THE INFLUENCE OF HIDRATATION CAPACITY ON FERMENTATIVE ACTIVITY OF YEAST DURING DOUGH FERMENTATION MANUFACTURED WITH ACTIVE DRY BAKERY YEAST

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Abstract
Because in the bakery industry it require finished products with large volume, it is important to work with yeasts that have good fermentative activity that allows gas development on entire fermentation process.
Saccharomyces cerevisiae having different commercial types is the common yeast that is used in bakery.
In this paperwork was studied the active dry yeasts activity. This yeast was used in the amount of 2% related to the amount of flour used for doughs making in which the amount of water varied.
The volume of carbon dioxide emissions were registrated during 90 minutes of fermentation with a SJA fermentograph for 3 hidratation capacities: 51,4 (-10% compared to farinograph determination capacity); 51,7% (farinograph determination capacity); 62,8% (+10% compared to farinograph determination capacity). Because it used the same flour sample F1, the analysed fermentative activity and the variation of carbon dioxide emmisions are influenced only by dough consistency.
Decreasing the water amount used for dough making decreased the yeast fermentative activity, therefore carbon dioxide gasses emissions are lowered, this fact being explained by the imperfect contact between yeast cells and flour fermentative saccharides and dough.
Increasing the water amount used for dough making increased the free dough water amount that influences on the yeast enzymes mobilities and fermentative saccharides as a substrate.

Keywords: active dry yeast , SJA fermentograph, hidratation capacity

1. INTRODUCTION

Hidratation capacity is a parameter that can influence yeast fermentative activity features of final product and efficiency of technological process.
Dough consistency depends on several factors: flours properties, fermentation method and diagram, type of production (industrial or artisan), technological equipments that are used, temperature and humidity of the working place.
If we are refering to flour hidratation capacity it mainly depends on flour initial humidity, flour composition (protein content and their quality, amount of damaged starch, pentosans content).
Although numerous factors have a bearing on the fermentative activity of yeast, we should remember that the baker judges this activity by the rising of the dough. This is the result of the force exerted by the increase in internal pressure (impermeability plus CO_2 production) and the resistance of the dough to deformation [1]. So, the CO_2 causes the gluten proteins to stretch, and some escape, but most of the gas is retained and is trapped within the matrix. This process is known as leavening [2].
I can say that the gas formation is the most important effect of fermentation because it creates the foamlike structure of dough that is the prerequisite for a rapid heat flow through the doughs [5]. Various methods based on monitoring gas production have been used to characterize the physical properties of fermenting dough [3]. Fermentograph SJA (Sweden) or advanced type Rheofermentomenter (Chopin, France) can describe this dough behaviour [4].
The objective of this study was to study the influence of dough humidity on the fermentative activity of active dry yeast .

2. MATERIALS AND METHODS

The determinations were performed by using Romanian wheat flour type 650 with a weaker-average quality, like start material. Flour quality tests, which were accomplished according to Romanian, or international standard methods, indicated the following values: ash content 0.65%, wet gluten content 25,69%, gluten deformation 1,5 mm, gluten index 93, falling number 386 sec, farinograph data – water absorption WA 62,5%, development 2min, stability 2,5min, alveogrpah data - tenacity 105 mm H_2O, extensibility 34 mm, index of swelling 13, baking strength 156, configuration ratio of the curve 2.02 and extensograph data – energy 39/ 35/24cm², resistance to extension 170/ 174/122BU, extensibility 137/124/129mm, proving time 45/90/135min.

For the yeast, a active dry *Saccharomyces cerevisiae* type, made by S.C. Rompak S.A. Romania, was used. The used yeasts were analyzed according to standard methods as following: humidity 6,5 %, content of dry matter by drying 93,5%, protein content 42%. The raise activity of yeasts in dough made from the control flour was 51.3 min.

The fermentation behaviour of the flours was analyzed at different water absorption capacity 56.3, 62.5, 68.8% using the SJA fermentograph. The dough for the fermentograph test is prepared in farinograph (Brabender, Germany). After 5 minutes of mixing the dough sample is placed into the temperate fermentograph chamber at 35˚C. Fermentograph plotter registers the changes in the volume of gases and fermentation time.

3. RESULTS AND DISCUSSION

The fermentative activity of the active dry yeast expressed by the emission of carbon dioxide obtained with the fermentograph SJA on different levels of dough humidity is shown in *Table 1*.

It is registred a volume increasing of carbon dioxide gasses at dough fermentation prepared with active dry yeast how much amount of water is used.

For the dough obtained with a smaller amount of water than the one determined with farinograph it can be seen that altough the volume of carbon dioxide gasses released is smaller after 10 minutes of fermentation, the gasses forming speed is higher in the next 10 minutes, the volume increasing with 72,7% inspite of using a higher amount of water, when although the volume of carbon dioxide gasses released after 10 minutes is higher, 100 cm^3, the gasses forming speed is lower, the volume increasing only with 55%.

In the case of dough with higher consistency in last 15 minutes is registrated a lower speed of gas production, the volume increased with 15,5%.

In the case of the dough with lower consistency (+10% CH) the releases of gasses continue to increase in all period with a moderate speed.

The variation of water volume amount used for the dough making influences the studied bakery yeast activity. The more the water amount is reduced the more yeast fermentative activity is diminished and carbon dioxide gasses released are reduced, the fact being explained by incorrect contact between yeast cells and fermentative sugars in flour and dough.

By modification of the used water amount it is modified the dough consitency, this being the parameter that influences the yeast fermentative activity.

Increasing of the water amount used for dough making implies the increasing of free water amount in dough that influence the yeast enzymes mobility and the fermentative sugars as a substrate.

Also, soluble substances in water are better solubilised, the more water amount is higher and will have a positive influence on yeast activity.

Because the same flour sample was used, the analysed yeast fermentative activity and implicitly variation of carbon dioxide gasses releases are influenced only by dough consistency.

4. CONCLUSIONS

Activity of active dry yeast in dough is influenced by dough consistency, this being the parameter that can modify the volume of gasses released at fermentation.
The more the water amount is reduced the more yeast fermentative activity is diminished and release carbon dioxide gasses are reduced, the fact being explained by incorrect contact between yeast cells and fermentative sugars in flour and dough.

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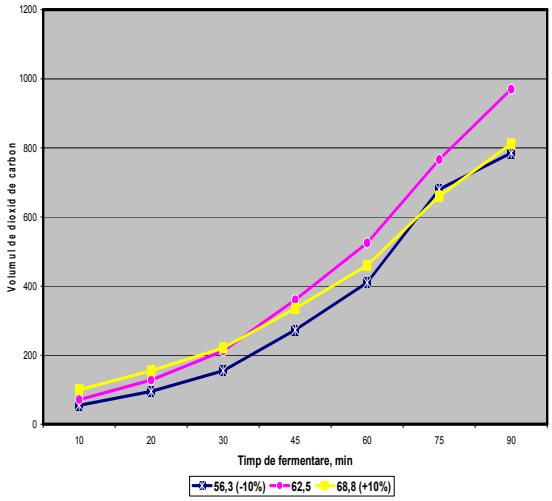

Figure 1 Evolution of carbon dioxide releases on dough fermentation manufactured with 2% active dry yeast and different hidratation capacities

Tabel 1CO_2 volume (cm^3) relieved during dough fermentation at different levels of dough humidity.

Flour hydration capacity % 3	Fermentation time, min						
	10	20	30	45	60	75	90
56,3	100	183	275	425	590	830	1010
62,5	90	195	295	490	775	1130	1420
68,8	110	220	350	561	795	1095	1365

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