USING OF REDOX AGENTS IN CONDITORY PRODUCTS, CAKES AND BISKUITS

MAJLINDA SANA[1], GAFUR XHABIRI[2], ELTON SEFERI[3] AND ABDYL SINANI[3]

[1]AlbaniaUniversity of Tirana, Faculty of Pharmacy

[2]StateUniversity of Tetova, Faculty of Food Technology and Nutrition

[3]AgricultureUniversity of Tirana, Faculty of Food Biotechnology

Corresponding author email: lidabrahaj@hotmail.com

Abstract

Using of additive tested has a reduction effect on hydrogen's links of gluten proteins in preparing of dough for confectionary production. Effects is attributed the action of the additives (redox agents) that have at their optimum from 12 in 20 ppm, which affect in decreasing of the dough resistance increasing extension ranged. The activity of the additive has a correlative connection with cultivars of the wheat and radius of flours. Redox agents (additives) are the products with chemical-based, which through oxidation or reduction reactions that develop in the dough, change the physical and rheological properties of confectionary product. Structures and formations quantitatively of gluten proteins determine the quality of the dough for cakes and biscuits. Reductants are substances that affect in the gluten soften, weakening the links from –SS- in –SH. Their impact is reducing of overall molecular weight to aggregates of the gluten proteins. The first stage of the reaction is interaction of reluctant with gluten proteins that is an exchange of SH/SS, which release a unit of proteins and leaves a link –SS- between proteins and reluctant, leaving so second group of proteins –SH free and giving the oxidized form to the reluctant. The most used of reluctant are L-Cysteine and Sodium Metabisulphites. By tests made results that using of these reductants leads to an advanced extension of the confectionary dough and to a very good form of the final product.

Key words: Quality ofconfectionary dough, wheat cultivar, redox agents, dough rheology.

1. Introduction

Flours with low gluten content in general are more suitable for producing baked confectionery. The tendency of the dough to return to the initial state after being opened and the formation of gluten granules in cake dough and biscuits are reasons for this study. Even if it is not available a flour with low protein content or with weak gluten, using of redox agents, for example ascorbic acid, amylase, cysteine, yeast, sodium metabisulfate passive, give a positive effect on all stages of the process by reduced elasticity of the dough [1].

Mill will be uniform, the reduction of the thickness of the dough pin will be faster and retrieval, resting time of dough can be shortened, the pieces of dough protects the given form by the cutting, contraction and curvature in the oven and the formation of thin cracks avoided [2].

Among the modifications undergone by flour during thermal treatment are physical changes, chemical and nutritional value. There are two ways to handle acquisition of cake, that are using of thermally treated flour and additive using, compared with a reference flour [3].

2. Materials and methods

Confectionery products: Production of confectionery products are manufactured using flour from a variety of Apache (France), Anchor (Russia) and Progress (Albania), the specified percentage of every cultivar; also are used sugar, yeast, and food additives. Cake and biscuits production of various types were conducted in laboratory Vora flour factory, and in the laboratory of Biotechnology Faculty in the University of Tetovo, using the method AACC 2000. Additives are used in recipes with different concentrations, as mentioned in Table 1 [4].

Productions of confectionery products are carried out with simples of flour reference and them with adding food additives. To perform these experiments were taken:

Eight reference samples – have been produced cake and biscuits with various forms without additions. Reference flour is produced by mixing 60% (Anchor and Progress) and 40% Apache, range 70% and ash content 0.58-0.60% (Table 2). The table shows the composition of the flour used for the manufacture of confectionery products.

Eight samples - adding 20 ppm ascorbic acid;

Eight samples - with four additives: 20 ppm α-amylase, 20 ppm cysteine, 40 ppm hemicellulose and 20 ppm ascorbic acid [5].

Analysis used are performed according to AACC method (2000), where the following parameters: humidity (Method no. 44-15 A), ash (method no. 08-01), fat in bran (Method no. 30-10), proteins in bran (Method no. 46-10), and fiber in bran (Method no. 32-10) [6].

Qualitative indicators of wheat for study

Table 1: Content quality of wheat for study.

Wheat veriety	Wheat quality						
	Weight Hectolitre kg/hL	Himidity (%)	Proteine (%)	F.N (sek)	Amylase AU	Gluten %	W P/L
Apache	78	12.7	11.8	370	600	23	200
Ankor	80	13.5	14	290	400	30	300
Progres	76	13.7	13.8	531	700	28	210

Table 2: Composition of wheat flour. (Reference flour: 60% Ankor dhe Progres, dhe 40% Apache)

Parameters	Value (%)
Humidity	12.5±0.02
Total ash	0.52±0.01
Fat in bran	0.95±0.02
Protein in bran	11.05±0.03
Fibers in bran	0.42±0.01
Carbohydrates	85.61±2.34

Analysis of dough rehology: Analysis of doughts rehology are carry out by Farinograph, Mixograph and Falling Number according to the method ISO 21415- 1 , ISO 7971 -3, ISO 712, ISO 20483, ISO 3093, AACC 54-21 and 54-40, respectively AACC 2000 [6].

Sensorial evaluation: Sensorial evaluation of confectionery products treated with additives were conducted by a panel of 5-member testers to determine the effect of redox agents (food additives) on the characteristics of domestic and external manufactured confectionery products. To determine the rheology characteristics are used 300 grams flour for each analysis with FarinographBrabender, Alveograph Chopin dhe Ekstensograph [7].

3. Results and discussions

Farinograph Studies: Farinographic parameters such as water absorption, advent time, dough development time, dough stability time, and mixing tolerance index were studied under the influence of different doses of additives used. Table 3 explains the influence of additives used on farinographic parameters, except absorption of water that shows no effect during treatment with food additives (Table 4) [4].

Farinographic parameter (Table 5) of water absorption does not increase proportionally with increasing concentrations of food additives, and maximum water absorption was 59.6 ± 0.11% in T_3 (500 IU/100 g flour) followed by 59.1 ± 0.12% in T_2 (250 IU / 100 g flour), while the minimum value for the parameter is calculated based control, e.g. 57.9 ± 0.8%. Time of advent of all treatments reduced with increasing concentration of additives. Flour control shows the maximum time of advent 1.9±0.08 min, while the minimum advent time of 1.3±0.07 min is calculated in T_3 (500 IU/100 g flour) [5]. Depending on the dough development time, it decreases gradually with increasing units of food additives. Flour without addition of food additives shows maximum time dough development (4.7 ± 0:02 min), while T_3 shows minimal development time of dough (3.9 ± 0:08 min). Similarly, when the additives units increase in flour gradually, dough stability decreases progressively. The control shows the maximum of dough stability (10 ± 0:13 min), while T_3 shows the minimum time of stability (8.1±0:08 min) [8, 9].

Table 3: Using of different doses of food additives in bread production.

Treatment Redox agent (IU/100 g flour) (α-amylase, cysteine, hemicellulose and ascorbic acid)
Control
110 IU/100 g flour
245 IU/100 g flour
520 IU/100 g flour

IU = international units to measure the activity of food additives.
Example: Vitamin C: 1 IU is equal to 50 µg L-ascorbic acid.

Table 4. Measurements of Farinographic characteristics.

	WA	AT	DDT	DST	MTI
Control	57.9	1.9	4.7	10	60
Weighted average of treatment 1st	58.3	1.8	4.5	9.5	65
Standard deviation of treatment 1st	0.11	0.04	0.06	0.11	2.2

Table 5. Values of Farinographic characteristics.

Treatment	WA (%)	AT (min)	DDT (min)	DST (min)	MTI (BU)
Control	57.9±0.8	1.9±0.08a	4.7±0.02a	10±0.13a	60±2.8a
100 IU/100 g	58.3±0.11	1.8±0.04ab	4.5±0.06ab	9.5±0.11ab	65±2.2a
250 IU/100 g	59.1±0.12	1.6±0.04b	4.2±0.07ab	8.9±0.12ab	77±2.8b
500 IU/100 g	59.6±0.11	1.3±0.07 c	3.9±0.08 b	8.1±0.08b	85±3.2b

Miksograph Studies: Table 6 describes ways of Miksograph study. This shows that treatments show significant effects on the mixing time and peak height. The measured values in Table 6 reflect the effect of different doses of additives on Miksograph parameters [4]. As shown from table 7 the addition of additives reduces the mixing time of dough along the experiment. Samples of flour taken for the experiment shows the maximum mixing time as 5:50 ± 0:09 min, followed by T_1 (5.1 ± 0:11 min), and T_3 (500 g flour IU/100) show minimal mixing time (4.25 ± 0:09 min). No significant differences were found between T_1 (5.10 ± 0:11 min) and T_2 (5.00 ± 0.1 min), while T_0 and T_3 shows too large changes. In contrast to the mixing time, a gradual increase in the top of peak is observed with increasing levels of additives, T_3 (500 g flour IU/100) shows maximum values of peak(60.2 ± 4.20%) followed by T_2 (60.10 ± 3.80), however minimum values of peak are defined in T0, 57.50 ± 2.80%. It is determined from the data that T_1 (60.00 ± 2.50) and T_2 (60.10 ± 3.80) show no significant difference with each other, while significant variations are defined between T_0 (57.50 ± 2.80%) and T_3 (60.20 ± 4.20%) on top of the peak [8, 9].

Table 6. Measurements of the effect of treatment on the Micrographic characteristics.

SOV	df	Mixing time	Achieve of the peak
Treatment	3	1.8475**	138.00*
Mistakes	8	0.0725	21.966
Total	11		

*Important; ** Very important.

Table 7. Measurements on the Micrographic characteristics.

Treatment	Mixing time (min)	Achieve of the peak (%)
Control	5.50±0.09 a	57.50±2.80 a
100 IU/100 g flour	5.10±0.11 b	60.00±2.50 ab
250 IU/100 g flour	5.00±0.10 b	60.10±3.80 bc
500 IU/100 g flour	4.25±0.09 c	60.20±4.20 c

Effect of food additives in the quality of confectionery products: Confectionery products are prepared by the flour samples with different content of food additives and are evaluated for various qualitative features [10, 11].

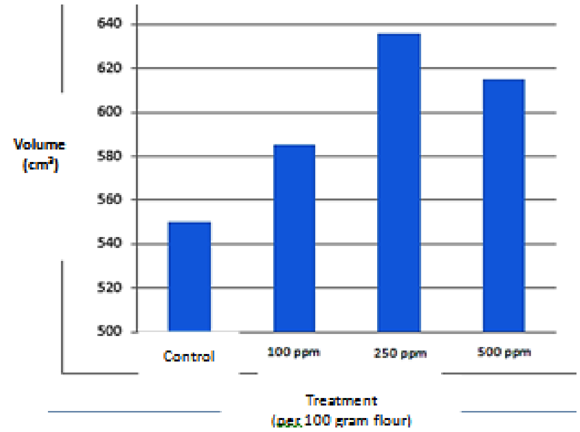

Figure 1: The volume of bread treated with various concentrations of food additives

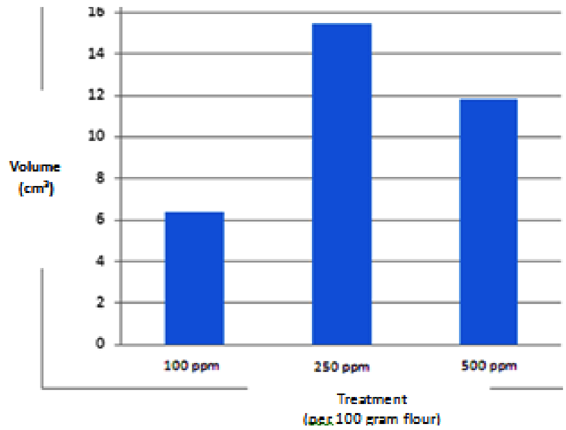

Figure 2: Percentage of increase in volume of bread treated with different percentages of food additives.

The volume and density of confectionery products: After the production process of confectionery products, volume of the pulp is measured by the rapeseed displacement method. The maximum volume is estimated in the case of T_2 (635 ± 25.30 cm^3) followed in T_3 (615 ± 25.60 cm^3), while the minimum value for this parameter is 550 cm^3 ± 15:50, as shown in Figure 1. At the highest level, supplements used resulting in a low volume due to poor mixing and flour characteristics [5, 12]. Dough weakens and loses its ability to hold gas produced during the process of fermentation and baking. Such dough can be broken during maturation, where as a result occurs reduction in volume. Figure 2 describes increase the percentage of bread volume such compared to control over: the maximum increase is calculated in T_2 (15:45 ± 0.35%) followed in T_3 (11.82 ± 0.30%), while minimum increase is determined in T_1 (6:36 ± 0.25%) [13].

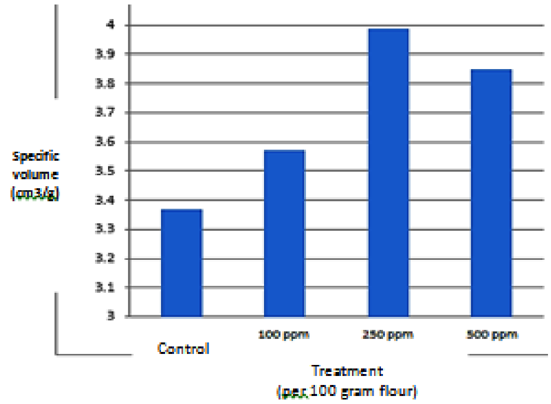

Figure 3: Specific volume of bread treated with different percentages of food additives.

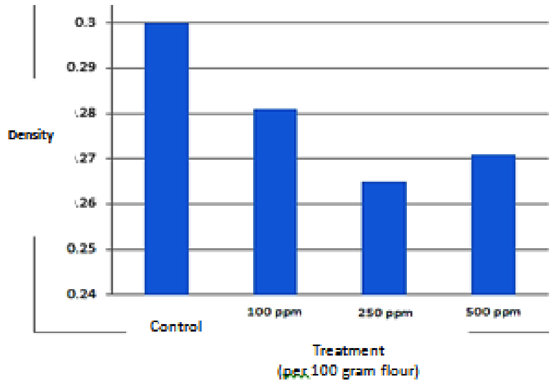

Figure 4: The density of bread treated with different concentrations of food additives

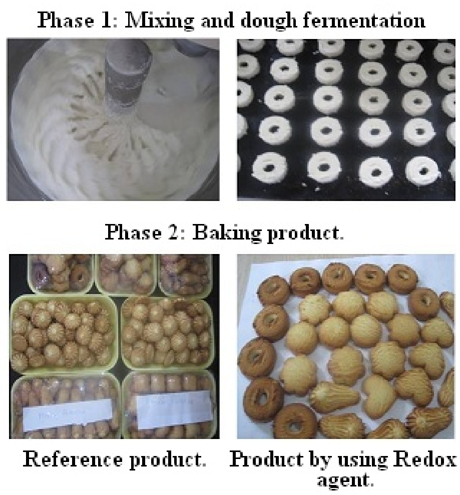

Figure 5: Tests of making confectionery products

Similarly Figure 3 presents the specific volume of confectionery products, the best treatment in this evaluation is determined to beT_2 (3.99±0.14 cm^3/g)followed byT_3 (3.85±0.12 cm^3/g), while T_0 is the lowest level of specific volume3.37±0.10 cm^3/g.Evaluation of results on the specific volume of confectionery product produced (Figure 4) shows that the product produced with low density and high volume is preferred for the customer.

In Figure 5 are given factual products of confectionery products experimented by mixing process until the final baked product, where distinguished reference samples (without food additive) and others by using redox agents that comply fully with data tables and figures of over mentioned.

4. Conclusion

Food additives have started to be used in bakery products industries in order to improve characteristics of the dough-cooking and increase their quality. The improvements in optimal levels by the food additives have been attributable to specific effects and non-specific. Forming effects estimated to be related with the improvement of characteristics of the dough (softness), improving the elasticity and crumble, closely related to hydrolytic water connections.

In conclusion, by mixing 60% to 40% (wheat varieties, which is optimal) confectionery production volumes (cake) has the highest value to supplement 220-250 ppm). Higher density and optimal value achieved by the use of additives in measure 120 ppm.

Other effects attributed to interaction between hydrolytic reaction of product specific enzymes and other dough ingredient or product, resulting in processing and the best features of the product.

Using the food additives in confectionery products could result in improved cake and biscuits, as determined by the study conducted. In the case of volume, the pulp of the cake, it is very important to determine the acceptability of the final product. Food additives included in the study cause increased volume of pulp in confectionery products that support the appropriateness of their use in the manufacture of confectionery products, thus replacing the use of chemicals.

5. References

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