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SALT INFLUENCE ON DOUGH'S BEHAVIOUR

Georgiana Gabriela Codina[1], Ionela Cretu[2], Vasile Paslaru[2]
[1] "Stefan cel Mare" University of Suceava
[2] "Enzymes & Derivates" Co., "Cantacuzino Pascanu" Hall, Costisa, Neamt

Abstract

Technological activity of salt is representing by its influence on dough's behaviour. In this paper we will present rheological and technological effect of salt (in different doses) on dough's behaviour and quality of bread. Rheological properties were determinate with Chopin Consistograph and Alveograph and the effect on quality of bread was determinate with baking tests.
Keywords: *salt, influence, rheological, technological, Consistograph, Alveograph, baking tests.*

Introduction

Supplement of salt in American's diet represent a problem because it is associate with high blood pressure. Although salt is present in almost rough material, salt are two sources: industrial and menial addition. As it is known, salt is used in processing of all products, excepting diet products, without salt. It is used for taste and with technological intention. Technological activity of salt is representing by its influence on dough's behaviour. Addition of salt determines reduction of water absorbtion capacity of flour, increasing formation number and stability of dough (Ceapoiu, Giurea 2002).

It is thought that effect of salt is bound by hydration modification of glutenic proteins hereby water amount is increases and, implicitly, proteins suffering conformation immutable. This last effect determines decrease proteins capacity to tie water molecules (Ceapoiu, Giurea 2002).

Experimental

We have made tests in order to study the influence of salt on the maximum pressure (Pr Max) measurement at constant hydration (CH),

on dough behaviour during mixing at adapted hydration (AH), on the Alveographic parameters at CH and AH. We have used the Chopin alveograph and consistograph.

Measurements were made using different concentrations of sodium chloride solution (prepared with distilled water) for prepare dough: 0%, 1%, 1.5%, 2%, 2.5% and 3% of salt. For each concentration, these following tests were made in two ways: at constant and adapted hydration.

Regarding Consistograph, constant hydration test are made in order to measure the maximum pressure (Pr Max), thus the water absorbtion capacity using to obtain a target consistency.

The amount of sodium chloride solution which is added depends of the flour moisture content. For each test, the hydration is the same, only the salt concentration changes. The maximum pressure is the main parameter because it is directly linked to the water absorbtion capacity of the flour.

Adapted hydration test is used in order to be sure the target consistency is obtained and to study the dough behaviour during mixing (T Pr MAX, Tolerance, 250 seconds Drop and 450 seconds Drop).

The hydration could be different; it depends on the water absorbtion capacity which is determined during constant hydration test for each concentration of salt.

With Alveograph we have made the same two tests in order to determinate the salt influence (adapted hydration) and the evolution of parameters ***P*** (tenacity, maximum pressure required to reshape the sample), ***L*** (dough's extensibility, curve length), ***G*** (extensibility number), ***W*** (baking strength), P/L (curve configuration ratio), ***Ie*** (P200/P elasticity, P 200 represented pressure at 4 cm from the beginning of the curve).

Results and Discussions

After we made constant hydration test (CH) and adapted hydration test (AH) on the Consistograph, were have obtained results from table 1. From these results we can draw that water absorbtion capacity increases proportionally to the salt addition, and the time for Pr Max increases almost proportionally. Also, the 450 seconds drop decrease

proportionally. It could be observed that the tolerance is increased by salt addition.

Table 1. Consistograph values for constant and adapted hydration tests

Protocol	Parameters	0%	1%	1.5%	2%	2.5%	3%
CH	Pr MAX(mb)	2238	2380	2435	2486	2521	2570
CH	T Pr MAX (sec)	102	121	143	167	181	206
AH	HYDHA	52.8	53.1	53.7	54.2	54.9	55.6
AH	T Pr MAX HA (sec)	112	125	134	148	159	171
AH	TOLERANCE (sec)	130	141	149	157	166	179
AH	D 250 (mb)	886	752	645	512	403	365
AH	D 450 (mb)	1370	1301	1238	1123	1045	1002

The salt strengthens the dough. With salt addition, the dough is stiffer at CH and plastic qualities are improved during mixing.

The results obtained with Alveograph test at constant hydration (CH) and adapted hydration (AH) are presented in table 2.

Table 2. Alveograph values obtained for constant and adapted hydration tests

Protocol	Parameters	0%	1%	1.5%	2%	2.5%	3%
CH	P	95	98	101	103	106	108
CH	G	14.9	15.4	16.1	17.0	17.8	18.3
CH	P/L	1.92	1.87	1.79	1.64	1.55	1.47
CH	Ie	49.7	51.1	52.8	54.1	56.2	57.5
CH	W	187	198	212	230	243	255
AH	T	78	80	85	89	93	97
AH	Ex	17.5	17.9	18.5	19.1	19.6	20.2
AH	T/A	1.23	1.17	1.12	1.07	1.04	1.01
AH	lec	50.9	51.5	52.7	53.4	54.2	55.9
AH	Fb	180	196	217	225	236	249

From these results can be observed that at constant hydration, the increase of pressure follows salt addition. These results could be linked to the stickiness of dough when no salt is used.

Regarding adapted hydration, tenacity increases and the ***lec*** increases a lot between 0% and 2.5% of salt, then much gradually.

It appears that salt addition induces an increase of tenacity and elasticity on Alveographic tests. The extensibility clearly shows an improvement of the gluten network with a strengthening between flour constituents.

Conclusions

It could be establish that salt induces a strengthening of proteinic structure. This effect is used in breadmaking to delete the stickiness at the end of mixing. The effect of salt on rheological qualities of dough is really noticeable and measurable with the Consistograph. It is clear on the alveograms. It shows an increase of tenacity and extensibility for moderate quantities of salt. These results show the strengthening of the proteinic structure.

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