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The effects of grape seed flour and glucose oxidase supplementation on the some quality attributes of bread

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Abstract

Grape seed flour, obtained from grape pomace, the by-product of wine industry was supplemented into bread wheat flour to determine its effect on bread characteristics. Bread was prepared using different levels (0, 5, and 10%) of Öküzgözü (red grape variety) seed flour (ÖSF) and Narince (white grape variety) seed flour (NSF) replacement with bread wheat flour. At the same time, different amounts (0, 50, 100 mg/kg) of glucose oxidase (GOX) were added to each formulation to improve bread properties. It was observed that addition of NSF or ÖSF showed an important effect on physical and textural properties of wheat bread. Loaf volume, width, length and height values decreased accurately depending on increasing ÖSF and NSF levels. The addition of GOX, mainly when it was used at 100 mg/kg provided a significant improvement in all these values. Brightness (L value) and yellowness (b value) of crumb and crust of bread were gone down while redness (a value) went up as the ratio of NSF or ÖSF in the bread formulation were increased. Usage of GOX was made the bread brighter. It was determined that there was a significant increase in bread hardness by the addition of NSF or ÖSF depending on the increase of percentage. When compared with control sample hardness of bread was risen from 264.9 g to 1207.8 g and 1458.0 g by the addition of 10% of ÖSF or 10% NSF, respectively. using 100 mg/kg of GOX was found to be improve bread firmness considerably. Overall results indicate that the by-products of wine industry can be evaluated in bread making up to 5% level and the addition of GOX can restore quality characteristics of the bread.

Key words: Bread, grape pomace, grape seed, Narince, Öküzgözü, texture

Introduction

Grape is one of the most important fruits of Turkey. Turkey takes places among the major countries in terms of grape production and foreign trade (Gül and Akpınar, 2006; Akpınar et al., 2006). Total world production for grapes in 2017 is 74,276,583 metric tonnes and Turkey is the sixth highest producer of grapes in the world with its 4,200,000 metric tonnes (FAO, 2019). Labour is used extensively during grape production (Karadağ Gürsoy et al., 2018) and processing it to various products. Grapes are consumed as fresh or after processed to various products such as wine, juice, raisins or boiled grape juice. Wine takes the seventh place among most produced commodities of the world with 29,105,845 metric tonnes (FAO, 2019).

During wine processing by-products called as grape pomace includes skins, seeds, and stalks of grapes. (Beres et al., 2016). Usage of these by products in food including breads may provide enrichment with bioactive compounds and additional health benefits (Hoye and Ross, 2011; Eskimez et al., 2019; Gundesli et al., 2019). Although grape seeds give potential health benefits to bread, the usage of grape seed flour in bread production brings some problems on technological and sensorial quality parameters of breads. Hoye and Ross (2011) reported a decrease on the loaf volume and brightness, an increase in the hardness and porosity of bread with the replacement of grape seed flour above 5 g in 100 g hard red spring wheat flour. They also reported a lower consumer acceptance of breads when the replacement level of grape seed flour was increased to ≥ 7.5 g.

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Gül et al. (2017) also found a highest acceptability of breads containing up to 5 g of grape seed flour in 100 g bread wheat flour. If the replacement level of grape seed flour in bread formulations is increased, its potential benefits will also increase. However, this increasement may cause some deterioration effects on quality of breads. This deterioration effects may be limited by adding some bread improvers besides grape seed flour. Glucose oxidase (GOX) may considered one of these bread improvers. Because GOX has the potential to improve dough and bread properties (Bonet et al., 2006; Gül et al., 2009; Decamps et al., 2012). Therefore, in the present study it was aimed to investigate changes in the physical and instrumental texture properties of breads containing various amounts of both GSF and GOX.

Material and Methods

Materials

Bread wheat flour was purchased from Berberoğlu Flour Co., Burdur, Turkey. Moisture (13.23±0.07 %), ash (0.61±0.01%), crude protein (10.44±0.13 %), wet-dry gluten-gluten index (30.65±0.03%, 10.29±0.26 %, 93.74±1.28 %) sedimentation (32.3±0.58 ml), falling number (305±7 .00 s) and farinogram values (water absorbtion capacity: 62.0±0.1%, dough development time: 1.7± 0.14 min, stability: 12.3±0.54 min, softening 12. minute: 35.0 ± 8.00 B.U.) of wheat flour were measured according to the approved methods 44-01.01, 08-01.01, 46–12.01, 38-12.02, 56-60.01, 56-81.03, 54-21.02 of AACC, respectively (AACC International, 2010). Glucose oxidase: Gluzyme Mono 10000BG (GOX, 10000 GODUF/g) was supplied by Novozymes (Novozymes, İstanbul, Turkey). All other chemicals used were of analytical grade.

Preparation of grape seed flours

Preparation of grape seed flours were made as in explained in our previous study (Gül et al., 2013). To put it briefly; grape pomaces by-product of white (from Narince grape variety) and red (from Öküzgözü grape variety) wine processing factory (Küp wines Denizli, Turkey) were taken as soon as the pressing and maceration processes were completed. Both types of grape pomaces were dried (8-9 hours at 55ºC until moisture level decreased to 7-8%). After drying, seeds were separated and floured to a particle size of less than 300 µm. Grape seed flours of narince (NSF) and Öküzgözü (ÖSF) were vacuumed packed and stored at -18ºC until usage at further analysis.

Experimental design

The effect of three levels (0, 5 and 10%) for ÖSF and NSF, and the effect of three levels (0, 50, and 100 mg/kg) for the dose of GOX added in wheat flour by the replacement with wheat flour on the quality parameters of bread was investigated. Breads prepeared with 100% wheat flour was evaluated as control sample. The measurements were conducted three times.

Bread making

Bread was prepared in accordance with a method described by AACC Method 10-10.03 (AACC, 2010), with slight modifications. 1 kg wheat flour or wheat flour-GSF blends (with or without GOX), 30 g baker's yeast, water (according to water absorbtion capacity of each formula) and 15 g salt were mixed in a dough mixer (Günsa, Industrial Kitchen Equipment, İzmir, Turkey) until for 15 min, followed by proofing at 25°C and 75% relative humidity for 30 min in a proofer (Enkomak, Turkey). After mass proofing dough was cut into pieces according to 100 g flour weight basis, molded and placed into baking pans for the last fermentation at 25°C for 90 min in a proofer with relative humidity at 75%. Breads were baked at 275 °C for 15 min in a stone flour electrical oven (Enkomak, Turkey), followed by being cooled at room temperature for at least 30 min and packed in plastic bags prior to any subsequent analysis.

Determination of Bread Quality

Physical evaluation of breads

Loaf volume of breads prepared in triplicate was measured by rapeseed displacement method (AACC Method 10-05.01) 6 h later after baking. The bread weight measurement was made after the breads were baked and allowed to cool at room temperature for 1 hour. Specific volume of breads was calculated by dividing the bread volume by bread weight. Width, length and height of breads from each batch were measured by a dijital calliper.

Crumb and crust colour evaluation of breads

Crumb and crust colour values of breads with or without the addition of different concentrations of ÖSF, NSF or GOX were measured with colourimeter (Minolta CR-410 Chroma Meter, Konica Minolta, Tokyo, Japan). Colour components L^*, a^* and b^* values, where L^* indicates brightness [(0) Black - (100) White], a^* redness [(+) red, (-) green], b^* indicates yellowness [(+) yellow, (-) blue].

Texture profile analysis (TPA) of breads

Texture profile analysis (TPA) of bread was performed following a method described in our previous study (Gül and Şen, 2017). In brief, after cooling 4h at room temperature, breads were sliced in width with an electric bread knife into uniform slices of 25 mm thick which were used for TPA. TPA was conducted in a texture analyzer (TAXTPlus; Stable Micro System Ltd., Godalming, UK) using a 36 mm diameter probe, with, pretest speed, test speed, posttest speed, and strain as 1 mm/s, 1.7 mm/s, 10 mm/s and 40% respectively. The TPA was replicated four times. Hardness, springiness, cohesiveness, gumminess and chewiness were measured.

Statistical analysis

Data were presented in the form of mean analysed by one-way ANOVA and the calculated mean values were compared using Duncan's multiple range test with significance defined at $P < 0.01$. All of the statistical analyses were carried out using a SPSS 16.0 software (SPSS Inc., Chicago, IL, USA).

Results and Discussion

Effects of ÖSF, NSF and GOX on physical properties of bread

Physical properties of bread especially bread volume is the most important characteristic of bread quality. To measure and compare quality of breads commonly specific volume, width, length and height measurements are used. Therefore, in this study, weight, loaf volume, specific volume, width, length and height values of breads containing different amounts of ÖSF, NSF and GO were determined and these results were compared with control bread made from only wheat flour. Physical (weight, loaf volume, specific volume, width, length and height) properties of breads containing different amounts of ÖSF, NSF and GOX are presented on Table 1. Loaf weight of breads were found between 136.71 g to 148.22 g. Highest loaf weight values were measured at 10 % NSF containing breads. This probably occurred as result of the higher water absorption capacity of NSF (Table 1).

Table 1. Effects of ÖSF, NSF and GOX on physical (weight, loaf volume, specific volume, width, length and height) properties of bread

GSF (%)	GO (ppm)	Loaf Weight (g)	Loaf volume (cm^3)	Specific volume (cm^3/g)	Width (mm)	Length (mm)	Height (mm)
0 (Control)	0	140.85^{de}	650.00^{d}	4.60^{d}	71.79^{b}	128.85^{ef}	77.38^{c}
	50	141.42^{cd}	680.00^{c}	4.79^{c}	72.71^{b}	132.54^{cd}	82.36^{b}
	100	144.24^{b}	750.00^{a}	4.91^{b}	74.87^{a}	134.47^{a}	85.60^{a}
5 % ÖSF[2]	0	137.42^{fg}	613.33^{e}	4.46^{e}	64.56^{f}	122.20^{j}	60.53^{g}
	50	136.71^{g}	666.67^{d}	4.88^{bc}	65.06^{f}	125.29^{i}	57.84^{h}
	100	138.92^{defg}	730.00^{b}	5.25^{a}	69.62^{c}	127.84^{fgh}	61.77^{fg}
10 % ÖSF	0	137.68^{fg}	386.67^{i}	2.81^{i}	56.35^{g}	134.23^{ab}	34.27^{n}
	50	138.41^{efg}	400.00^{i}	2.89^{i}	55.63^{g}	132.34^{d}	40.91^{m}
	100	139.42^{def}	413.33^{i}	2.96^{i}	55.41^{g}	133.39^{bc}	43.75^{l}
5 % NSF[3]	0	140.69^{de}	446.67^{h}	3.17^{h}	69.60^{c}	129.66^{e}	62.56^{f}
	50	143.66^{bc}	496.67^{g}	3.46^{g}	68.50^{cd}	127.15^{h}	68.33^{e}
	100	144.71^{b}	546.67^{f}	3.78^{f}	69.67^{c}	129.45^{e}	71.13^{d}
10 % NSF	0	145.20^{b}	356.67^{j}	2.46^{j}	66.75^{e}	128.34^{fg}	47.36^{k}
	50	145.46^{b}	360.00^{j}	2.47^{j}	67.64^{de}	127.55^{gh}	51.44^{i}
	100	148.22^{a}	366.67^{j}	2.47^{j}	67.66^{de}	127.73^{gh}	49.09^{j}

(1): There is no statistically significant difference between the averages indicated by the same letter in the same column ($p<0.01$).
(2): ÖSF: Öküzgözü seed flour
(3): NSF: Narince seed flour

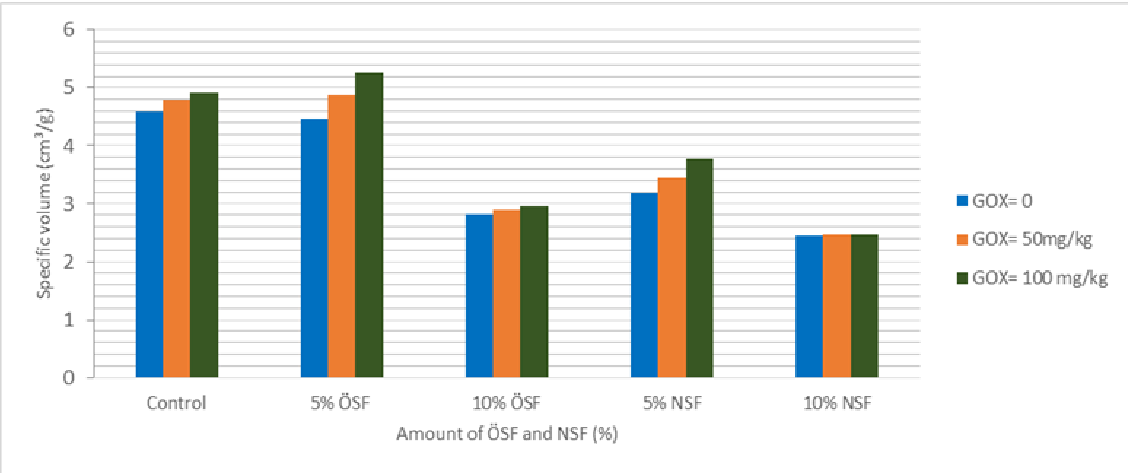

Figure 1. Specific volume of bread with the addition of different amounts of ÖSF, NSF (0, 5, 10 g/100g) and GOX (0,50,100 mg/kg).

The effect of GSF and GOX on loaf volume and specific volume of breads are shown in Table 1 and Figure 1, respectively. There were significant differences ($P < 0.01$) in loaf volume and consequently the specific volume between the control bread (without GSF) and the bread groups with added ÖSF and NSF. There was a general trend indicating a decline in bread specific volume with increasing GSF levels. When the specific volumes of control bread and 5% ÖSF, 10% ÖSF, 5% NSF and 10% NSF added breads were compared, significant reduce ($P < 0.01$) was recorded as from 4.600 to 4.463, 2.808, 3.174, 2.456 cm^3/g respectively. Reducing effect of grape seed flours on bread loaf volume is due to the fact that the dilution of gluten proteins with the addition of grape seed flours. This would prevent the formation and expansion of gluten network (Aghamirzaei, et al., 2015). Our results are in agreement with those presented by Walker et al. (2014) who found that wine grape pomace fortified breads had significantly lower loaf volume than the control and also loaf volume decreased with an increase in wine grape pomace replacement of flour. Reduction in loaf volume of breads with dietary fibers has also been reported in similar studies where bread was enriched by pomegranate seed flour (Gül and Şen, 2017), grape by-product (Mildner-Szkudlarz et al., 2011), melissa or lavender waste (Vasileva et al., 2019), Cupuassu (*Theobroma grandiflorum*) peel as potential source of dietary fiber and phytochemicals in whole-bread preparations (Salgado et al., 2011).

Compared with the effects of ÖSF and NSF on the specific volume of bread; ÖSF had a more positive effect on the specific volume. As can be seen clearly from Figure 1 as NSF was increased to 10% addition level into wheat flour, breads had a significantly smaller specific volume ($P < 0.01$) than the control bread and the other breads prepared with 5% ÖSF, 10% ÖSF or 5% NSF. The reason for the difference effect of ÖSF and NSF on bread volume might relate to the cultivar difference. Because bread characteristics are strongly influenced by cultivar of grape pomace seed flour. Similar effects were noted by Sˇporin et al. (2017). Glucose oxidase (GOX) is frequently used in baking industry to improve the bread making performance of wheat flours (Meeerts et al., 2017). GOX treatment in the presence of oxygen, catalyzes the oxidation of glucose to gluconolactone and hydrogen peroxide and this resulted hydrogen peroxide effects crosslinking on gluten proteins by oxidizing thiol groups of gluten proteins to form disulfide bonds (Steffolani et al., 2010; Niu et al.,2018). The replacement of wheat flour with GSF negatively impacted bread volume, however addition of GOX in to bread formulation had a significant ($P < 0.01$) improving effect on this value (Table 1, Figure 1). Improving effect of GOX was become more evident by increasing its supplementation amount from 50 mg/kg to 100 mg/kg. Our results are in agreement with Zhang et al. (2018), who stated that the larger loaf-specific volumes, caused by the addition of GOX.
Most pronounced benefit of GOX addition was seen on 5% ÖSF breads. Highest specific volume was observed with the addition of 100 mg/kg GOX into 5% ÖSF containing doughs. Although GOX had a positive impact on loaf volume of 5% GSF containing breads, this effect was seen in a limited extent when the incorporation level of GSF was increased over 5% to 10%. However, there were no significant differences among the three addition levels of GOX on specific volumes of 10% NSF breads.
It was observed that incorporation of GSF into wheat flour was resulted with a significant decrease on loaf width, length and height as similarly loaf volumes. The increasing levels of GOX caused very clear increase on bread physical characteristics (width, length, height, loaf volume and specific volume) when the GSF was used up to 5% replacement level.Cross-linking abilities of GOX in whole-wheat system and its quality improvement effects on whole wheat products also reported by Niu et al. (2018). Our result is also in accordance with those of Bonet et al (2006) who observed a reinforcement or strengthening of wheat dough and an improvement of bread quality with the addition of GO, which modified gluten proteins (gliadins and glutenins) through the formation of disulfide and non-disulfide crosslinks.

Crumb and crust colour of breads

The crust and crumb colour values of bread with different amounts of added GSF and GOX are given in Table 2. The results show that the colour of bread crust and crumb were affected by GSF addition. A significant decrease at L* values and significant increase at a* values were determined with the addition of GSF in bread fromulations. The data agree with previous findings where bread with the grape pomace flour additions showed decreased L* and increased a* values (Sˇporin et al., 2017). Our results are in agreement with those presented by Pečivová et al. (2014) who noticed that darker color of the bread with the addition of 40 to 100 g/kg grape seed flour in comparison with the control variant.
In general, L* and b* values decreased, whereas a* values increased, with increasing GSF levels. As expected, with the addition of GOX, breads were become a few lighter than breads without GOX. However, when the GOX was used more than 50 mm/kg and depend on increase of percentage, L* and b* values showed significant changes on ÖSF added breads while a* values were not affected. Increasing levels of GOX also was not cause any change on crust a* and crust b* values of NSF breads. Oxidizing effect of GOX from the appearance of the breads also reported by Decamps et al. (2012). In contrast to our findings Vukić et al, (2014) observed darker bread samples with the addition of GOX which probably responsible for the associated with production of reducing sugars and the Maillard reaction.

Table 2. Effects of ÖSF, NSF and GOX on crust and crumb colour of bread$^{(1)}$

GSF (%)	GO(ppm)	Crust L*	Crust a*	Crust b*	Crumb L*	Crumb a*	Crumb b*
0 (Control)	0	$65.24^{b(1)}$	2.25^{g}	16.04^{cd}	63.60^{c}	1.08^{h}	10.20^{a}
	50	69.28^{a}	2.33^{g}	14.36^{fg}	68.02^{b}	$0.93^{h\imath}$	10.11^{a}
	100	62.85^{c}	5.22^{f}	17.40^{b}	70.61^{a}	$0.56^{\imath}$	8.90^{b}
5 % ÖSF$^{(2)}$	0	47.93^{h}	9.79^{cd}	17.94^{ab}	53.21^{e}	2.82^{g}	7.69^{d}
	50	48.31^{gh}	10.40^{bc}	18.56^{a}	54.55^{e}	3.16^{fg}	7.41^{d}
	100	47.56^{h}	10.66^{b}	18.16^{a}	56.58^{f}	3.29^{ef}	5.64^{g}
10 % ÖSF	0	$45.57^{\imath}$	9.32^{d}	15.37^{de}	44.44^{h}	4.29^{c}	5.93^{fg}
	50	39.74^{j}	12.23^{a}	14.62^{ef}	46.14^{gh}	4.37^{c}	7.41^{d}
	100	$44.60^{\imath}$	9.45^{d}	16.16^{c}	50.03^{f}	4.66^{bc}	5.64^{g}
5 % NSF$^{(3)}$	0	49.57^{fg}	10.36^{bc}	13.45^{h}	51.14^{f}	3.80^{d}	7.59^{d}
	50	56.07^{d}	8.52^{e}	14.66^{ef}	53.54^{e}	3.60^{de}	8.28^{c}
	100	55.43^{d}	9.36^{d}	13.75^{gh}	57.50^{d}	3.83^{d}	8.28^{c}
10 % NSF	0	50.36^{f}	7.95^{e}	$10.88^{\imath}$	44.42^{h}	4.91^{ab}	6.87^{e}
	50	51.90^{e}	8.38^{e}	$11.58^{\imath}$	45.16^{h}	5.26^{a}	7.69^{d}
	100	55.42^{d}	8.41^{e}	13.08^{h}	43.33^{g}	5.06^{a}	7.41^{d}

$^{(1)}$: There is no statistically significant difference between the averages indicated by the same letter in the same column ($p<0.01$).
$^{(2)}$: ÖSF: Öküzgözü seed flour
$^{(3)}$: NSF: Narince seed flour

Textural properties of breads

Texture is one of the most important parameter used in determining the quality of bread (Mildner-Szkudlarz, et al. 2011). Different additives used in bread production have important effects on texture. Thus in the present study effects of both GSF and GOX on textural properties of wheat bread were investigated. Texture profile analysis (TPA) was performed 6 hours after the bread left the oven and the results are given in Table 3.

Table 3. Effects of ÖSF, NSF and GOX on TPA of bread(1)

GSF (%)	GO (ppm)	Hardness (g)	Springiness	Cohesiveness	Gumminess	Chewiness
0 (Control)	0	264.9^{k}	1.42^{cd}	0.84^{ab}	231.88^{j}	714.52^{i}
	50	235.50^{l}	0.96^{d}	0.68^{d}	243.50^{i}	553.00^{j}
	100	154.40^{m}	0.93^{d}	0.66^{d}	230.20^{j}	576.8^{j}
5 % ÖSF(2)	0	476.24^{i}	1.89^{bc}	0.83^{ab}	397.56^{l}	738.55^{l}
	50	297.27^{j}	2.81^{a}	0.86^{a}	261.65^{i}	731.30^{l}
	100	273.53^{k}	1.61^{cd}	0.85^{a}	239.14^{j}	325.51^{k}
10 % ÖSF	0	1207.80^{e}	1.00^{d}	0.77^{c}	898.97^{e}	898.06^{f}
	50	1313.90^{d}	0.98^{d}	0.84^{ab}	1029.30^{d}	1014.60^{e}
	100	996.41^{g}	0.99^{d}	0.76^{c}	766.67^{f}	764.19^{h}
5 % NSF(3)	0	1004.30^{f}	1.74^{cd}	0.84^{ab}	791.32^{f}	847.49^{f}
	50	686.24^{h}	1.27^{cd}	0.85^{a}	631.91^{g}	1252.90^{c}
	100	565.34^{l}	2.65^{ab}	0.84^{ab}	490.64^{h}	804.93^{g}
10 % NSF	0	1458.00^{c}	0.96^{d}	0.75^{c}	1165.40^{c}	1174.60^{d}
	50	2170.40^{a}	0.96^{d}	0.76^{c}	1652.70^{a}	1594.50^{a}
	100	1867.30^{b}	0.97^{d}	0.72^{cd}	1443.80^{b}	1404.2^{b}

(1): There is no statistically significant difference between the averages indicated by the same letter in the same column ($p<0.01$).
(2): ÖSF: Öküzgözü seed flour
(3): NSF: Narince seed flour

As can be seen from Table 3 and Figure 2 replacement of wheat flour with GSF negatively impacted bread firmness. Addition of GSF increased hardness with the increasing level of GSF. In agreement with our results Mildner-Szkudlarz, et al. (2011) found that the hardness and gumminess of breads significantly increased with an increasing level of grape pomace flour.

When ÖSF and NSF compared each other, ÖSF provides softer breads than NSF at all replacement levels. A significant difference in firmness has also been reported by Sˇporin et al. (2017) where bread was enriched with the 'Merlot' (red) and 'Zelen' (white) grape pomace flours.

After the addition of GOX hardness was decreased and breads become softer. GOX showed an improving effect also in crumb grain. This finding is in accordance with research of Bonet et al. (2006), they found a decrease in the crumb hardness of breads and improvement of crumb grain with the addition of the low GOX concentrations (0.001–0.005%, w/w). Similar effect as, higher bread specific volume, an improvement of the bread shape and crumb porosity was reported by Paucean et al. (2016). On the other hand, this finding is not in accordance with research of Vukić et al (2014) a, they are determined that addition of GOX in all concentrations has led to increase of hardness, compared with the control sample. Similarly, Renzetti et al. (2010) observed a significant increase in crumb hardness of oat bread with the addition of GO.

Increasing the supplementation level of GOX from 50 ppm to 100 ppm provided the bread to be softer.However this positive effect of GOX was not seen in breads containing 10% NSF. On the contrary, the use of GOX made the 10% NSF breads harder.

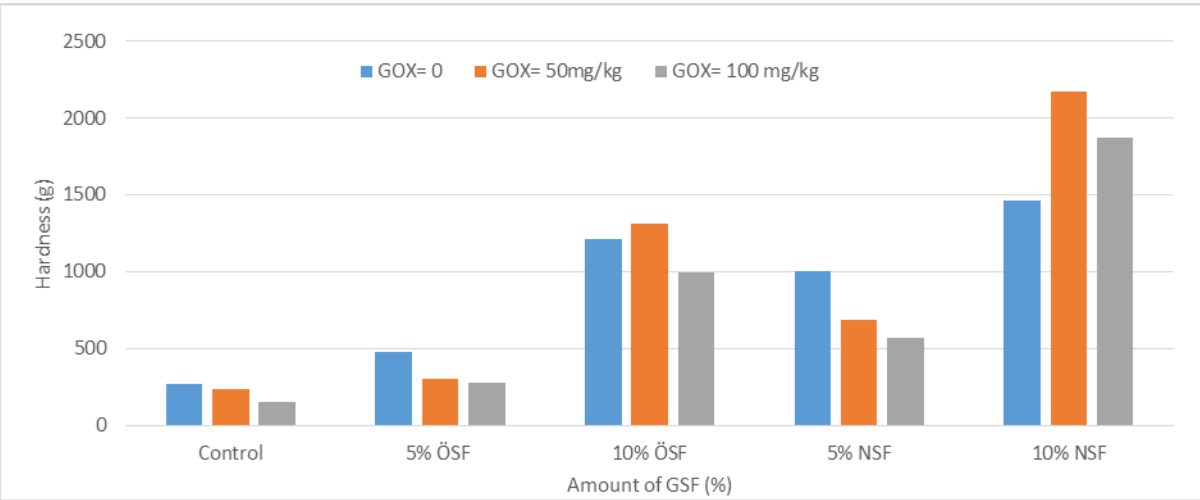

Figure 2. Crumb hardness (g) of bread with the addition of different amounts of ÖSF, NSF (0, 5, 10 g/100g) and GOX (0,50,100 mg/kg).

There was no significant difference was determined between the springiness values of control and GSF added breads. While addition of 5% NSF and ÖSF did not led to any change on the springiness values of breads. Cohesiveness of control and 5% ÖSF and NSF containing breads were showed similar values. But lower cohesiveness was determined when the addition level of ÖSF and NSF were rised to 10%. However addition of GOX did not cause important changes on the cohesiveness of experimented breads. Mildner-Szkudlarz et al. (2011) found that cohesiveness did not change significantly up to 6% grape pomace addition level in sourdough mixed rye bread.

Significant increase on the gumminess and chewiness of breads were determined by the increasing levels of ÖSF and NSF as compared with control breads.

When the chewiness values of breads containing ÖSF and NSF in the same proportions were examined, it was found that the chewiness values of ÖSF-added breads were lower. GOX had a decreasing effect on chewiness of breads when it was used 100 ppm level. But in breads containing 10% NSF, the improving effect of 100 ppm GOX was found insufficient in terms of chewiness. Steffolani et al (2012) found that gGlucose oxidase had a negative linear effect and positive quadratic effect on firmness and chewiness of bread crumb.

Conclusion

Results of the present study indicated that the addition of grape seed flour was caused to decrease the quality characteristics of bread. Loaf volume, width, length and height values decreased while hardness of breads increased with addition of ÖSF and NSF in the bread formulation. Improving effect of GOX on these properties were determined when it was used at 100 mg/kg. Using 100 mg/kg of GO was found to improve bread firmness considerably. Overall results indicate that the by-products of wine industry can be evaluated in bread making up to 5% level and the addition of GO can restore quality characteristics of the bread.

Author Contributions

Gül H., devised and supervised the project, the main conceptual ideas and proof outline. Ödeş N. carried out the experiments. Gül H. wrote the manuscript in consultation with Ödeş N.

Conflict and Interest

Authors declare no conflict and interest.

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