

Visco-elastic Characteristics Variation in Biscuits Dough, as a Result of the Simultaneous Amelioration with Conditioners containing Cystein and Proteases

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Abstract

In order to obtain biscuits, there were used flours with different characteristics, from those used for obtaining other bakery products. In this way, the flours are treated with important quantities of L-cystein and/or proteases. Our investigations followed the evaluation of L-cystein (Cisto'Pan), protease (Veron W) and their combinations addition impact, upon the alveographic parameters of the flour resulted from Romanian wheat. Our results showed that the L-cystein addition increases the dough extensibility (L), reduces the resistance (P) and the absorbed energy in the kneading process (W). The using of protease in combination with L-cystein cancels its effect upon the extensibility parameter (L) and emphasizes all the alveographic parameters' decrease (P, W, G, Ie, P/L).

Keywords: wheat flours, improvement, proteases, L-cystein, quality parameters, alveogram etc.

Introduction

Dough used for biscuits and waffers' preparation is characterized by technological parameters which are very different from those of the dough used for bakery and pastry. Proteasic and L-cystein based conditioners are widely used for reaching specific parameters required for biscuits. The optimum technological characteristics are often attained as a result of joining the dough proteasic activity with the L-cystein's activity [2]. The proteases attack the peptidic bondage, their effect upon dough being mainly reducing their resistance. L-cystein acts by breaking the disulphydic connections, with combined effect: resistance reducing and extensibility increasing. The protease-L cystein combinations' effect in dough is difficult to predict, as the two conditioners act mainly in certain technological phases [1]. The up-to-date assumptions regarding the L-cystein's activity suggest that L cystein acts at the kneading level phase; the effect of L- cystein depends on the kneading parameters (kneading rate, the mixer's type, etc). The protease's activity depends upon the kneading parameters, but continues during the other technological phases, before baking.

As a result, the combined action's evaluation of the two ameliorators upon the dough rheology is an extremely important problem, both for technologists involved in preparing and coordinating the biscuits' and waffers' production, and also for specialists interested in evaluating the influence of different supplements upon the colloidal processes that happen in dough.

Materials and Methods

Our material for research is the unimproved 480 type flour, resulted from the Romanian cereals harvested in 2005 and processed at 'Farinsan SA Grădișteea'. This material has been treated with an enzymatic conditioner having proteasic activity and a conditioner based upon L-cystein, as shown in the improvement scheme in table 1.

The enzymatic conditioner with proteasic activity that we used derived from the AB Enzymes company and has the commercial name Veron W, and the conditioner based on L-cystein derived from the Beldem Company, and has the commercial name Cisto'Pan (10 % L-cystein content).

The assay method used for analysing the dough rheological characteristics is described in ICC-Standard No. 115/1 regarding the alveographic method [3].

Table 1. Improvement scheme

VARIANT	VERON W (PROTEASES) (PPM)	CISTO'PAN (L-CYSTEIN) (PPM)
M (CONTROL)	0	0
V ₁	0	50
V ₂	10	50

V ₃	25	50
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Results and discussions

The results obtained from the analyses of the control flour and of the treated flours with Veron W and Cisto'Pan conditioners are brought in table 2.

Table 2. Results obtained by analyses of the control flour and flours improved with the two commercial conditioners

PARAMETRU	M	V ₁	V ₂	V ₃
Resistance P (mm)	151	94	75	49
Extensibility L (mm)	41	53	44	38
Extensibility index G	14.3	16.2	14.7	13.7
Deformation energy W (E-4J)	259	169	111	59
Ratio P/L	3.65	1.78	1.73	1.28
Elasticity index Ie (%)	51.5	40.3	30.2	0.0

As shown in table 2, the treatment with Cisto'Pan, applied in singular variant (V₂), determined a significant decrease of the Resistance parameter (P), about 38 % and also a significant increase of the Extensibility parameter (L) of about 29 %, referred to the control flour. The absorbed energy during kneading (W) decreased with about 35 %, the P/L value with about 51 %, and the dough elasticity index (Ie) with about 22 %.

The protease addition for the no. 2 improvement variant, determined for this variant (10 ppm proteasic activity conditioner) the amplification of the diminution ratio for the parameters correlated with dough resistance, as well as a significant decrease of dough's extensibility related to the variant containing only Cisto'Pan.

The protease addition to flours treated with L-cystein, tends to increase its activity, upon dough resistance parameters and cancel its influence upon the extensibility. The dough resistance parameter (P) has been characterized for the no. 2 improvement variant by a 50 % decrease against the control flour, respectively 20% related to the variant which used only Cisto'Pan.

The extensibility parameter (L) decreased by about 17 % against the variant with Cisto'Pan, remaining still 7 % bigger than the control flour variant. The absorbed energy during kneading (W), the P/L ratio and the dough elasticity index continued to decrease, both against the control flour and the improvement variant in which we used only Cisto'Pan.

As regarding variant 3, characterized by increasing of the added proteasic conditioner against variant 2, we found out the maintaining of decrease trend for all rheological parameters values. Thus, the extensibility parameter attained a value 7 % lower against the control flour and 28 % lower against the variant in which we used only Cisto'Pan.

The absorbed energy during kneading (W) decreased with 77 % against the control flour, and the dough elasticity index (Ie) turned to zero (0) level. This shows that if we increase the protease quantity and join it with the L-cystein, the dough' rheological characteristics modify substantially.

Figures 1 – 4 show the alveograms for control flour (M) and the three improvement variants used in our study (V₁, V₂, V₃).

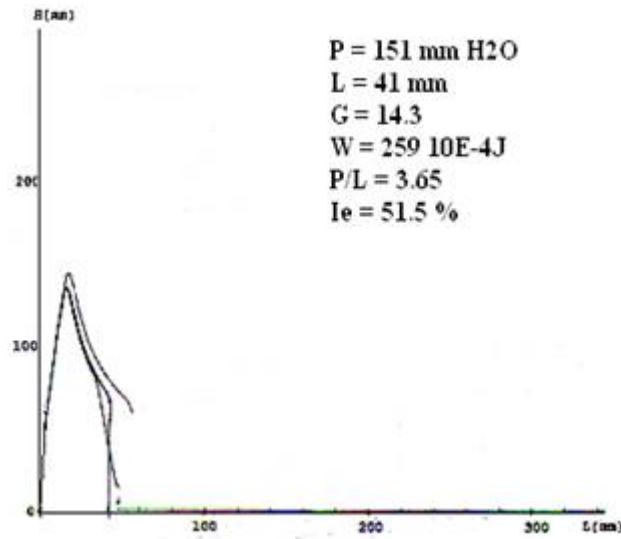


Figure 1. Control flour alveogram

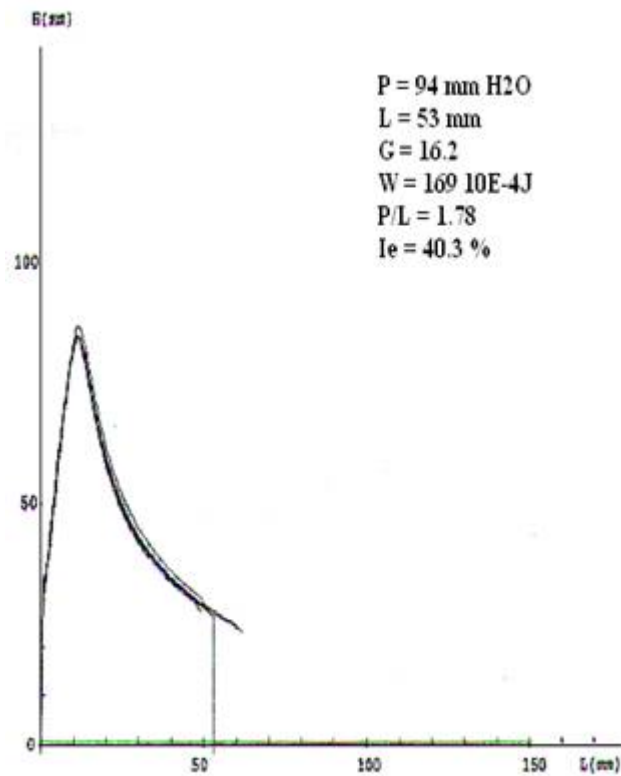


Figure 2. Alveogram obtained by treating control flour with 50 ppm Cisto'Pan (Variant 1)

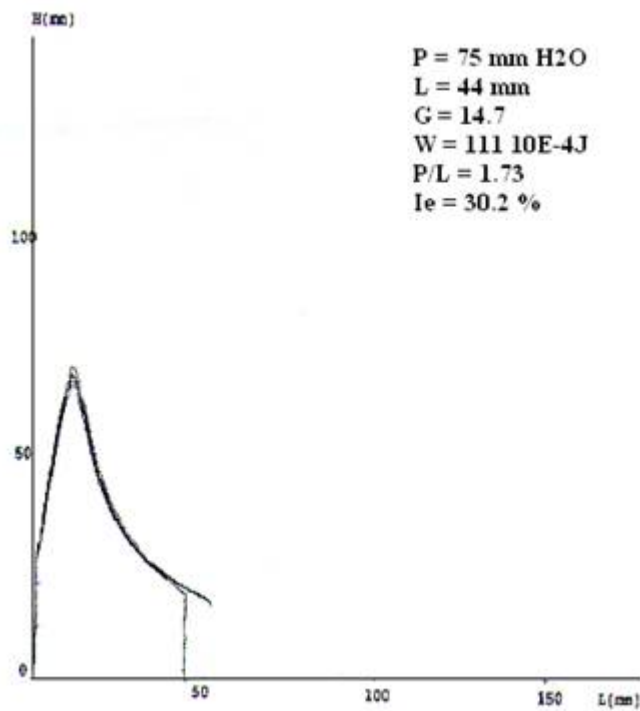


Figure 3. Alveogram obtained by treating control flour with 50 ppm Cisto'Pan and 10 ppm Veron W (Variant 2)

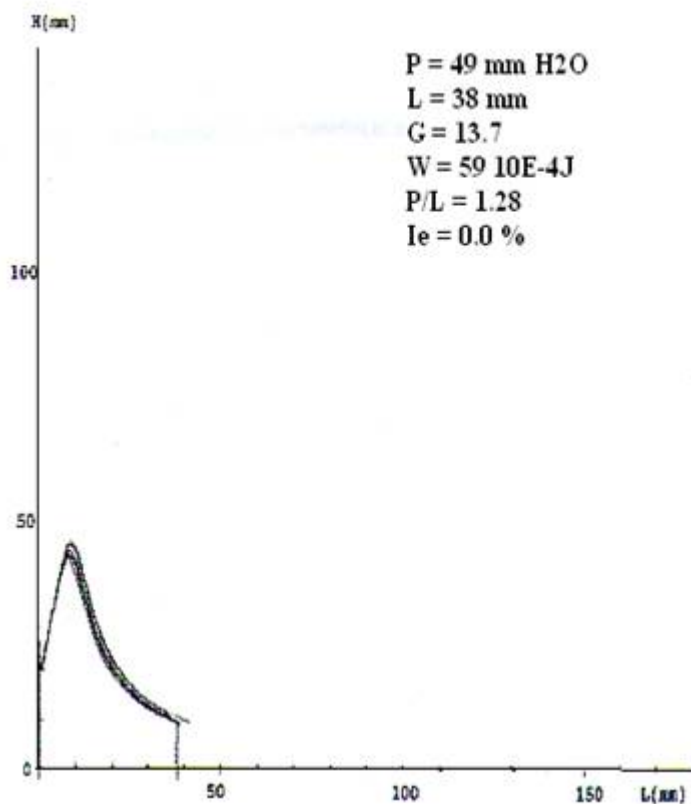


Figure 4. Alveogram obtained by treating control flour with 25 ppm Cisto'Pan and 25 ppm Veron W (Variant 3)

Figure 5 shows the alveographic parameters for the control flour and the 3 studied improvement variants. We notice a decreasing effect of all alveographic parameters' values for all tested improvement variants, except variant 2, for which the treatment with L-cystein caused an increase for the extensibility at the beginning.

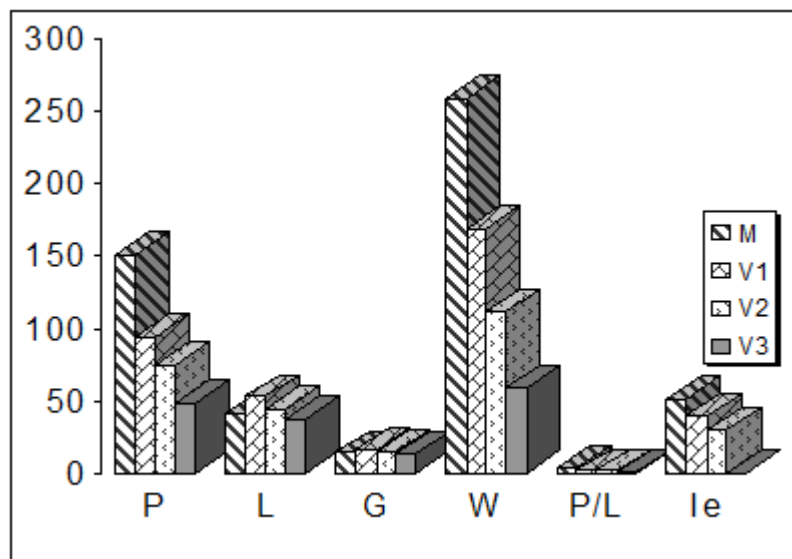


Figure 5. Alveographic parameters evolution for control flour and the 3 improvements studied variants

Conclusions

- ◆ Treatment with L – cystein (Cisto’Pan) caused a significant increase of the control flour extensibility, corroborated with a decrease of the resistance, the absorbed energy during kneading (W), the P/L ratio and the elasticity index Ie;
- ◆ The addition of 10 ppm protease (Veron W) to the variant with L-cystein (Cisto’Pan) caused the decrease of all the alveographic parameters taken into consideration;
- ◆ In variant 3, in which we used 25 ppm proteasic activity conditioner and 50 ppm Cisto’Pan, the extensibility decreased for the control flour and the elasticity index (Ie) turned to zero (0) level.
- ◆ The combinations L-cystein – proteases can be successfully used for guiding dough technological properties to the assessed directions, by certain technologies. These combinations can be used for decreasing dough capacity to modify its form after technological processing and for decreasing dough capacity to retain gases during baking etc.

References

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3. ICC STANDARD No. 121, Method of using the Chopin-Alveograph.