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Original research

Utilization concentrate of smoked and sun dried raisin as a natural humectant on quality and shelf life of taftoon bread

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ABSTRACT

Recently, consumers have become more concerned with foods contain natural ingredients in terms of health and economic. Hence, in this study, the effects of concentrate of smoked and sun dried raisin were investigated at 3 levels (1, 3 and 5%) as a natural humectant to improve the quality and shelf life of flat bread. Results showed that addition of smoked and sun dried raisin improved quality and shelf life of Taftoon bread. Sun dried raisin was more effective to improving sensory properties. Bread containing 5% concentrate of both treatments (sun and smoked raisin) had higher moisture content, specific volume and minimum firmness in compare with other samples. In treatment containing 5% concentrate of sun dried raisin sensory properties was rated higher than smoked ones. So concentrate of smoked and sun dried raisin can be used as a humectants, to improve the quality and shelf life of flat bread.

Keywords: Flat bread, Raisin concentrate, Sun dried, Smoked dried, Quality and shelf life

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1. Introduction

Bread is the first rating in terms of nutritional value in the household consumption basket, and provided a major part of the daily energy and protein needed. In addition, the intake of vitamins, iron and calcium from bread also was significant and has important role in providing the daily needs (Cauvin & Yong, 2007). After baking, the bread is faced with changes that adversely affect on the quality, that as result of break down starch and start of the partial recrystalline (Selomulyo & Zhou, 2006). Bread staling causes a high rate of wastes and loss of many different aspects such as political, economic and health. Today, the use of additives in bread is a common method, the aim of using them was improving the texture, strengthen the gluten network and delay staling and as a result bread had longer shelf life and better quality (Bollain et al., 2005). Humectants are additives that bind water and control a_w, Water activity reduction achieved by adding humectants to food enhances stability, maintains texture, and reduces microbial activity. Salt and sugar are the oldest, most widely used humectants. Other commonly used humectants include sorbitol, glycerol, and propylene glycol. A primary benefit is the reduction of microbial activity in foods, achieved through reduction of a_w to less than 0.90, while retaining moisture (Gliemmo et al., 2006). In the other hand, consumption of functional foods, and other health foods, has been on the rise in recent years as consumers' focus has become more health oriented. Consumers have become more concerned with natural foods, and foods that contain only natural ingredients. Most consumers also desire natural additives more than their chemical counterparts due to the rising concern that diseases such as cancer may be caused by unnatural ingredients (Sarah & Davis, 2004).

Raisins have a unique combination (propionic acid, tartaric, fiber, high levels of vitamins, minerals and type of carbohydrates) and considered by bakery manufacturers. Raisin was using to improve color and flavor, increase shelf life and delay staling of bread and also increase the nutritional value (Sabanis et al., 2008; Sabanis et al., 2009). Studies show that the addition of 3% raisin to bread formulation improved the volume, color, helps baking and also increased shelf life due to maintenance moisture in crumb (Decock & Cappelle, 2005). Raisin concentrate can be used in bakery products as sweetener and this advantage in comparison by the common sweeteners such as sucrose was has fewer calories (Sabanis et al., 2009). Sanders (1991) expressed that the addition of 9-12% raisin juice to bread was inhibited mold growth for 4 days. This inhibition, due to synthesis of propionic acid (caused by low pH and

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presence of tartaric acid). Successful applications of the concentrates have included a range of bakery products. In many cases, the properties derived from raisins are used to replace other additives, it has been theorized that raisin concentrate might inhibit mold development in bakery products due to its high malic acid content as well as traces of benzoic and salicylic acids. In addition, the concentrate has been used as a natural sweetener, colorant, and humectant in bakery products (Sanders, 1991; Sabanis et al., 2009).

The objective of this research was to the compare the effects of concentrate smoked and sun dried raisin as a national humectant on Taftoon bread quality and shelf life.

2. Material and Methods

2.1. Material

Commercial wheat flour with 11.6% moisture, 9.6% protein, 2.35% lipid, 0.86% ash, and 26% wet gluten and 412 s falling number was procured from Zarrin Mill Factory Mashhad, Iran (AACC, 2000). The compressed yeast (from leaven Razavi) raisin and other ingredients (salt, sugar, fat) was purchased from local market.

2.2. Preparation of Bread

Raisin concentrate (RC) were prepared the manufacture method reported by Ariaii et al (Ariaii et al., 2009) with 28% brix.

The bread was baked according to method described by Razavi zadegan et.al (2012). All ingredients (100% flours, 1% sugars, 1% salt, 1% active dry yeast and 1% vegetable oil and water (based on the farinograph absorption), were mixed for 10 minutes. Sun and smoked dried RC was added to the dough at three levels (2%, 4% and 6%) w/w flour basis. The first fermentation was performed at ambient temperature (25°C) for 30 minutes and the dough was then divided into 250g pieces and patted. Next, the rounded dough was placed at ambient temperature for the intermediate fermentation for 10 minutes. Following this stage and forming, the dough was then proofed at 45°C and 85% moisture for 15 minutes for its final fermentation. The dough was finally baked in a rotary oven (the Italian ZuccihelliForni model) at 360°C for 13 minutes. After cooling, bread samples were packed in polyethylene bags and stored at room temperature (25°C).

2.3. Moisture content

Moisture analyzer MX-50 model (A&D Co., Limited, Tokyo, Japan) was applied to quantify determination of bread's moisture content according to AACC-approved methods (AACC, 2000).

2.4. Specific Volume

Specific volume was determined two hours after baking based on rapeseed displacement method (Bárcenas & Rosell, 2006).

2.5. Texture Determination

The change in the texture of Taftoon flat bread due to staling was measured by using the penetration test. A QTS texture analyzer (CNS Farnell, Hertfordshire, UK) was used to measure the force required for penetration of a round-bottom (2.5 cm diameter×1.8 cm height) probe at a velocity of 30 mm/min and descended 30 mm (a sufficient distance to pass through the slice of 10×10 cm of bread) into the bread. Trigger value 0.05 N. Three replicates from three different sets of baking were analyzed (Pourfarzad et al., 2009).

2.6. Image Analysis

For each treatment, three samples (crust) were scanned with desktop flatbed scanner (HP, Scanner G3010; at Optical Resolution of 4800 dpi×9600 dpi) and the images were saved as jpg format. To study the effect of processing parameters on color components of bread, the RGB color space images were converted to L*a*b* space (Karimi et al., 2012).

2.7. Sensory Assessment

Sensory evaluation was conducted on the breads to study possible effects of treatments on the sensory profile of each type of bread (Larmond, 1982). Sensory evaluation was performed by 10 trained panellists and the overall quality of bread was evaluated using a ranking scale with scores ranging from 1 (least pleasure) to 5 (best pleasure).In this study, some sensory properties including odor, taste and flavor, upper surface properties and overall quality (total acceptance) of bread were evaluated. Also bread staling was evaluated following (Gacula, 1984) for panel selection and staling studies, following rating scale was used, 1 (very stale) to 6 (very fresh).

2.8. Statistical Analysis

The result was analysis whitin a complete randomized design with 3 replications. Data was analysed by ANOVA with statistical version 9 and Duncan's new multiple range tests were used to study the statistical differences of the means with 95% confidence.

3. Results and Discussion

3.1. Moisture content

The effect of smoked and sun dried raisin concentrate (RC) on moisture content of bread is summarized in Table1. The results showed that there was a significant ($p < 0.05$) difference in moisture content of some treatments in comparison with the control. The moisture content increased with using raisin concentrate. Changes between sun and smoked dried raisin concentrate were significant ($p < 0.05$). The sample with 5% concentrate of smoked and sun dried raisin had maximum moisture content. Raisin concentrate contain natural humectants, fibre, sorbitol and reducing sugars (glucose and fructose) that retain and then hold moisture in bread crumb (Sabanis et al., 2008). This is due to the combination of fibre (half of which is soluble), sorbitol and other reducing sugars (glucose and fructose) that retain and then hold moisture. Casper et al, (2008) expressed many additives (e.g. emulsifiers or humectants) include hydrophilic groups such as hydroxyl and carboxyl groups, which increase the ability to retain water. Sabanins et al, (2008) expressed dry raisins concentrate in comparison by raisins syrup have a greater impact on increasing moisture of bread.

3.2. Specific volume

Specific volume analysis of Taftoon bread is summarized in Table 1. Results indicated that specific volume was enhanced by using sun and smoked dried raisin concentrate; the highest specific volume of Taftoon bread was related to 5% sun and smoked dried RC, without significant difference (P<0.05).This increasing behavior might be related to moisture content of RC and the presence of tartaric acid in grapes, which contributes to the leavening action. Raisins also contain fermentable (sugars glucose and fructose), which is consumed by the yeast and will cause produced more gas in fermentation (Torley &Van Der Molen, 2005), also raisin act as a humectant hence improve the dough development and volume of bread. Sabanis et al., (2009) reported that specific volume in loaf increased by using dry and juice concentrate of raisin.

3.3. *Firmness*

The results indicated a positive impact on reducing firmness bread by using sun and smoked dried raisin concentrate at the storage time. As it shown in Fig. 1, the firmness in control, two h after baking was 90.37 and increased to 125.82 during 1 and 3 days storage, while in the samples with concentrate of smoked and sun dried raisin, firmness was reduced. The bread containing raisin concentrate had not significant difference (P<0.05) between 24 and 72 hour later storage, this means that the staling was retarded. The Humectants that presence in grape include hydrophilic groups such as hydroxyl and carboxyl groups, which increase the ability to retain water and could be retard staling. The relationship between moisture and reduce firmness previously approved by (He and Hoseney, 1990). RC had, sorbitol that an effective humectants, and thus helps to keep bakery products soft and moist over an extended shelf life (Sabanin et al, 2008). Because sulfur gas is used in the production of smoked raisins, sulfide compounds formed in its. This sulfur compounds in strong wheat act as a SMS that cause better fermentation hence reduced firmness. No significant difference (P<0.05) was observed in the firmness between smoked and sun dried raisins concentrate.

3.4. *Image analysis:*

The use of concentrates raisin bread was reduced lightness (l*). Control had the highest Lightness. With increasing concentrations of smoked and sun raisin concentrate brightness was reduced. In the Taftoon bread, browning was more favorable b* index was near the blue and yellow and a* index near the green and red and ranged between 120 to -120. According to Table 2 The Taftoon bread with lower amount of a* and greater b* is more favorable. According to the results shown in Table 2 using smoked and sun raisin concentrate a* and b* index was increased. The smoked raisin more improving the color of bread due to b* index was greater and a* index was lower. Color crust created by maillard reaction (a reaction between sugar and protein), raisins contain a high sugar content, that sugars participate in maillard reactions as result, increased color intensity and reduced the lightness of bread. Another reaction causes the formation of brown bread is caramelization, the reaction caused by the thermal degradation of sugars of sugar during baking. Sabanin et al., (2008, 2009) reported the use of concentrated raisins in bread can reduce the brightness and increased color intensity. The reason for better color with smoked raisin because of don't exposed to direct sunlight hence the colored compounds such as tannins and carotenoids are better preserved.

3.5. *Sensory properties*

The result for the effects of sun and smoked RC and their levels on bread sensory properties showed in Tables 3. The values reported are the mean values of each descriptor contributing to color, aroma, texture, taste and overall acceptance ratings. Results of bread staling after 3 and 5 days also summarized in Table 4. The most acceptable bread was the one with 5% RC which had a fine taste, fruity flavor, brown color, good aroma and fresh appearance.

Table 1. Effect of concentrate of smoked and sun dried raisin on moisture and specific volume of Taftoon bread.

Samples	Moisture content (%)	Specific volume (cm^3/gr)
Control	18.56^{e}	2.3^{d}
Smoked RC 1%	23.74^{c}	2.57^{c}
Smoked RC3%	26.86^{b}	3.42^{b}
Smoked RC5%	29.65^{a}	4.39^{a}
Sun RC1%	20.62^{d}	2.65^{c}
Sun RC3%	23.81^{c}	3.5^{b}
Sun RC 5%	25.49^{b}	4.44^{a}

* Different letters show the statistical significant differences (p<0.05)

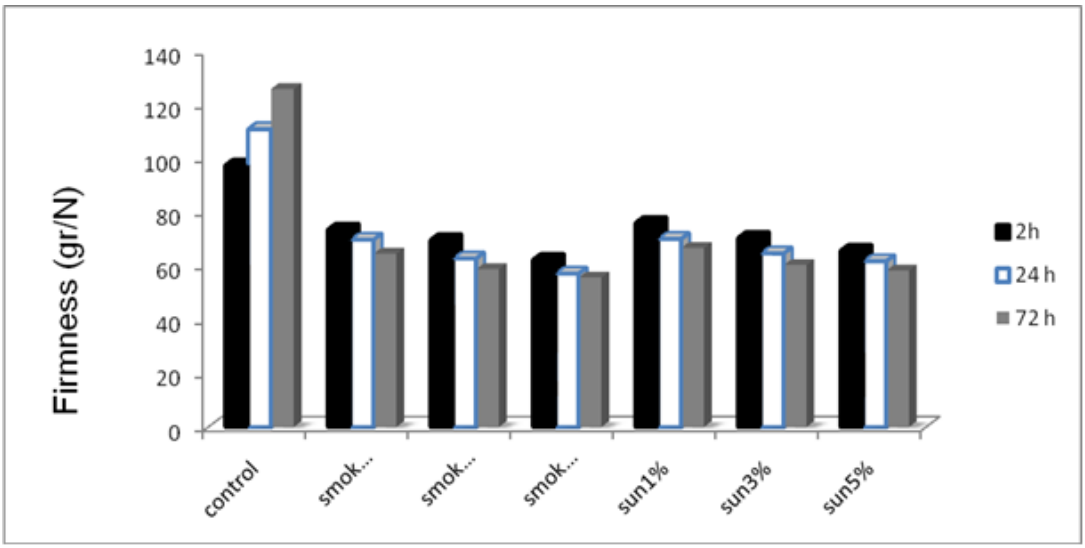

Fig. 1. Effect concentrates of smoked and sun dried raisin on firmness of bread.

Table 2. Effect of concentrate of smoked and sun dried raisin on l*, a* and b* of Taftoon bread

Samples	l*	a*	b*
Control	55.36^{d}	4^{e}	58.37^{f}
Smoked RC 1%	49.84^{c}	8.44^{d}	62.97^{c}
Smoked RC3%	46.14^{b}	9.85^{c}	65.55^{b}
Smoked RC5%	41.86^{a}	10.09^{c}	67.81^{a}
Sun RC1%	50.33^{c}	9.63^{c}	60.11^{e}
Sun RC3%	42.04^{a}	11.01^{b}	61.99^{d}
Sun RC 5%	41.67^{a}	12.65^{a}	62.59^{c}

* Different letters show the statistical significant differences ($p<0.05$)

Table 3. Effect of sun and smoked dried raisin concentrate on sensory parameters of Taftoon bread

samples	texture	Aroma	color	Taste	Overall acceptance
Control	2.7^{d}	2.5^{f}	3.5^{d}	2.7^{e}	2.8^{d}
Smoked 1%	3.5^{c}	3^{e}	3.5^{d}	3.6^{c}	3.5^{c}
Smoked 3%	4^{b}	3.5^{d}	4^{b}	4^{b}	4^{b}
Smoked 5%	4.5^{a}	3.8^{c}	4.5^{a}	3^{d}	4^{b}
Sun 1%	3.5^{c}	3.8^{c}	3.5^{d}	3.8^{c}	3.5^{c}
Sun 3%	4^{b}	4^{b}	3.8^{c}	4.5^{a}	4.5^{a}
Sun 5%	4.5^{a}	4.5^{a}	4^{b}	3.2^{d}	4.2^{a}

* Different letters show the statistical significant differences ($p<0.05$)

Tartaric acid in the grape enhanced the taste and the aromatic perception of bread and makes it taste crisper.RC increased Maillard reaction and caramelization as result improved the sensory properties of bread (Sabanis et al., 2008).

The color of the crust, which is nearly a good factor in Barbari bread, was more intense in 5% RC, but breads with 3% RC was more desirable. The results indicated that using 5% raisin concentrate made the most freshness in Taftoon bread after 3 and 5 days (Table 4). It was shown that humectants delay staling in bread, by interaction with starch, and also water holding capacity (Karimi et al., 2012).Also organic acids (like malic and tartaric) help to inhibit microbial spoilage and can serve as the natural acid component. The score of sensory properties of the sun dried Rc was more than smoked dried RC due to natural taste and flavor.

4. Conclusion

The timing is right for researchers to focus on the use of natural products to replace chemical additives. This study indicated that the use of raisin concentrate increased specific volume, moisture content, color, sensory properties and shelf life of Taftoon bread by retarded staling in comparison the control samples. Sun dried Raisin concentrate was natural additives and did not have the harms of smoked. Also, and in some cases even had better result on the quality and sensory characteristics of Taftoon bread, and recommended as a natural additives to improve the quality and increased the shelf life of bread.

Thus, raisin concentrate can be effectively used in place of sorbitol or other sugar alcohols while maintaining a "natural" formulation, additionally serve as a natural preservative in yeast-leavened baked products. With their other attributes of natural color, dough strengthening, flavor enhancement, sweetening, and humectancy, it can be considered a multi-purpose natural food ingredient.

Table 2. Effect of Storage time on the sensory parameters (Overall acceptance)

samples	staling		
	1 day	3 day	5 day
Control	3^{e}	2^{e}	1^{d}
Smoked 1%	3.5^{d}	3.2^{d}	2.5^{c}
Smoked 3%	4^{b}	4^{b}	3.8^{b}
Smoked 5%	4.5^{a}	4.5^{a}	4.2^{a}
Sun 1%	3.2^{e}	3^{d}	2.5^{c}
Sun 3%	3.8^{c}	3.8^{c}	3.6^{b}
Sun 5%	4.2^{b}	4.2^{b}	4^{a}

* Different letters show the statistical significant differences ($p<0.05$)

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