QUALITY ACCEPTANCE AND TEXTURE PROFILE OF WHITE LOAF FOMULATED WITH MAZAFATI DATES (PHOENIX DACTYLIFERA LINN) SEED FLOUR

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Abstract

The experiment was performed to determine the nutritional content and textural properties of white bread incorporated with date seeds since it has been studied that it coyld be a promising aternative source of fiber and bioactive compound in food product. Date seeds were soaked, washed, oven-dried, grinded and sieved to produce date seed flour (DSF). The wheat flour was substituted with DSF at 0, 5, 10 and 15 %. The proximate composition of wheat and date seed breads were determined using standard procedures. The physical characteristics (loaf height and weight, colour, texture) and sensory attributes were determined for the control and the supplemented breads. Meanwhile, physical properties such as texture profile analysis (TPA) recorded that hardness increased as the date seed flour increased. A sensory analysis showed that the substitution of 10 % date seed flour into white loaf gave the bread with the best overall quality acceptance.

Keywords: *White loaf, quality, date seed, texture, acceptance.*

INTRODUCTION

Dates (*Phoenix dactylifera* Linn) is a species in the palm family Arecaceae. The Arabian region such as The Middle East and The Kingdom of Saudi Arabia has been used dates as their main food for daily consumption. However, in Malaysia the date fruit is mostly found in the market in the Ramadhan month until Eid Hajj only due to Muslims consuming dates during Sahoor and when breaking their fast. Generally, people has acknowledged the benefits of consuming the dates. For example, dates have been well known as the energy source provider. Ali et al. (2012) reported that the sugars in date fruit are easily digested and can metabolize the energy rapidly for various human cell activities. Usually, people think that the date flesh is the only edible part of the date fruit and the date seed will be thrown away.

Date seeds, which make up 6-15% of the ripe date's total weight is has a very good nutritional composition of fiber and can be an alternative of underutilized fiber source. The dietary fiber obtained from date seed can be used as natural additives for fortified food products to improve their functionality. Recent studies have found that a higher fiber content in dates seed (Platat & Habib, 2015). Al-Faris et.al (2015) reported that the total dietary fiber contents in date seeds was 57.87 g/100 g, whereas insoluble fiber was the major fraction (52.70 g/100 g). Wahini (2016) and Almana and Mahmoud, (1994) mentioned that amount of fiber content increased in the dates seed flour as the concentration of date seed increased. Since most of date seed are being wasted, it can be used a source of fiber in white bread formulation to increase the fiber content. The addition of date seed flour with refined flour may increase the fiber content in white bread (Maqsood et al., 2020) . Besides, utilization of date seed as a source of fiber that may increase the acceptance of consumer towards fiber-enriched bread.

It is undeniable that nowadays people are in a busy life. They always want everything being fast and easy as well as in term of food. White bread is made from refined flour which has lower nutrient composition as well as their fiber content compared to the whole grain bread (Devani et al., 2016). Despite of the awareness on the benefits of consuming whole grain bread, majority of the consumer still prefer the white bread due to its soft texture and appealing appearance. Hence, it is necessary to increase the fiber content in white bread by adding the date seed flour which has been studied that it can be a source of fiber and bioactive compound in food product.

Malaysia-German Chamber of Commerce and Industry (2016) reported that there is an increasing acceptance of bread as staple food among the consumers in Malaysia. Currently, the world is having war against COVID-19, most of the countries are being affected including Malaysia. COVID-19 is an contagious disease caused by novel , newly discovered virus named Coronavirus. Malaysia is under the Movement Control Order which carried out to cut off the spread of COVID-19 in the country. Malaysians are much to the delight of people after loaves of bread, specifically Gardenia bread. After the Movement Control Order (MCO) came into being, these breads have been snapped out of the shelves every day, making the Malaysians rushing to their nearest grocery shops and supermarkets every morning. Angelin Yeoh (2020) reported that Gardenia Bakeries (KL) Sdn Bhd are still operating in producing their baked products and trying their best to fulfill the demands as the production are at maximum capacity and could not produce more additional bread in the market. The sales of manufactured bakery products including bread shows there is a significantly increased from 2015 to 2018. In 2018, the sales value of manufactured bread, cakes and other bakery products in Malaysia was approximately 2.61 billion Malaysian Ringgits.

Ishida & Steel (2015) described that the white loaf is the bread that is not enriched with fibers, and whole grain bread is made of whole grain flour which is high in fiber and other ingredients making the color of the bread become dark. Due to the high fiber content, whole meal bread is generally perceived as the healthier choice. However, some consumers cannot accept the texture and appearance of the whole-grain bread. As a result of increasing awareness of health benefits, consumers are also increasingly seeking fortified bread with vitamins and minerals. Therefore, the addition of date seed flour in the white bread formulation may increase the fiber content and acceptance among consumers.

The purpose of this study was to determine the quality acceptance and textural properties of white loaf incorporated with date seed flour. The bread physical and sensorial characteristics were investigated and the impactful findings from this research could benefit the food industry in Malaysia and also the consumers.

METHODOLOGY

Sample Preparation and Bread Formulation

Mazafati date seed being obtained (full ripeness) from local market (Nilai, Negeri Sembilan). The seeds were soaked in water, washed to get rid of any adhering date flesh and then air-dried using dehydrator (Food Dehydrator ED 2009). They also further dried at about 50 °C for 2 hours. Date pits were turned into powder by separately milled in a heavy-duty grinder (Eclipse Blender HBH750 Series). The powdered date pits were obtained by sieved them using 60-mesh sieve and preserved at 4 °c until analyses been carried out.

According to the methods done by Sudaryati et al. (2018) with slight modifications, wheat flour was blended with dates seed powder in four treatments. The flour composition for control was 100 % of wheat flour and 0 % of dates seed flour, treatment A was 5 % of dates seed flour and 95 % wheat flour, treatment B was 10 % of dates seed flour and 90 % wheat flour, treatment C was 15 % of dates seed flour and 85 % wheat flour.

The measurement for the material and the steps was followed from the method by AACC Method 10 - 10.03 (AACC, 2003) in Table 1. Four bread formulations were prepared by 0 %, 5 %, 10 % and 15 % (w/w) of date seed flour (DSF) replacing the wheat flour. Dough was optimally mixed until a mixer (Kitchen Aid, Michigan, USA) has rested at 25 °C and 75 % relative humidity for 30 minutes. Baking process were at 275 °C in an electric oven for 30 minutes. At room temperature, breads being cooled and packed in plastic sealer bags until further analysis.

Table 1 Ingredient used in the formulation of date seeds bread

Ingredients	Treatment group			
	Control	A (5 % DSF)	B (10 % DSF)	C (15 % DSF)
Dates seed flour (DSF)	0 g	20 g	40 g	60 g
Wheat flour	400 g	380 g	360 g	340 g
Yeast	4 g	4 g	4 g	4 g
Sugar	20 g	20 g	20 g	20 g
Milk powder	8 g	8 g	8 g	8 g
Water	250 g	250 g	250 g	250 g
Butter	24 g	24 g	24 g	24 g
Salt	8 g	8 g	8 g	8 g

Source: Sudaryati et al. (2018)

Analysis of bread quality

The height of loaf breads was measured by ruler (AACC Method 10-05.01). Loaf weight was measured by using a laboratory scale, an hour after baking and the readings were recorded in grams. According to the method done by Bartolomeual et al. (2011), the colour analysis of the bread was carried out using a Hunter Colorimeter equipped with an optical sensor (Hunter Associates Laboratory, Reston, VA 20190-5280, USA, Model: LabScan XE) to measure the colour of bread on the basis of CIE L*, a*, b* colour system. The L* values are black to white (0–100), a* values are positive for redness, and b* values are positive for yellowness.

Bread was cut into 25 mm thick slices with a bread knife after four hours cooling. The toughness and the force of penetration and cutting was carried out using a texture analyzer (Stable Micro Systems, USA) by following Korus et al. (2015) equipped with a 36 mm diameter cylindrical sample (pre - test speed: 1 mm / s, test speed: 1.7 mm / s, post - test speed: 10 mm / s and strain: 40 %). The hardness, adhesiveness, springiness, cohesiveness, and chewiness values were obtained based on Texture Profile Analysis (TPA).

Sensory analysis

For sensory analysis, hedonic test was performed followed Bortolomeu et al. (2011) to evaluate the overall quality and level of acceptability of the bread by the judgers of 70 panelists, with a 9 points scale. The panelists have experienced in the recognition of basic tastes, good health without oral or nasal infections, and did not wear dentures

or orthodontic appliances; have normal appetite; demonstrated ability to replicate trials; had good sensory memory; did not have an aversion to bread. By the hedonic tests the products were qualified to obtain the degree of appreciation by the judging panel. A scale of nine points ranging from ' extremely like ' to ' extremely dislike ' was used, corresponding to the highest and lowest scores of 5 and 1, respectively The score sheet contain a list of sensory descriptors (crust and crumb colour, characteristic aroma and taste, crust firmness, moisture, adhesiveness, crumb softness and breakdown, persistence, residual taste and overall acceptability).

Statistical Analysis

All analyses were performed in triplicate. The result for each parameter was described as the mean ± SD, analyzed using one-way analysis of variance (ANOVA) with significant differences between means were determined at ($p<0.05$) and evaluated by using the MINITAB software version 17. The classification of letters was according to the difference in which different letters in the same column indicated that the samples were significantly different when p-value ($p\leq 0.05$).

DISCUSSION

Texture Profile and Physical Properties

The prepared breads were analyzed for their physical properties namely loaf weight, loaf height, bread colour and texture profile analysis. It was observed that different compositions of flour in making bread has significantly affect the loaf weight and loaf height with value ranging from 220.73 g to 233.52 g and 5.44 cm to 4.29 cm, respectively as shown in Table 2.

Table 2 Values of loaf weight and loaf volume of different formulations

Formulation	Loaf Weight (g)	Loaf Height (cm)
Control (0 %)	220.73 ± 0.35^{d}	5.44 ± 0.05^{a}
A (5 %)	223.97 ± 1.18^{c}	4.72 ± 0.10^{b}
B (10 %)	229.97 ± 1.69^{b}	4.52 ± 0.03^{bc}
C (15 %)	233.52 ± 1.27^{a}	4.29 ± 0.25^{c}

Note: Control = (0 % DSF), A = (5 % DSF), B = (10 % DSF), C = (15 % DSF). DSF = Dates seed flour. Mean values with different letters within the same column are significantly different ($p<0.05$)

The physical attributes of bread samples incorporating various percentages of date seed flour substitution comparing to the control were stated in Table 2. The weight of the entire samples of date seed flour bread loaves were greater than the control wheat bread. In another word, the higher the level of substitution of the date seed flour, the weight of loaves increased, and the height of loaves decreased. The

result was similar to the one reported by Bouaziz et. al., (2020) using Date seeds of three cultivars (Deglet Nour, Ghars Souf, and Allig). The highest loaf weight was observed for sample C, 15 % date seed flour substitution. Also, sample C have the lowest value of loaf height which is 4.29 cm.

This condition might due to the texture of bread sample has become dense, carbon dioxide in the dough lesser and addition of date seed flour with wheat flour had affected the network of gluten in the bread. In addition, by substituting the date seed which contains high amount of fiber also resulting in heavier loaf weight. Higher fiber content have higher water absorption and increase in moisture (Muñoz and García, 2015). Hence, by adding wheat flour and more than 15% date seed flour shows to have an unfavorable quality of bread as they tend to become denser and harder.

Colorimetric parameter of four samples including the control were analyzed in triplicate, the mean score value is shown in Table 3. Colour analysis is important as L^* value represents 0 (black) to 100 (white) which indicated the darkness to brightness of the colour of product. For a^* value changes from redness to greenness while the b^* value changes yellowness to blueness. The colour of the bread influenced by the physio-chemical characteristics of the raw dough such as its moisture content, pH, reducing sugar and amino acid content. Tamanna and Mahmood (2015) mentioned that colour are attributed to the chemical reaction that takes place during baking, which are dependent on processing condition, such as Maillard reactions and caramelization which cause browning reaction.

Table 3 Values of L, a and b of dates seed bread made with different formulations

Values	Control (0 % DSF)	A (5 % DSF)	B (10 % DSF)	C (15 % DSF)
L	75.18 ± 0.34^{a}	63.37 ± 0.10^{b}	57.73 ± 0.19^{c}	48.66 ± 0.25^{d}
A	-0.53 ± 0.02^{d}	3.51 ± 0.02^{c}	4.23 ± 0.03^{b}	7.45 ± 0.04^{a}
B	23.13 ± 0.17^{a}	18.09 ± 0.14^{b}	18.15 ± 0.22^{b}	18.09 ± 0.14^{b}

Note: (L) vary from black (0) to white (100), values of (a) ranges from green (-60) to red (+60) and (b) values, from blue (-60) to yellow (+60). Mean values with different letters within the same column are significantly different ($p<0.05$)

From the Table 3, the L^*, a^* and b^* value of bread samples were significantly different ($p<0.05$) from one another. The dates seed flour used in this study for the samples which have influenced the colour of the bread samples. Furthermore, there were significant differences ($p<0.05$) in L, a and b value among the bread samples. The lightness (L) values of control was lighter and significantly ($p<0.05$) higher (75.18) compared to treatment A (63.37), followed by treatment B (57.73) and treatment C (48.66). The redness (a) values of treatment C was significantly ($p<0.05$) higher (7.45) compared to treatment B (4.23), followed by treatment A (3.51), while control showed the lowest a value (-0.53). Meanwhile, the yellowness (b) value of control was

significantly ($p<0.05$) higher (23.13) compared to treatment A (18.09), treatment B (18.15) and treatment C (18.09). Thus, all white loaf samples had significant different darker colour when increasing the amount of DSF. Similarly, muffins enriched with date seed flour were darker in a study by Ambigaipalan and Shahidi, (2015) which strongly supported the findings.

Texture Profile Analysis (TPA) parameters stimulate mastication process with different actions. In the experimental Texture Profile Analysis data, where supposed to be there are eight textural parameters were tested such as hardness, fracturability, adhesiveness, cohesiveness, springiness, gumminess, chewiness, and resilience. From the data obtained, only four parameters that were tested which includes hardness, cohesiveness, springiness, gumminess and chewiness. There was no significant difference between the attributes with bread samples. All the data involving all the texture attributes with the samples had been summarized in Table 4. These indicated that all bread samples have similar characteristics. Hardness is defined as force necessary to achieve given deformation and related to resistance of food to first and total mastication, respectively. Commonly, consumer would look up to hardness attribute of white bread first before choosing for another closed attribute such as chewiness or gumminess.

Table 4 Texture characteristics of different bread formulation

Parameters	Control	A (5 % DSF)	B (10 % DSF)	C (15 %DSF)
Hardness (g)	5.07 ± 0.35^{a}	5.13 ± 0.29^{a}	5.34 ± 0.33^{a}	5.42 ± 0.43^{a}
Springiness	0.88 ± 0.01^{a}	0.87 ± 0.00^{a}	0.86 ± 0.02^{ab}	0.82 ± 0.03^{b}
Gumminess (g)	2.98 ± 0.66^{a}	2.96 ± 0.43^{a}	2.60 ± 0.08^{a}	2.66 ± 0.29^{a}
Chewiness (mJ)	2.19 ± 0.31^{a}	2.24 ± 0.03^{a}	2.62 ± 0.60^{a}	2.81 ± 0.17^{a}

Mean values with different letters within the same column are significantly different ($p<0.05$)

Bread treatment C which contains 15 % date seed flour and 85 % wheat flour have the hardest texture. While for the chewiness, was influenced by the hardness attribute. Chewiness is the energy required to chew a solid food to a state of readiness for swallowing. Since the white bread with treatment C had the highest in hardness value thus, its chewiness measurement which is (2.81) indicated that this bread sample was slightly difficult to chew. Apart from that, gumminess was similar to chewiness, it was specifying as the energy to disintegrate a semi-solid food prior to swallowing. The result for gumminess is similar with the chewiness according to the Table 4.3. This outcomes has similar result for addition of *Shatavari* root powder in bread by Singh et al. (2014). However, Bouaziz et al., (2020) found out that the texture profile of bread (decrease of the hardness and chewiness by 41.54% and 33.81%, respectively) which is contradict with the finding of thi study. It could be elucidated that the higher amount of DSF incorporated, the harder the bread texture which is undesirable for consumer and has low quality acceptance.

Sensorial Properties

The mean scores for appearance, colour, texture, and taste for control, formulation A, B and C were presented in Figure 1. The result on sensory qualities obtained by 70 panelists showed that were not significantly ($p<0.05$) difference among all bread samples with the values ranging from 6.4 to 6.97, 6.51 to 6.89, 6.07 to 6.74, 6.49 to 6.94 and 6.67 to 7.06 for appearance, colour, texture, taste and overall acceptability respectively. The highest mean score for appearance, colour and texture was observed in formulation A with 5 % date seed flour substation while taste was observed in formulation B with 15 % date seed flour substitution.

It was observed that the value for appearance, colour and texture were decreased linearly as increased date seed flour concentration for 5 %, 10 % and 15 % compared to the control with no addition of date seed flour. Formulation C have the least mean score (6.40) in terms of appearance compared to other formulations. The formulation A with 5 % date seed flour was the highest mean score with 6.97 among other formulation. However, the differences were not significant as the p-value 0.068 was more than 0.05.

In colour, formulation A had the highest mean score 6.89, while formulation C had the least (6.51). It was noted that the breads colour became gradually darker across formulations. The results likely related to the appearance where it showed that, the increasing of date seed flour substitution cause decreased in colour. However, most of the panelists were still accept the colour of bread with date seed flour substitution as the mean scores were similar to all samples.

It was found that formulation A had the highest scores of texture (6.74), followed by formulation B with 6.69, and control with 6.37, while the formulation C had the least (6.07). Hence, increasing the level of date seed flour reduces the mean score for texture even because the bread was harder compared to the control. This is an evident from the data stated in Table that the hardness profile value of the bread increased with the increasing percentage of date seed flour.

The data illustrated in Figure 1 indicates that there was a clear different between sample A, B, C and control in term of taste. Plus, it was found that formulation B consisted of 15 % date seed flour with 85 % of wheat flour have the highest mean score (6.94). As shown in Figure 2, most panelist have chosen the formulation B since it gave the best quality in term of taste. Brouk and Fishman (2016) cited that date seed able to be coffee-substitute in food product as it produced a similar aroma and taste to coffee. This may be an advantage to date seed bread compared to the normal wheat bread.

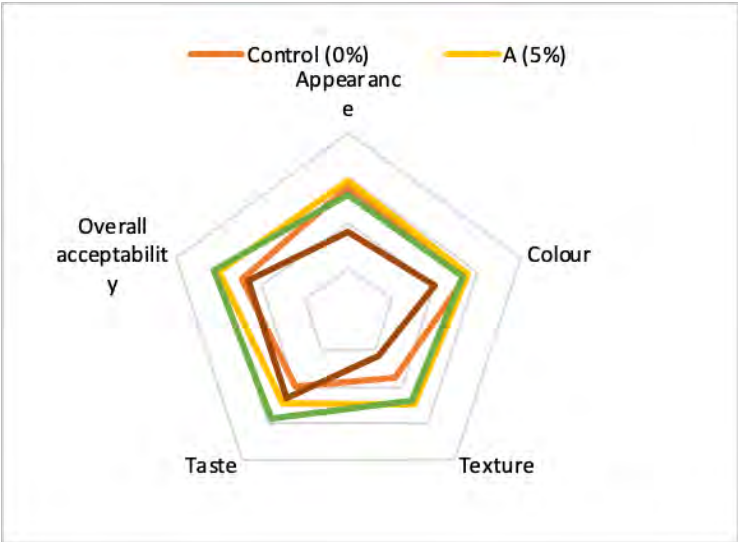

Figure 1 Spiderweb chart of sensory attributes

CONCLUSION

From data observation, it could be concluded that formulation B with 10 % substitution of date seed flour was the best addition level, thus was recorded to be the highest mean score for overall acceptability compared to other samples including control. This result was similar to the finding by Mongi (2011) as the additional of 10 % cocoyam flour in bread was the best formulation that being accepted by the panelists. The valorization of date seed which always be seen as a useless by-product could be potentially used as an important source of dietary fibers and could enrich the quality propoerties of bread product. In future study, it is recommended to future researcher to inspect the the antioxidative properties of date seed flour as a promising functional ingredient for food products.

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