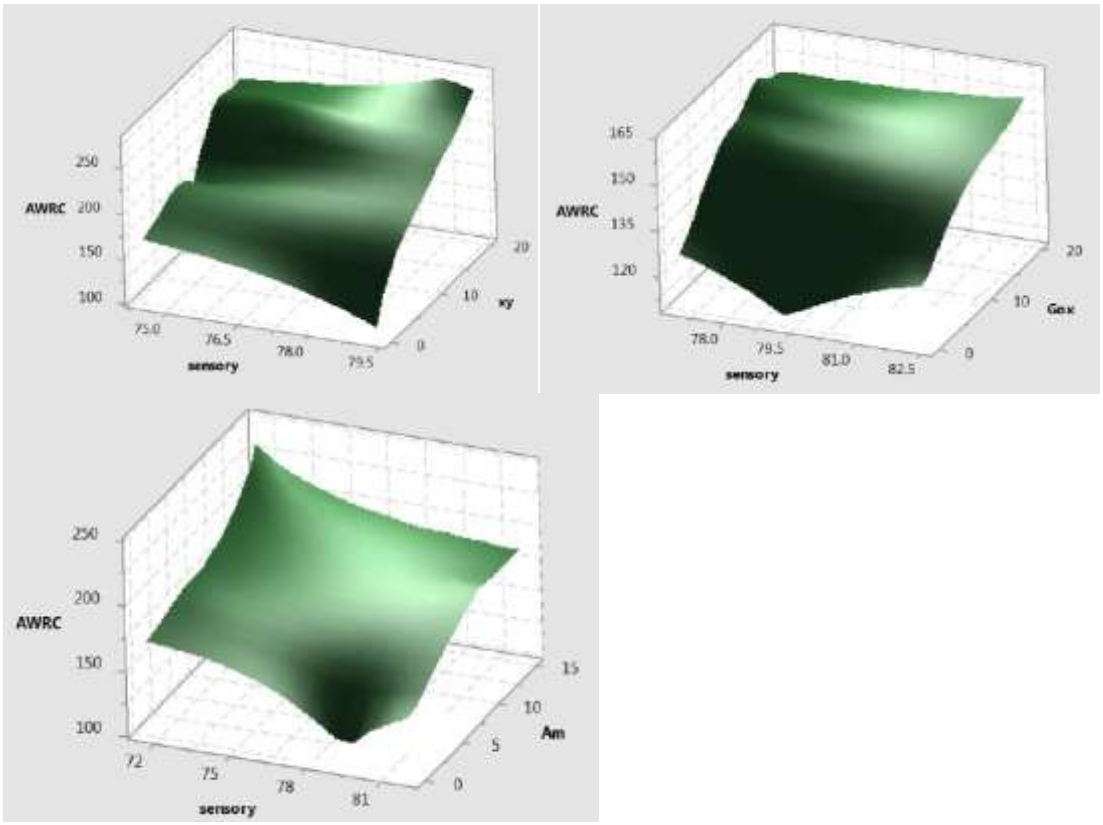

Fig.(3): Response surface plots of alkaline water retention capacity (AWRC) and sensory evaluation: GO, glucose oxidase; XY, xylanase; AM, α amylase.

Table 4. Texture profile analysis of pan bread

Dosage of enzymes	Parameters					
	Firmness	Cohesiveness	Gumminess	Chewiness	Springiness	Resilience
Control	9.470	0.127	2.470	1.536	0.822	0.353
T1	4.900	0.670	3.498	2.758	0.788	0.269
T2	3.580	0.693	2.481	1.926	0.776	0.453
G3	5.200	0.714	3.486	1.987	0.570	0.314
X1	3.480	0.395	1.374	0.626	0.455	0.155
X2	6.620	0.555	3.676	2.656	0.723	0.460
X3	2.450	0.565	1.392	0.729	0.524	0.305
A1	3.820	0.494	1.888	0.912	0.483	0.398
A2	4.810	0.510	2.454	1.470	0.603	0.236
A3	2.990	0.496	1.483	0.686	0.462	0.302

Specific volume

The effect of enzymes on specific volume of pan bread is presented in **Table (5).** Immediately after baking, pan bread specific volume increased significantly with increasing the doses of enzymes. The specific volume of bread loaves with any doses of all enzymes was significantly higher ($p < 0.05$) than the control sample(2.01 cm^3/g), and highest value it was for bread loaves treated with XY3 (3.80 cm^3/g), GO3 (3.60 cm^3/g) and Am3 (3.24 cm^3/g). XY had a linear positive effect on bread specific volume **(Bonet *et al.*, 2006 andSteffolani *et al.*, 2010).** The higher loaf volume could be due to higher gas (carbon dioxide) production during fermentation, it is dueto increasing of monosaccharide (xylose) production by XY action. Also, this effect could be due to the action between xylose molecular and gluten network. Hydrolyzed starch or oligosaccharide producing by Am can be leads to increasing of loaf volume, which observed during the previous results. The addition ofAM during fermentation it stimulates the yeast to production of carbon dioxide **(Gujral *et al.*, 2003 and Kim *et al.*, 2006)**. The addition of GO to commercial wheat flour positively influence the volume of pan bread and this effect was a linear with the increase in dose

(Shafisoltani et *al.*, 2014). GO could be led to increase the strength of dough and this is reflected on retaining the dough of gas therefore increasing of the bread specific volume.

Table 5. Specific volume of pan bread

	Treatments									
	Control	**GO1**	**GO2**	**GO3**	**XY1**	**XY2**	**XY3**	**AM1**	**AM2**	**AM3**
Weight(g)	**176.765**	**109**	**113.5**	**107.5**	**108.5**	**111.25**	**110.75**	**107.5**	**112.5**	**111.25**
Volume (cm^3)	**326.5**	**350**	**345**	**392.5**	**385**	**425**	**422.5**	**315**	**330**	**365**
Specific volume (cm^3/g)	**2.06 ± 0.04^{e}**	**3.22 ±0.08^{cd}**	**3.05 ±0.06^{d}**	**3.65 ±0.04^{ab}**	**3.55 ±0.00^{b}**	**3.82 ±0.08^{a}**	**3.81 ±0.01^{a}**	**2.93 ±0.02^{d}**	**2.93 ±0.03^{d}**	**3.28 ±0.03^{c}**

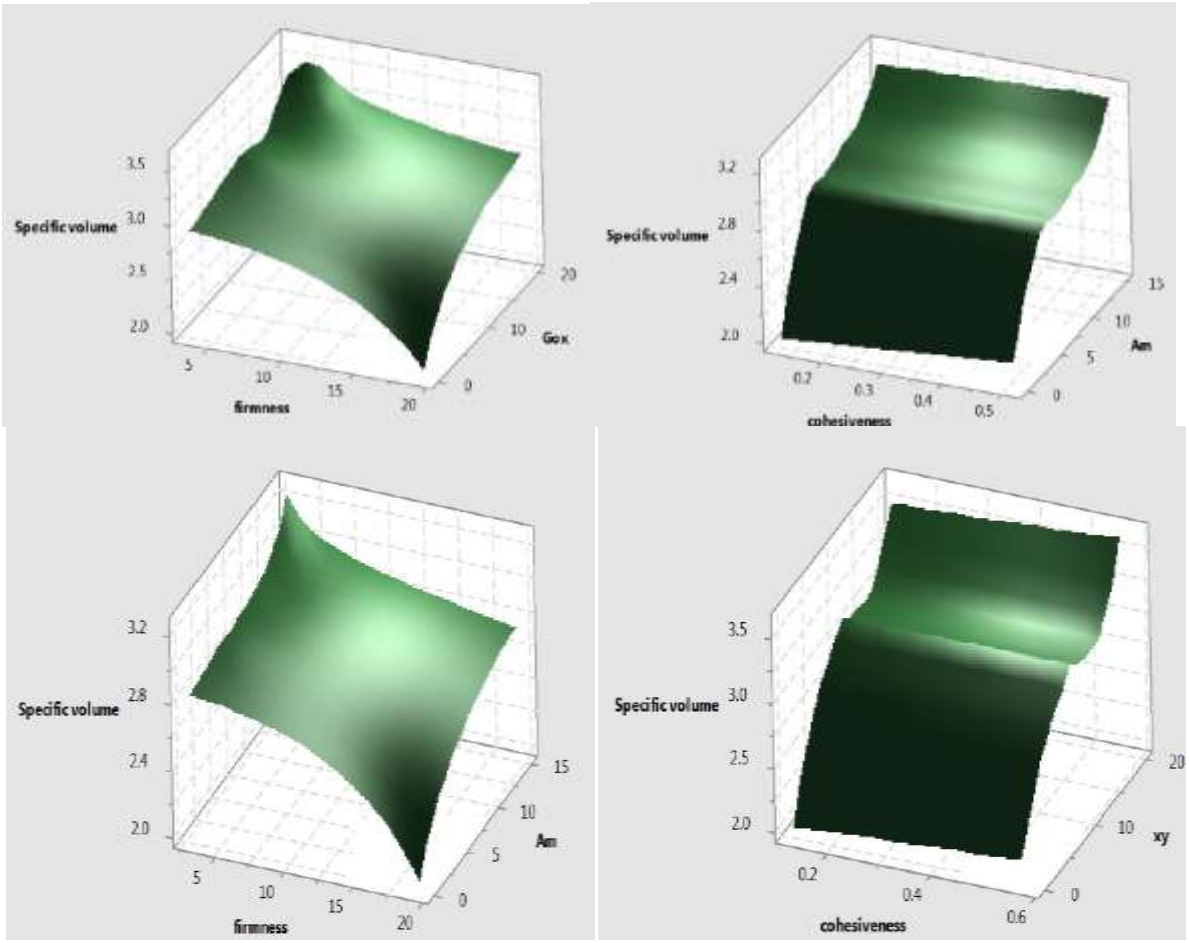

Fig.(4): Response surface plots of specific volume, firmness and Cohesiveness: GO, glucose oxidase; XY, xylanase; AM, α amylase.

Rheological properties of dough (alveogragh parameteres)

Rheological properties of commercial wheat flour dough containing the best doses of different enzymes are summarized in **Table (6)** and **Fig(5).** The addition of GO was due to increasing of the P (mm H_2O) which mean the dough tenacity (aptitude to resist deformation), W (10−4 J) which mean also the dough baking strength (surface under the curve) and P/L that mean the configuration of the curve. But it's due to decreasing of the L (mm) dough extensibility (maximum volume of air that the bubble is able to contain) and G (mm) the index of swelling. On the contrary, it was with the control sample **(Rasiah *et al.*, 2005**;**Decamps *et al.*, 2012 andYang *et al.*, 2014)**. The addition of both Am and XY was indicated midiate level between GO and control sample in all alveograpg parameters**. Bonet *et al.* (2007)**noted that the possibility of improving and rebuilding the gluten network of damaged wheat by GO treatments. This effect has been described by forming dityrosine crosslinks between the wheat

proteins. Several studies indicate that there are some enzymes that are able to make an impact similar to GO such as Hexose Oxidase (HOX). The addition of HOX could be due to strength dough and bread characteristics. This is due to the oxidative reaction for HOX. But, these results cannot be generalized for all wheat varieties as HOX affects the dough from different wheat varieties in different ways **(GUL *et al.*, 2009 and Maikweki *et al.*, 2014).**

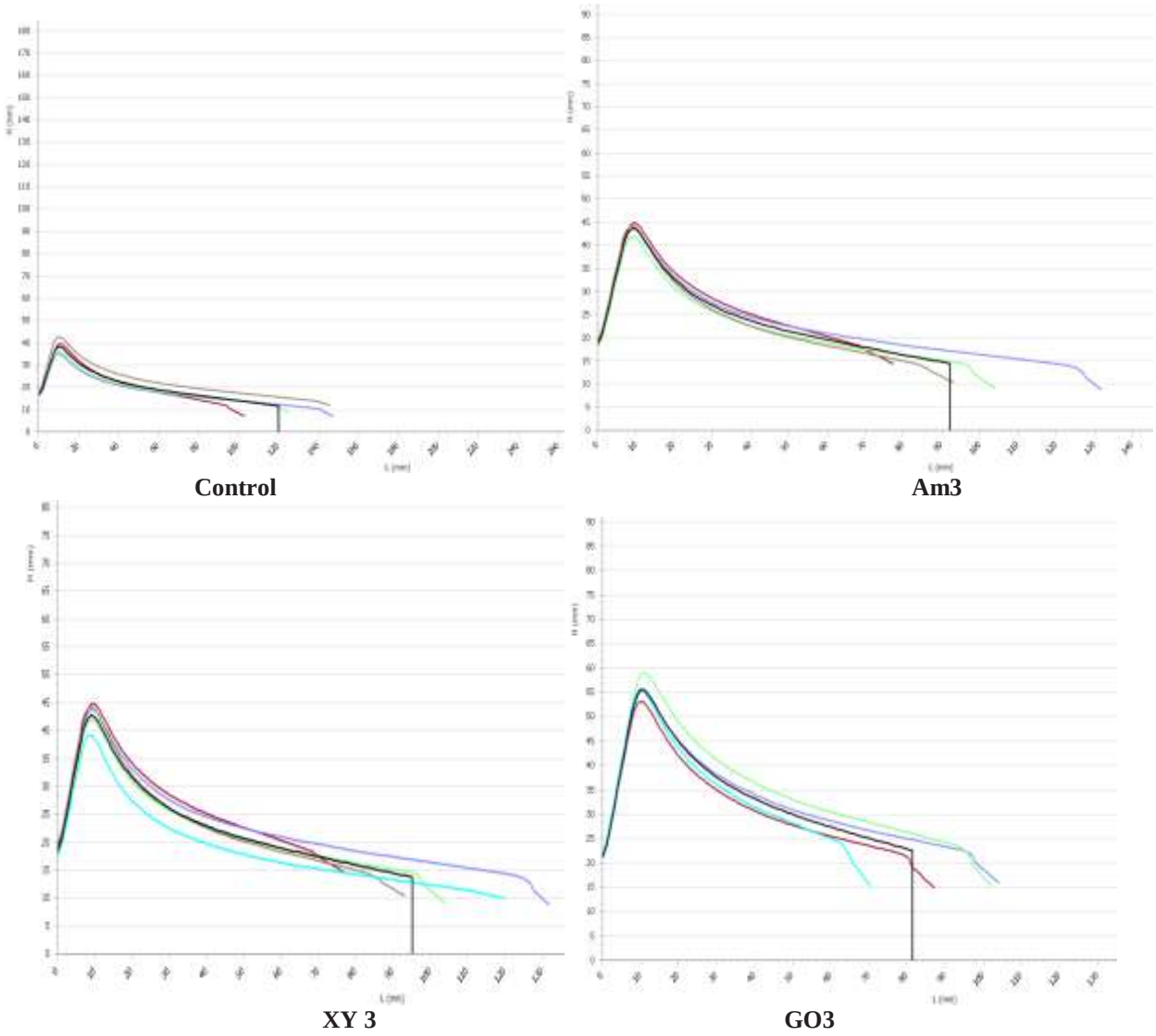

Fig.5.Curve Alveograph for the best treatments

Table 6. Alveograph parametersfor the best treatments

Parameter	Control	A3	G3	X3
P **(mm H_2O)**	**42.0**	**48.0**	**61.0**	**47.0**
L **(mm)**	**120.0**	**91.0**	**81.0**	**95.0**
G **(mm)**	**24.3**	**21.2**	**20.0**	**21.6**
W **(10−4 J)**	**164.0**	**148.0**	**184.0**	**146.0**
P/L	**0.35**	**0.53**	**0.75**	**0.49**
Ie**(%)**	**60.3**	**55.1**	**60.6**	**54.4**

Conclusion

The supplementation of the Egyptiancommercial flour (extract 82%) showed a significant improvement each of the properties. Specificvolume has increased with every treatment, though it the XY treatment was a highly effective. But the AM treatment was a lower effective, while the GO treatment was a among of them. Alkaline water retention capacity,improved with add all of the treatments. Despite the contrast level of improvement

between different enzymes and between the doses of the same enzyme. Add enzymes showed a noticeable positive change in the rheologicale properties. All of these changes culminated in the sensory evaluation, which showed a significant approbation for treatments compared with the control sample.

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تأثير أستخدام الإنزيمات على جودة خبز القوالبالمصنوع من دقيق القمح المصري

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الملخص العربى

تهدف هذة الدراسة الى توصيف دقيق القمح المصرى التجارى من حيث الخصائص الريولوجية وصفات خبز القوالب الناتج منة. تم استخدام ثلاثة من الانزيمات وهم الجلوكوز اوكسيديز و الالفا اميليز والزيلينيز وكانت التركيزات كما يلى: الجلوكوز اوكسيديز كان 10و 15و 20 ppm ، الزيلينيز كان 10و 15و 20 ppm ، الالفا اميليز كان 5 و10 و15 ppm. وكانت النتائج المتحصل عليها كما يلى:

أحتوى الدقيق على المكونات الكيميائية الأتية الرطوبة (14.08%) و الرماد (1.39%) و البروتين (12.92%) و الدهن (1.68%) و الالياف (2.36%) و الكربوهيدرات (67.39 %) و الجلوتين الرطب(28.6%) اما الجلوتين الجاف فكان (11.2%). اوضحت نتائج التحليل الكيماوى الى احتواء الدقيق على نسبة عالية من البروتين على الرغم من حلوله ضمن اصناف الدقيق متوسطة القوة بالرجوع الى نتائج الالفيوجراف له. أدى اضافة الانزيمات (كلا على حدة وبالتركيزات المذكورة سابقا) إلى تحسنا ملحوظا فى زيادة خطية مع النسبة المستخدمة على كلا من الحجم النوعى للخبز و خصائص القوام ودرجة وقدرة المنتج على مسك الماء. حقق انزيم الزيلينيز اعلى المستويات فى قدرة الخبز الناتج على الاحتفاظ بالماء، وجاء بعدة انزيم الالفا اميليز ثم كان انزيم الجلوكوز اوكسيديز واقلهما كانت عينة المقارنة. أما بالنسبة الى الحجم النوعى للخبز الناتج فكانت افضل النتائج عند اضافة انزيم الزيلينيز جاء بعدة الجلوكوز اوكسيديز ثم كان انزيم الافا اميليز وفى الاخير كانت عينة المقارنة.

أثر كلا من الانزيمات المضافة بمستوى متقارب على خصائص القوام للخبز فى حين سجلت عينة المقارنة اقل مستوياتة. أظهرت نتائج الالفيوجراف التى أجريت لافضل الجرعات من الانزيمات الثلاثة افضلية انزيم الجلوكوز اوكسيديز عند مستوى 20 ppmعن كلا من انزيم الالفا اميليز والزيلينيز بينما أظهرت عينة المقارنة أقل القيم.