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INVESTIGATION OF THE YEAST DOUGH MIXING PROCESS

Assoc. Vitalii Rachok
Department Machines and apparatus of food and pharmaceutical productions,
National University of Food Technology, Kyiv, Ukraine
Phone: +380665848545
E-mail: RachokV3478@gmail.com

Assoc.prof. Yuliya Telychkun, PhD
Department Machines and apparatus of food and pharmaceutical productions,
National University of Food Technology, Kyiv, Ukraine
Phone: +380665658549
E-mail: tvill@meta.ua

Prof. Volodymyr Telychkun, PhD
Department Machines and apparatus of food and pharmaceutical productions,
National University of Food Technology, Kyiv, Ukraine
Tel.: +380674665890
E-mail: tvill@meta.ua

Abstract: *Nowadays, the baking industry is concerned with improving the quality of bakery products, which can be achieved through the improvement and intensification of individual stages of the baking process, namely the mixing stage. One of the effective methods of accelerating the dough maturation and the quality of bakery products improvement is amplified mechanical process through dough mixing, which allows to influence its structure and physico-chemical parameters.*

The process of mixing the yeast dough was studied using precision equipment Farinograph®-AT, the German company Brabender.

There were obtained the mixing process pharinogram and the torque time dependence on the humidity with different speed of rotation. Structural-mechanical properties of yeast dough have been investigated. There have been determined the stamping steps duration and the time required for the dough preparation, depending on the speed rotational and dough humidity.

The conducted studies allowed to establish that the rational mode of working part rotation for yeast dough kneading is the mode with the of 63 rpm.

Keywords: *mixing, bakery product, yeast dough*

INTRODUCTION

Mixing the dough is a complex process, which consists in creating a homogeneous capillary-porous mass of flour, water, yeast, saline solution and other components. The process of mixing the dough is divided into three stages: mixing the ingredients, actually dipping the dough and the third stage - plasticization. The dough is considered as a complex colloidal system, consisting of several continuous and periodic phases. Solids and liquids (gluten and water) in the dough are continuous phases, starch grains and gas formed during the dough fermentation - the periodic phase. As a result, the physical properties of the dough are characterized by parameters of solids, liquids, gases and indicators as a result from the interaction of these phases.

This process is carried out by mechanical treatment of the dough, and consists in swelling of the starch and the protein complex with the elastic-viscous homogeneous mass creation. It containins active microorganisms and ferments.

The purpose of the scientific study of mixing the yeast dough is to set the time limits of the mixing yeast dough stages length with different humidity (40.3%, 42.4%, 44.3%), depending on the rotation frequency of the working parts.

EXPOSITION

The research was carried out on FARINOGRAPH®-AT (Fig. 3.), produced by German company BRABENDER®, the next generation of high-precision instruments for the flour quality and the dough behavior study during its mixing determining, depending on the dipping time and the rotation frequency of the working part.

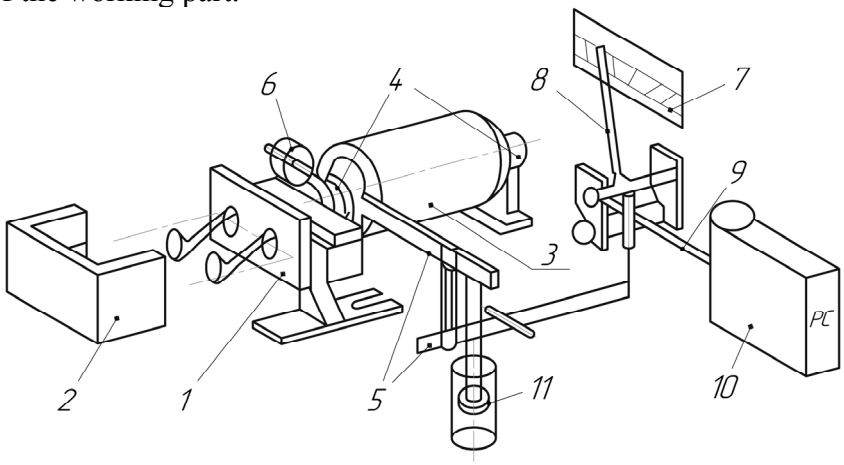

Fig.1.FARINOGRAPH®-AT scheme

1-back stand dough mixers and work shovels; 2-case of the working chamber; 3-drive; 4-ball bearings; 5-levers; 6-weight balancer; 7-measuring device; 8-arrows; 9-transmitter; 10-digital converter (personal computer); 11-dosing station water.

Fill your flour sample into the preheated and temperature controlled measuring mixer. Start the program The mixer blades loosen up the flour and a minute later the water will be injected into the mixer. A dough develops, which is subjected to a defined mechanical stress by the rotating mixer blades which are driven by a motor, carried in a pendulum bearing. The resistance of the dough against the blades, which depends on the viscosity of the dough, causes an opposite deflection of the motor housing. This deflection is measured as torque and recorded and plotted online as a function of time in a clear color diagram.

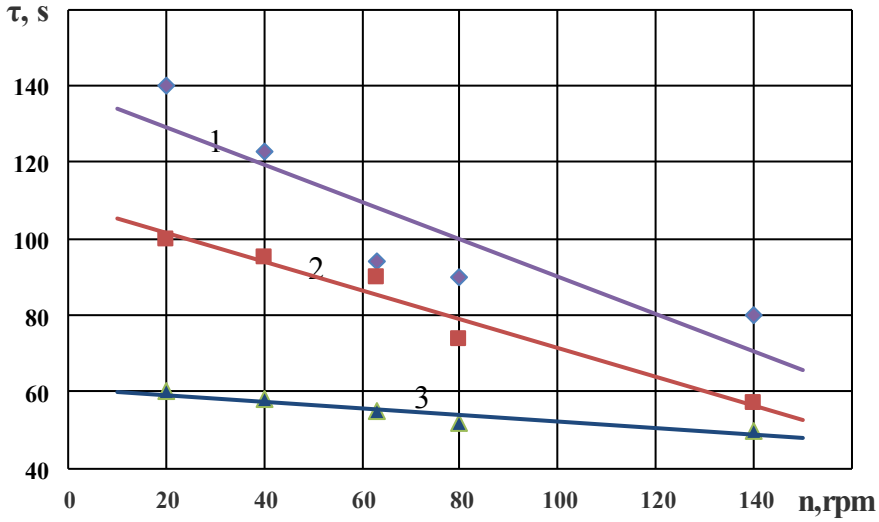

Fig. 2. The first mixing stage duration, depending on the frequency of rotation and the different humidity:1–40,3%; 2–42,4%; 3–44,3%.

We investigated the first stage (Fig. 2) of yeast dough components stirring. The graph shows that the first stage is linear. As the rotation frequency increases, the time required for components mixing decreases. On the moisture content of the dough 44,3% at any rotation speed, in the range from 20 rpm to 140 rpm. The regularity of the effect of humidity on the yeast dough mixing process is due to the fact that when more water is added, contact with bulk substances takes place in a much shorter time (50-60 seconds) and there is a qualitative mixing of the components.

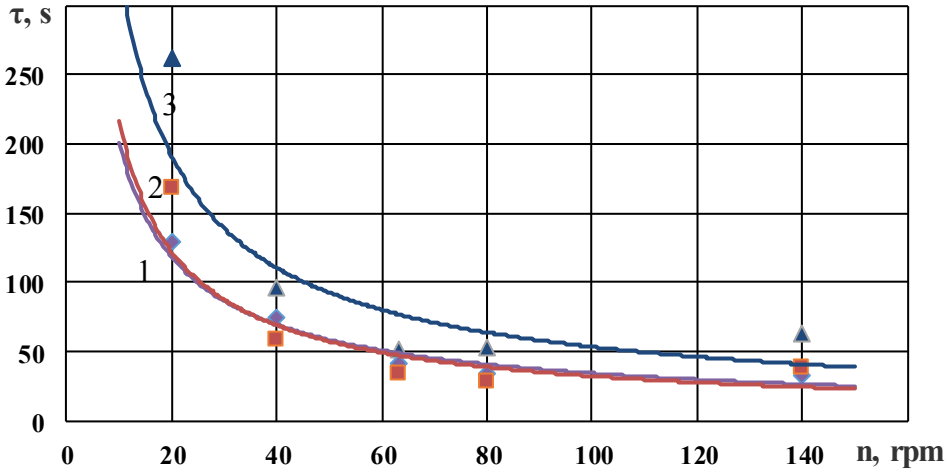

Fig. 3. The second stage of mixing duration depending on the frequency of rotation and the different humidity: 1–40,3%; 2–42,4%; 3–44,3%.

The second stage of mixing, actually the dough dipping (Fig. 3), depending on the rotational frequency and the different dough humidity, is of a power character and is inversely proportional to the first stage in duration. This process is explained by the fact that 40.3% of the dough humidity contains up to a relatively less amount of water and, thus, the dough framework is formed more quickly. With increased machining by working parts from 60 rpm to 140 rpm, the time required for the actual dough mix at a different humidity is 40-60 seconds.

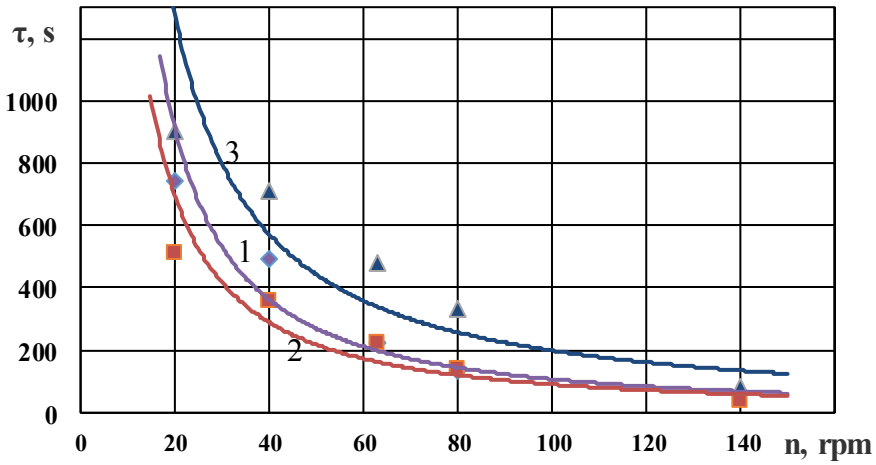

Fig. 4. Duration of mixing the third stage, depending on the rotational speed and humidity: 1–40,3%; 2–42,4%; 3–44,3%.

It was investigated that the physical properties of the yeast dough during mixing are continuously changed as a result of a number of processes that occur when kneading the dough. The time is required for the third stage of the dough plastification with the humidity 40,3-42,4% is 160-180 seconds at a rotational speed of 60-80 rpm.

CONCLUSION

The yeast dough mixing process of should be carried out at relatively high turns of the working part 60-80 rpm, so the humidity in the specified ranges (40,3-44,3%) will not significantly affect the process, the gluten macromolecule under the influence of internal stresses appear in the dough, partially destroyed, but due to the internal restructuring of is restored again, and gluten turns out to be elastic.

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