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Quality Characteristics and Sensory Attributes of Dough and Bread Fortified by Carob, Malt and Soybean Flours

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ABSTRACT

Background: The objective of this study was to evaluate the effect of the partial replacement of wheat flour by carob, malt and soybean flours on the characteristics of dough's and breads.

Methods: For preparation of basic dough, wheat flour was blended with water, sodium chloride and dried yeast. The samples were subjected to the operations of mixing, proofing and baking. The carob, soybean and malt flours were used in increasing ratio 1-5%.

Result: Physicochemical properties of composite flours showed that the proteins level (for soybean), ash, fat, fatty acids and starch were increased with increase level of flours substitution. Composite flours prepared with carob and soybean displayed higher amounts of dry and wet gluten, Zeleny number and lower value of failing number. For sensory characteristics, carob and soybean breads received higher liking scores compared to the malt and wheat samples. For malt, only 1% was able to improve the color, section shapes and texture of bread. This study demonstrated the potential use of carob, soybean and malt flours to improve the overall characteristics of the dough's and breads.

Key words: Bread, Carob, Dough, Malt, Soybean.

INTRODUCTION

Bread is one of the oldest products widely consumed in the world. This fermented food is manufactured mainly from wheat flour, water, salt and yeast by a series of operations of mixing, proofing, shaping and baking (Dutta *et al.* 2018). Bread is a very elaborate food; its preparation requires a technological and scientific knowledge to achieve a finished product of very good nutritional and sensory quality. This quality is due to the quality of the flour used and also to the different substances used as additives in order to improve the different aspects of the product (Verma *et al.* 2018). Bakery industries use wheat flour as the important raw material in bakery products for its viscoelastic characteristics; it dominates over other cereal flours (Adeniji, 2015). Wheat gluten protein is mainly responsible for the protein-starch interaction that gives specific viscoelastic properties, the strengthens the dough, for the stabilization and retention of then gas cells during the proofing and baking process. Currently, due to the high cost and high demand of wheat flour, strong initiatives are taken toward the provision of alternative natural source of flour. It is therefore of economic advantage is wheat import can be reduced by substitution with other local nutrient dense materials. Composite flour is a combination of wheat and non-wheat flours for the manufacture of leavened breads, other baked products and pastas to be used for traditional or novel products (Marco and Rosell, 2008). Additionally, the composite flours can have nutritional benefits than the individual flours lack. These properties can be optimized by adjusting the composition of the flour blend. The cereals can solve the deficiency of macro and microelements (*e.g.* Fe, Zn, I, essential amino acids, proteins, vitamins) in nourishment by fortification of wheat flour with absenting or deficiency elements and compounds (Verma *et al.* 2018). Partial or total substitution of wheat flour with available by-products flours remains a good viable option. Soy proteins are used as functional and nutritional food additives and are a good source of some of the essential amino acids used to complement cereal proteins deficiency (Husain and Bhatnagar, 2018). It promotes moisture and flavor retention, aid emulsification and enhances the texture of many foods. The objective of this work was to evaluate the effect of the partial substitution of wheat flour with carob pod, malted barley and soybean flours on the qualities of dough and bread.

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MATERIALS AND METHODS

Vegetable material

Commercially white wheat flour (*Triticum aestivum* L.) T.75% expressed as the milling yield without additive was obtained from the Company of Cereal Food Industries and Drifts (Mascara, North-West of Algeria) in the month of November 2017. The salt, instant dry yeast and soybean seeds were obtained from the local market. Different vegetable improvers were used for the formulation of composite flours. Soybean flour (*Glycine max*) was used for it richness in proteins, malted barley flour (*Hordeum vulgare*) for it higher content of starch and alpha amylase enzymes and carob pod flour (*Ceratonia siliqua* L.) for its richness in fibers, flavoring power, microelements and carbohydrates contents.

Preparation and physic-chemical characterization of flours

All experiments were carried in Bioconversion Laboratory, Microbiology Engineering and Health Saftey, (Mascara University, Algeria) during year of 2018. Soybean seeds were sorted to eliminate extraneous matter, boiled for 30 min to facilitate decortications and then manually dehulled, drained and oven dried at 60°C for 48 h (SPAG, Massy, France). Dried seeds were then milled in a domestic grinder to obtain fine flours. Malt was prepared by steeping of the barley variety Saida 183 (obtained in the month of October 2017 from the Cereals and Vegetable Cooperative) in distilled water (grain to water ratio is 1:2) at 30°C for 24 h, followed by germination for 4 days in a sterile moistened cloth bag kept in dark. Moistened conditions were maintained throughout the germination step by spraying distilled water. The grains were dried at 80°C under the sun to arrest germination and the dried grains were pulverized into malted barley flour. The carob pods were collected in the month of October 2017 from the region of El-Menaouer (Mascara). These pods were washed and then cut into small particles 1-2 cm, dried at 80-90°C and grounded into fine powder. The carob (CF), soybean (SBF) and malt (MF) flours were used for the substitution of wheat flour (WF) in increasing proportions ranging from 1-5% (ratio flours added/WF in percentages 1:99, 2:98, 3:97, 4:96 and 5:95). The following qualitative and quantitative characteristics of WF, SBF, MF, CF and their composite blended flours were determined chemically according to the official methods (AACC, 2000). The pH was measured by using a digital pH-meter (Mettler Toledo. MP220) and titratable fatty acids (TFA) were determined after liberation of fatty acid present in 5 g of flours by 30 mL of ethanol 95% and centrifuged for 5 min at 3000 rpm (Sigma labrzentrifugen D-37620 Osterode am Harz, Germany). The TFA were determined by titration of supernatant 20 mL with 0.05 N NaOH using phenolphthalein as indicator. The control was conducted by manual titration of 20 mL of ethanol 0.05 N by NaOH using phenolphthalein. The volume of NaOH required to neutralize the test was recorded and used to evaluate the content of TFA according to the formula:

$$\text{TFA} = \frac{0.075\ (v1 - v0).100}{m} \qquad ...(1)$$

Where,

V0: volume of NaOH used to neutralize the control.

V1: volume of NaOH used to neutralize the sample.

M: mass of sample.

The moisture level was evaluated by measuring the mass of the sample before and after water is removed by evaporation in an oven at 130°C for 1.5 h until constant mass was obtained. Fat level was evaluated by SOXHLET method and starch content by the protocol as described by Mathew *et al.* (2006). Five grams of tested flours were mixed with 100 mL cold water and left for 1 h. After the removal of the soluble compounds, the residues were exposed to acid hydrolysis with 37% HCl acid for 2.5 h. Subsequently, the samples were cooled, neutralized with 5N NaOH and centrifuged. The evaluation of the formed sugars was performed using a 3.5 dinitrosalicylic acid spectro photometric method (model Hitachi 4-2000) at 540 nm, using glucose as standard. The sugars to starch conversion factor used was 0.9. Total nitrogen and proteins level were evaluated by the Kjeldahl method (ISO 20483: 2014), using a conversion factor of 5.7 for converting nitrogen into proteins. The ash level was evaluated by incineration 5 grams of flour in a muffle furnace (Nabertherm, Germany) at 900°C during 2 h. Standardized methods were conducted to evaluate falling number (ICC 107/1), wet and dry gluten level (ICC 137/1) and Zeleny sedimentation index (ICC 116/1). Hydration capacity (HC) was determined according to the formula:

$$\text{HC\%} = \frac{\text{Wet gluten - Dry gluten}}{\text{Dry gluten}} * 100 \qquad ...(2)$$

Formulation of dough samples and alveogram parameters

1 kg of wheat or composite flours were placed in the mixer (Kitchen Aid, 5K45SS, USA), then 600 mL of water at 27°C, 20g of sodium chloride and 20 g of dried yeast were added. After mixing for 15 min, the dough samples were rounded and bulk fermented at 27°C for 40 minutes. After proofing, dough was divided into 100 and 200 g dough pieces, baked at 250°C for 30 minutes in an electrical convection oven (Brio-Inox, Gierre, Milano). The composite flours were prepared by partial substitution of WF by CF, SBF and MF in increasing ratio 1-5%. The alveograph (Chopin NG France) was used to evaluate parameters that provided insight in the fermentation tolerance of the dough as may be exhibited during proofing stage of bread making. Characteristics included the overpressure P (mm), extensibility L (mm), energy of deformation of the dough W (10^{-4} J.), inflation required for maximum development G and P/L ratio of configuration were measured with the Chopin alveograph on 250 g samples.

Sensory evaluation of breads

The sensory analysis was conducted to evaluate the degree of the acceptance of the bread by consumer using a 5-point hedonic scale with 1: less good, 3: acceptable, 5: very good according to the (ISO 8586: 2014) method. The panellists were selected according to the criteria checklist that included: Good health, non-smoker, no allergic to wheat, malt, carob and soy bean, willingness to participate and passion/likeness for the consumption of bread. Ten selected trained participated in the sensory evaluation and they were asked to fill in a questionnaire which included the following questions for the appearance (section shape, crust colour, crust odor and crust delicacy) and internal characteristics (crumb texture, crumb colour and crumb odor).

Statistical analysis

All analyses and experiments were performed in triplicates and data are presented as mean values. The statistical analysis of the data was determined by analysis of variance (ANOVA) to determine significant differences among samples and statistical test with statistical error did not exceed 5% (with a 95% confidence level) using SPSS, version 9.1 (StatSoft, Inc., USA).

RESULTS AND DISCUSSION

Proximate composition of the vegetable and composite flours

Table 1 shows the summary of all parameters that were evaluated in our research. The substitution of WF by CF, MF and SBF slightly increases the pH of the composites flours. Results indicate that WF exhibited higher moisture level 14.2±0.3% and lower ash content 0.6±0.03% compared to the moisture of CF 10±0.2%, MF 4.5±0.1% and SBF 13±0.1%. As far as the different ash levels are concerned (0.6% for WF vs. 1.7% for CF, 1.6% for MF and 3.2% for SBF flours), they can be justified considering that WF was white, while other flours was whole-grain and, as a result, contained more minerals. Frakolaki *et al.* (2018) found the value of 13.57% for moisture content and 0.68% for ash content. SBF present the high content of proteins 22% compared to the CF 4%, MF 9% and WF 12%. An increase in the level of proteins was observed due to the addition of SBF from 12% for WF to 13.2% for composite flour at 5%. The addition of CF or MF seems to have a negative effect due to the decrease of proteins up to values of 10.7% and 8.3% respectively at ratio of 5%. The level of protein of WF obtained was higher to 11.58% cited by Frakolaki *et al.* (2018) and close to 11.8% reported by Lukin and Bitiutskikh (2017). The amount of protein of SBF obtained was lower to 38% cited by Singh *et al.* (2008). However, the substitution of WF by CF and MF decrease the level of protein contents.

Table 1: Some chemical composition of wheat (WF), carob (CF), malt (MF), soybean flours (SBF) and their composite blends.

Attributes	Flours		Composite flours (Improver flours/wheat flour in %)				
	100%		1:99	2:98	3:97	4:96	5:95
pH	WF	6±0.1					
	CF	5.9±0.2	5.9±0.1	6.1±0.3	6.2±0.1	6.2±0.2	6.2±0.1
	MF	6.7±0.1	6.1±0.2	6.2±0.1	6.2±0.3	6.3±0.2	6.3±0.1
	SBF	6.3±0.3	6.3±0.2	6.2±0.1	6.3±0.2	6.3±0.1	6.5±0.1
Moisture %	WF	14.2±0.3					
	CF	10±0.2	13.9±0.1	13.4±0.2	12.9±0.3	12.4±0.1	12±0.1
	MF	4.5±0.1	13.8±0.2	13.2±0.2	12.7±0.2	12.2±0.2	11.8±0.1
	SBF	13±0.1	14.1±0.2	13.8±0.2	13.3±0.1	12.9±0.1	12.2±0.2
Ash %	WF	0.6±0.03					
	CF	1.7±0.04	0.7±0.02	0.76±0.01	0.84±0.03	0.95±0.04	1.23±0.04
	MF	1.6±0.02	0.7±0.03	0.74±0.02	0.82±0.01	0.93±0.05	1.20±0.03
	SBF	3.2±0.04	0.7±0.03	0.76±0.02	0.87±0.01	0.96±0.04	1.26±0.04
Proteins %	WF	12±0.2					
	CF	4±0.3	11.8±0.2	11.3±0.3	10.9±0.2	10.8±0.2	10.7±0.3
	MF	9±0.32	10.6±0.2	10±0.2	9.9±0.2	9.4±0.2	8.3±0.1
	SBF	2±0.1	12.3±0.2	12.4±0.2	12.5±0.4	12.9±0.1	13.2±0.2
Starch %	WF	60.3±0.7					
	CF	64.2±0.6	67.4±0.6	69.3±0.2	69.5±0.4	70.9±0.4	72.4±0.4
	MF	64.2±0.6	67.4±0.4	69.3±0.4	70.8±0.6	73±0.3	73.2±0.5
	SBF	74±0.7	70.1±0.2	71.5±0.2	73.2±0.3	74.6±0.2	75±0.4
Fat content %	WF	0.9±0.02					
	CF	0.4±0.01	0.9±0.03	0.9±0.02	0.8±0.02	0.8±0.03	0.7±0.03
	MF	2.2±0.05	1.1±0.04	1.2±0.03	1.2±0.02	1.3±0.02	1.4±0.02
	SBF	1.2±0.04	1±0.04	1.1±0.02	1.2±0.03	1.2±0.02	1.3±0.02
Fatty acids %	WF	0.07±0.02					
	CF	0.08±0.01	0.06±0.01	0.06±0.02	0.06±0.01	0.06±0.02	0.07±0.02
	MF	0.04±0.02	0.09±0.02	0.1±0.03	0.12±0.02	0.14±0.03	0.17±0.03
	SBF	0.03±0.02	0.09±0.01	0.09±0.02	0.1±0.03	0.1±0.02	0.13±0.02

Values represent Mean±SD; n=3; Confidence level p≤0.05.

Similar result was obtained by Bakare *et al.* (2016). The starch content of WF 60.3% was lower to 66.38% reported by Frakolaki *et al.* (2018). CF and MF displayed similar results 64.2% and very high value for SBF (74%). All added flours improve the starch content of composite blended flours. WF is poor in fat content, the value obtained 0.9% was lower to 1.9% cited by Lukin and Bitiutskikh (2017). The addition of MF and SBF significantly increases the amount of fat and fatty acids contents of the composite flours, unlike the CF which, when incorporated, reduces the quantities of fat and fatty acids.

As shown in Table 2, WF contains 32.1% and 10% of wet and dry gluten. WF displayed higher quantity of wet gluten compared to 28.24% reported by Frakolaki *et al.* (2018). The level of the dry gluten obtained in WF was lower to 10.9% cited by same authors. The increasing ratio of CF and SBF in composite flours improves the content of wet and dry gluten respectively to 34.8±0.4%, 11.3±0.1% for CF and 35.1±0.2, 11.8±0.4% for SBF at concentration of 5%. The richness of CF and SBF flours in hydrophobic substances and emulsifiers ingredients caused a decrease in the water hydration capacity and provokes the increase of the values of wet and dry gluten. This result was in line with the work of Nour *et al.* (2017). Conversely, increasing ratio of MF reduces the percentages of wet and dry gluten. This is related to the partial replacement of wheat flour proteins (gliadins and glutenins) capable to forms viscoelastic gluten by malt proteins which are competent to do this. Both protein amounts and gluten quality correlate to the sedimentation index. The strength of the flour is higher than this sedimentation index is more important. WF exhibited 12% of protein amount and quality Zeleny volume 23 mL. The quality Zeleny volume presented in WF is similar to the quality of two varieties of wheat (11.5% protein, 22.75 mL Zeleny volume and 13.5% protein, 23.25 mL Zeleny volume) studier by Salehifar *et al.* (2010). The increasing ratio of CF and SBF in blended composite flours improves the values of sedimentation index, unlike the presence of MF decreases the level of this index. The results of proteins and gluten obtained for composite flours in the presence of these improvers flours confirm the value of sedimentation index obtained. As malt composite flour does not contain any gluten content, so with the increase of blending proportion of composite flour with wheat flour *i.e.* with the decrease in wheat flour content, the sedimentation volume also decreased. The falling index allows the appreciation of the alpha amylase activity of wheat. This activity has an influence on the bread fermentation and on the final structure of the bread. It appears that the WF displays a lower value of alpha amylase activity and a very slow time which indicates a high falling index (320 sec). The value of failing number of WF obtained was close to 316.3 cited by Bakare *et al.* (2016). The increasing ratio of CF, MF and SBF in the composite flours significantly improves the failing number due to the significant contribution of alpha amylase enzymes. The contribution of amylase enzymes and simple fermentable sugars by the three flours improves the performance of the fermentation, especially at low levels of incorporation 1 to 2%.

Alveographic characteristics

The control dough obtained from 100% of WF has energy W of 144.10^{-4} j, a swelling index G of 24 cm^3, P 36.3 mm and P/L configuration ratio of 1.5 (Table 3). Bakare *et al.* (2016), report that the WF displayed the value P of 90, energy W of 304.10^{-4} j, curve of configuration ratio P/L of 1.13 and swelling index G of 19.9. It seems that the energy of deformation W decreases with the increase of the percentage of the three flours incorporated. W and G are acceptable only for control and composites dough's at 1% and 2% which have good elasticity and maintain structure.

Table 2: Technological characteristics of wheat flour (WF) and blended composite flours.

Attributes	WF	Improver flours	Composite flours (Improver flours/wheat flour in %)				
			1:99	2:98	3:97	4:96	5:95
Wet gluten %	32.1±0.3	CF	29.7±0.2	29.8±0.3	34.2±0.1	34.4±0.3	34.8±0.4
		MF	27.3±0.1	20.1±0.2	17.2±0.1	20.1±0.2	20.4±0.3
		SBF	34.5±0.3	34.7±0.3	34.8±0.1	34.9±0.2	35.1±0.2
Dry gluten %	10±0.4	CF	9.3±0.3	10.3±0.2	11.1±0.1	11.7±0.4	11.3±0.1
		MF	9±0.1	7.1±0.2	6.4±0.4	6.2±0.2	6.3±0.2
		SBF	10.8±0.2	11.2±0.2	11.5±0.2	11.6±0.1	11.8±0.4
Hydration capacity %	68.88	CF	68.68	65.43	67.58	67.29	67.47
		MF	66.99	64.67	62.79	69.15	68.95
		SBF	68.69	67.72	66.95	66.76	66.38
Sedimentation index (mL)	23±0.2	CF	24±0.2	26±0.3	27±0.1	29±0.1	31±0.2
		MF	21±0.3	18.2±0.2	17.4±0.1	15.5±0.2	14.7±0.2
		SBF	27±0.3	28±0.2	30±0.1	32±0.1	33±0.2
Falling index Sec	320±0.6	CF	270±0.6	245±0.4	224±0.6	205±0.4	190±0.3
		MF	258±0.5	247±0.5	222±0.6	218±0.4	195±0.3
		SBF	260±0.5	250±0.6	235±0.2	220±0.3	205±0.3

CF: Carob, MF: Malt, SBF: Soybean flours.Values represent Mean±SD; n=3; Confidence level $p \leq 0.05$.

Sensory evaluation of breads

As far as the sensory determination of bread samples is concerned (Table 4), carob and soybean products received significantly higher liking scores compared to the malt and wheat samples. The results indicate that the color of the appearance of the bread was significantly (*p<0.05*) improved and higher appreciated by the panellists with the increase of the carob and soybean ratio. For malt, the only color of bread appreciated (*p<0.05*) was which is added with 1%. Malt bread sample presented noticeably darker crust and crumb color. This was expected mainly due to the higher fibers and bran content. In addition, malt flour is, by nature, darker than wheat flour and contains starch that can be hydrolyzed more easily by higher level of alpha amylase into sugars, participating at the Maillard or caramelization reactions which impart the characteristic brown color at bread's crust. All ratios of the carob and soybean improve significantly (p<*0.05*) the section shapes, whereas for malt only 1-3% ratio were selected. According to Rozylo *et al.*

Table 3: Alveogram of wheat flour (WF) and its composite blends.

Attributes	WF		Composite flours (Improver flours/wheat flour in %)				
			1:99	2:98	3:97	4:96	5:95
W (10^{-4} Joules)	144±0.4	CF	140±0.4	136±0.5	132±0.3	130±0.41	115±0.2
		MF	139±0.2	132±0.5	120±0.3	11±0.4	94±0.5
		SBF	138±0.6	135±0.5	128±0.3	125±0.4	112±0.3
G (cm^3)	24±0.2	CF	23.8±0.2	22.5±0.3	18.4±0.3	16.2±0.2	14±0.1
		MF	23.6±0.6	23±0.4	16.1±0.1	11.1 ±0.3	11.1±0.2
		SBF	22.9±0.2	22.1±0.2	19.3±0.2	18.2±0.2	13.4±0.4
P (mm)	36.3±0.3	CF	37.4±0.2	39.2±0.1	52.4±0.2	53.6±0.1	58.4±0.1
		MF	38.8±0.3	39.6±0.3	50.6±0.2	54.1±0.1	61.2±0.2
		SBF	36.4±0.2	38.6±0.3	53.1±0.2	55.2±0.1	60.3±0.3
P/L	1.5±0.2	CF	1.2±0.1	1.6±0.2	2.3±0.3	3.4±0.2	4.1±0.1
		MF	1.6±0.1	1.8±0.2	3.1±0.3	4.9±0.2	5.5±0.1
		SBF	1.2±0.2	1.6±0.1	2.4±0.1	3.6±0.2	4.3±0.1

W: Energy of deformation, G: Maximum inflation, P: Peak height, P/L: Curve configuration. Values represent mean±SD; n=3; Confidence level $p \le 0.05$.

Table 4: Sensory qualities of bread samples.

Attributes	Wheat breads		Score of composite breads				
			1:99	2:98	3:97	4:96	5:95
Crust colour	4.5±0.2	CF	4.5±0.1	4.6±0.1	4.7±0.3	4.8±0.1	4.9±0.2
		MF	4.8±0.1	4.3±0.1	4.1±0.2	3.6±0.2	2.5±0.1
		SBF	4.6±0.2	4.7±0.1	4.7±0.1	4.8±0.2	4.9±0.1
Section shape	3±0.1	CF	3.1±0.2	3.1±0.1	3.3±0.3	3.4±0.2	3.4±0.1
		MF	3±0.2	2.7±0.1	2.5±0.1	2.3 ±0.2	2±0.3
		SBF	3.3±0.2	3.4±0.1	3.8±0.2	3.2±0.3	3.1±0.1
Crust odor	3.5±0.2	CF	3.4±0.2	3.5±0.2	3.6±0.2	3.6±0.1	3.8±0.1
		MF	4.3±0.2	2.9±0.1	2.1±0.3	1.5±0.2	1.5±0.2
		SBF	3.6±0.2	3.3±0.1	3.1±0.2	3.2±0.1	2.9±0.3
Crust delicacy	4.7±0.3	CF	4.1±0.1	4.3±0.2	4.3±0.3	4.4±0.2	4.1±0.2
		MF	4.3±0.1	4.1±0.3	3.7±0.2	3.7±0.1	3.3±0.2
		SBF	4.2±0.2	4.6±0.1	4.7±0.1	4.8±0.2	4.9±0.1
Color of crumb	4.8±0.1	CF	4.6±0.1	4.6±0.2	4.3±0.1	4.4±0.2	4.1±0.1
		MF	4±0.2	3.8±0.2	2.9±0.1	1.9±0.2	1.5±0.1
		SBF	4.8±0.3	4.6±0.2	4.4±0.2	4.1±0.2	4.1±0.2
Texture of crumb	4.5±0.3	CF	4.7±0.1	4.6±0.2	4.6±0.1	4.7±0.2	4.7±0.1
		MF	4.9±0.1	2.8±0.3	2.1±0.1	1.4±0.2	1.1±0.2
		SBF	4.5±0.2	4.6±0.1	4.6±0.2	4.8±0.1	4.9±0.1
Odor of crumb	3.7±0.3	CF	4.1±0.1	4.3±0.2	4.3±0.3	4.4±0.2	4.4±0.1
		MF	4.3±0.2	3.7±0.2	3.7±0.1	2.4±0.3	1.9±0.2
		SBF	3.4±0.2	3.6±0.1	3.7±0.2	3.6±0.2	3.8±0.1

Values represent Mean±SD; n=3; confidence level $p \le 0.05$.

(2017), the addition of carob fiber provokes the significant changes of colour and texture of the bread crumb. For odor, only 1% of malt and soybean were retained and all percentages of carob incorporated improve significantly ($p<0.05$) the odor of the bread. Only 3-5% of soybean doses improve the delicacy of the crust. Regarding the internal aspect of bread, only 1% of soybean gives a colour equal to that of the bread control. Furthermore, samples also presented distinct differences in their textural properties (dough, crust and crumb hardness). The carob and soybean contribute to the significantly ($p<0.05$) improvement of the texture of the crumb and just 1% of malt improves this texture. Our results of sensory evaluation of the crumb texture are in good line with the observations of Wang *et al.* (2002) and not in line with the results of Rozylo *et al.* (2017).

CONCLUSION

Based on the above results, carob, malt and soybean flours have a notable potential can be used to increases health and nutritional benefits. These flours contains considerable amounts of ash, fat, fatty acids, insoluble and soluble dietary fiber, starch, protein for SBF and gluten that may allow the formation of a cohesive matrix, hold the produced CO_2 and result in an expanded and well-shaped final product. For alveograph characteristics, the tenacity P and the ratio of configuration P/L increases with increased level of incorporation. W and G are acceptable only for control and composites dough's at 1% and 2% which have good elasticity and maintain structure. For sensory evaluation, carob and soybean breads received significantly higher liking scores compared to the malt and wheat samples for colour of the appearance, section shapes, odor and delicacy of the crust. The carob and soybean contribute to the improvement of the texture and odor of the crumb. For malt, only 1% was able to improve the colour, section shapes and texture of bread.

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