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RESEARCH ARTICLE

RESEARCHES REGARDING THE USES OF SOME EMULSIFYING AGENTS IN BAKERY INDUSTRY

Vasilica Alisa ARUS [*], Mihai LEONTE, Alina Mihaela MOROI

University of Bacău, Department of Chemical and Food Engineering, Laboratory of Food, Technologies and, Biotechnology, Mărăşeşti Street, no. 157, RO-600115, Bacău

Abstract: The emulsifying agents using in the bakery industry have as effect the quality's amelioration through the freshness' maintaining and increment of the nutritive value for the bakery products in the same time. The main emulsifying agents were: monostearine, emulsifiers obtained from ethoxile stearic acid, sunflower oil transesterificated with glycerin and ethoxile.

Key words: emulsifiers, bakery, monostearine, quality.

Introduction

The emulsifying used in the bakery industry, ensure water binding fat during manufacture semi-product causing on this basis improve product quality.

The principal quality main one emulsifiers is harmlessness (Banu, 1985, 2000).

From this consideration, taking into account the health regulations in force, research has focused group transformation of sunflower oil in emulsifiers with superior properties.

By adding emulsifiers it slows the process of ageing bread, it increases the nutritional value of products, extending the duration of maintaining freshness of bakery products (Leonte, 2000).

Materials and methods

There have been using the following research emulsifiers: monostearine respectively monoglyceride stearic acid, emulsifier food-based monoglyceride called emulgopan, emulsifier obtained from ethoxile stearic acid, oil sunflower transesterificated glycerine and ethoxile.

The group sunflower oil transesterifcated, emulsol 20, have prepared more evidence with various degrees of ethoxilation and report variety of mono and diglyceride.

Physico-chemical characterization of emulsifiers was made by the determination of the acidity, saponification, oxidril and HLB.

To study emulsifiers it was used white flour type 650 with the following indicators of quality: gluten

[*] *Corresponding author: arusalisa@yahoo.com*

damp 24%, indicating deformation of 4 mm, hydration capacity of 57%, acidity 2.5 degrees, moisture 14.5%, 0.65% ash. Yeast compressed humidity was 75% and power dough fermentation dough in 81 minutes.

They used emulsifiers:

- gliceril 1 monostearat with molecular mass 358.55, solid white, with the taste and smell of fat, density 0.98, melting point of 59-60^{0}C, the minimum content of free fatty acids 5%, 4 iodine index, the pH of 3% dispersion in water at 25^{0}C is 9.6-9.7. The procedure for preparation of emulsion was: to weighing the amount of proof required emulsifier, respectively for 4.2 g sample laboratory and 480 g for industrial probe representing 0.2% of the flour, melted and over monostearine molten been added under continuous agitation and intense, hot water. Agitation continued until the temperature dropped below the melting point, is achieving a stable and viscous cream what has added to the preparation of dough;

- emulsifier called emulgopan natural, made from stearic acid;

- emulsifier obtained from oil esterificated .

For emulsifiers presented studies have been conducted laboratory and on an industrial scale. It was adopted biphaze process sour dough consistent with the dough and using prescription manufacturing established following the ripening of proof.

Indices of quality of emulsifiers inquired are playing in table 1.

Research laboratory have been based manufacturing recipe presented in table 2.

Results and discussion

The effect emulsifiers inquired about rheologycal features of dough and quality indices of bread for laboratory tests is presented in table 3

The effect of emulsifiers addition, stearetox 14, the characteristics rheologycal of dough resulting from the analysis of the characteristics curve farinographics evidence and witness evidence with added stearetox 14.

Conclusion

Analyzing critical feedback made concerning the quality and behavior in dough process, the quality of bread, organized experiments, can make a series of conclusions regarding the influence emulsifiers on rheologycal dough and quality products.

The dough with added monostearine properties rheologycal has improved, a greater ability to link water, the duration of training is less, and tolerance of fermentation is increased.

Table 1. *Chemical characteristics of emulsifiers inquired*

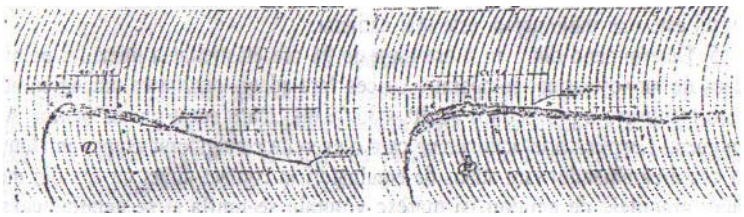
Name index	Emulsifier	Stearetox 14	Emulsol 20
Indices of acidity			
- Mg KOH / g	23.4	-	2.3
- mg stearic acid / g	118.20	-	1.2
Saponification index, mg KOH/g	114.5	60.6	40.1
Oxidril index, mg KOH	-	61.8	75.0
Gross water, mg phenol 2%	-	12.6	13.1
The pH aqueous solution1%	-	6.9	6.8
Content in groups ethoxy, %	-	67.3	7.7
Index HLB	-	13.1	14.2

Table 2. *The recipe, including manufacturing raw materials, process technology parameters in case of use of emulsifiers*

Matter premium and technological system	U/M	The proof of witness	Samples with added:	
			Monostearine	Emulgopan
Flour type 650	g	2100	2100	2100
Yeast	g	62	62	62
Salt	g	31	31	31
Water drinking	ml	1150	1150	1150
Monostearina	g	-	4.1	-
Emulgopan	g	-	-	6.2
Temperature dough	^{0}C	29	29	29
The duration of fermentation	min	125	115	120
Duration fermentating pieces of dough	min	50	45	43
Temperature baking	^{0}C	230	230	230
Duration ripening	min	30	31	30

Table 3. *The effect of researched emulgators on the characteristics of the dough and indexes of quality of bread weighing 0,600 kg/a loaf of type 650 flour*

Characteristics and quality indices	The proof of witness	Samples with added:	
		Monostearine	Emulgopan
The dough structure	normal	improved	
Flow dough, mm	40	40	40
The duration of fermentation dough, min	130	115	120
Volumetric yield of bread, cm^3/100 g flour	368	385	398
Porosity, %	75.1	76	76.3
Acidity, grade	24	2.4	2.3
Humidity, %	44	43.1	43
Elasticity, %	93	95.5	96.5
Appearance porosity	uniform pores	uniform fines pores	
Odour, taste	nice	nice, strong	
Properties of mastication	good	very good	
Properties cutting into slices	good	very good	
Gross ripening	272	286	295



a ***b***

Figure 1. *Farinographic curve a). the proof, b). with added stearetox 14*

This is due lightly active properties of molecules emulsifier consisting of one part and one part hydrophile which hydrophobe in contact with water and fat in the dough focuses environment so as part hydrophile is directed by water, and part hydrophobe by fat, forming a layer of transit properties and role of soaking and lubrication. The emulsifying agents affect the structural mechanical properties of gluten, trough interactions with gluten proteins, with the formation of complexes type emulsifier - protein. Monoglyceride stearic acid used in the experimental part of non-ionic emulsifiers category, which explains the reduction elasticity gluten and increase its capacity to flow, respectively flow dough.

The comparative analysis of the evidence and witness evidence with added monostearine, senzorial features and physico-chemical properties of the bread, resulting primarily an increase in the volume of bread with the addition of 15-24% versus bread witness. This increase in the volume of bread can be explained in that emulsifier during the ripening cover the walls of pores from dough mass, which gradually turns into a pulp, preventing the elimination of gas formed during the process of fermentation.

Senzorial and comparing the two products elasticity witness and added, shows an increase elasticity kernel from 93% to witness evidence, 95.5% of proof with added monostearine and 96.5% of proof with emulgopan.

Porosity kernel is more uniform, finer pores, kernel color to the bread with added monostearine is more open than a kernel bread witness, the core is less rugged, velvety.

Determining from 5 to 5 hours during 96 hours elasticity kernel bread with added monostearine compared with that without the addition, it appears that the bread has added a freshness to maintain 30-35% higher than bread witness. This phenomenon is explained by the action which carries a emulsifier on starch. At baking, dough without adding emulsifiers in direct contact with water in the environment dough, starch granules increase their volume is blowing and jellifying. Some of the water found in pellet starch blown moving beyond entrainment amylose. During the process of ripening amylose suffer a crystallization phenomenon or demotion. During the cooling amylose both bread and amylopectin are faced with. In that way amylose is forming a gel intergranule which causes the loss of property and elasticity of deformation kernel. Amylopectin starts to crystalize during cooling bread, releasing water with in running onto the shell. The loss by a core part of the water hydration is accompanied by worsening elasticity as a result of loss of deformation property. The bread with added emulsifier is forming a complex emulsifier-amylose which is insoluble in water and limiting the swelling of starch granules during jellifying process. The emulsifier - amylose inhibits solubilization of amylose which remains inside the starch granules and forms a protective layer on the surface of starch granules, immobilizing water in the amylopectin matrix, retarding the rustiness process of the bread.

References

Banu Constantin., *Aditivi si ingrediente pentru industria alimentara*, Editura Tehnica, Bucuresti, 2000.

Banu Constantin, Folosirea aditivilor în industria alimentară, Editura tehnică, Bucureşti, 1985.

Leonte, Mihai., *Biochimia si tehnologia panificației*, Editura Crigarux, Piatra-Neamt, 2000

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[*] *Note: Innovative Romanian Food Biotechnology is not responsible if on-line references cited on manuscripts are not available any more after the date of publication*