

Effect of Yeast Additives, Oxidants and Temperatures in Short-time Bread Making System

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Abstract

The effect of yeast powder (baker's yeast), and oxidants (ascorbic acid and L-cysteine) were ascertained for short-time bread making which were 2-6% and 50 ppm respectively. The oxidant reduced fermentation time from 180 minutes to 70 minutes. In the presence of oxidants the oven spring was 38mm at 230°C while in the absence of oxidant it was 35mm at the same temperature. At high temperature (230°C), oxidants reduced baking time and increased the oven spring (loaf-height after baking).

Introduction

In traditional bread making, after adding yeasts, 3-5 hours are required to ferment the dough which is considered as long time. This system also causes proteolysis in the dough and produced off-flavour and objectionable taste. To overcome the problems short time bread making system is introduced in the bakery industries¹⁻³. The system minimize the proteolysis and thus prevents the production of off-flavour and defects in taste.

The added yeasts ferment simple sugars and produces carbon dioxide and alcohol. This fermentation is gradual, beginning slowly and increasing in rate with time. Dry yeast decrease the mixing time and increase oxidation process.⁴ The speed of fermentation can usually be increased by a modest increase in the amount of yeasts. The action of yeasts can also be accelerated by the addition of sugars to the dough. Such action is also related with the temperature. The use of oxidants such as ascorbic acid, potassium bromate, L-cystein etc., improve further the quality of bread. In fact, the yeast and the oxidant in the mix minimize proteolysis, reduce baking time and increase loaf-height.¹⁻³ The oven-spring (loaf-height) is very much related with the temperature. The shortenings in the form of fats and oils, which are added to the dough contribute a tenderizing effect and lubricate the texture of bread.⁴ However, only the mixing of all the ingredients, mentioned above could not

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produce quality breads. This could be simply waste of materials. Efficient formulation, appropriate use of different additives and suitable temperature can help about successful short-time bread making and can produce quality bread thereby.

Today the varieties of breads and other bakery items can run into the thousands as ingredients, formulas and preparation methods are changed. The principles of cereal chemistry and baking technology are well-understood and the many possible variables can be kept under fairly rigid control in large modern bakeries. So, with this view in mind the present study had been undertaken.

Materials and Methods

Ingredients

Milled flour samples were collected from the local market. These were progressively milled to make finer and whiter in colour for making better quality bread. Commercial compressed baker's yeast like Meishan dry-yeast (Meishan Mauri Co. Ltd., China), Fermipan dry-yeast (Gist Brocades, Holland) were used. Ascorbic acid (orange juice), reagent grade potassium bromate and L-cystein were used as oxidants in the study. Soybean oil or vegetable oil as shortening, table salt and sugar were also used as additives.

The formulation and the method in the resent study was that of the modification of Magoffin et al², Fernandes et al⁵ and Finney's⁶ methods. The mixing ingredients were flour 100%, shortening 3%, 50 ppm of ascorbic acid and L-cystein as oxidants was added, flour and other ingredients were mixed thoroughly. To prepare the dough appropriate amount of water was added to the mix. In order to evaluate the effect of the level of dry-yeast and temperature on the baking results and time, 2-6% yeast powder was also added separately to the doughs. To determine the effect of fermentation time on the baking results the presence of oxidants, the doughs with and without oxidants were allowed to ferment at 30-38°C for 50, 60, 65, 70, 75, 80 and 90 minutes and 180, 160, 150, 120, 105, 80 and 60 minutes respectively. After fermentation, the leavened dough were kneaded and divided into desired smaller pieces of lumps, moulded by hand and placed into lightly greased baking pans and baked at 218 and 230°C. After baking, the breads were allowed to cool for 1 hour before the measurement of the oven spring (loaf-height) and other characters.

Sensory Evaluation

The organoleptic characters of the breads were evaluated 3 hours after baking by a taste panel consisted of 10 graduate student members. A ranking difference was introduced to compare the breads for crust appearance, crumb texture, crumb colour, grain texture, sponginess and flavour.

Results

Effect of yeast level and temperature on baking time and loaf-height.

To study the effect of yeast levels on the fermentation time and loaf-height, 2-6% dry-yeast was used in dough. After baking at 218°C the loaf-heights were measured which were 24, 27, 28, 30 and 28 mm corresponded to the time requirement of 30, 25, 30, 24 and 20 minutes (Table 1). Similarly, at 230°C the loaf-heights were 30, 32, 33, 34 and 31 mm after 25, 20, 18 and 16 minutes of baking respectively.

Table 1. Effect of yeast level and temperature on baking results (loaf-height) and baking time

Yeast level (%)	Baking Temp (°C)	Oven Spring (Loaf-height) (mm)	Baking Time (min)
2	218	24	30
	230	30	25
3	218	27	25
	230	32	20
4	218	28	30
	230	33	25
5	218	30	24
	230	34	18
6	218	28	20
	230	31	16

Effect of fermentation time and oxidant on baking results.

Table 2 summarized the results of the effect of oxidant on the loaf-heights. With oxidant, the loaf-heights were recorded 95, 30, 28, 38, 36, 33 and 35 mm in 50, 60, 65, 70, 75, 80 and 90 minutes respectively. Before baking, the loaf-heights were 22, 24, 18, 28, 28, 27 and 27 mm, whereas without oxidant, after leaping they were 34, 32, 30, 33, 31, 31 and 37 mm in 180, 160, 150, 120, 105, 80 and 60 minutes of fermentation respectively.

Table 2. Effect of fermentation time and oxidants on baking results

Fermentation time without oxidants (min)	Oven Spring (mm)		Fermentation time with oxidants (min)	Oven Spring (mm)	
	Before baking	After baking		Before baking	After baking
180	25	34	50	22	30
160	24	32	60	24	28
150	24	30	65	18	28
120	25	33	70	28	38
105	33	31	75	28	36
80	26	31	80	27	33
60	30	37	90	27	35

Discussion

The results of the effect of yeast level and temperature on baking time and loaf-height at both the baking temperatures (i.e. 218 and 230°C) show a trend of gradual increase of loaf-height with the increase of the amount of dry-yeast.⁷ This trend of relationship was observed upto the level of 5%. At 6% level, the decrease of loaf-height was recorded which indicated addition of higher percentage of dry yeast to dough reduce the loaf-height. In bread making the loaf-height is considered as one of the major organoleptic characters of bread. Between the two baking temperatures, 230°C was found better than 218°C in raising the loaf-height.⁵⁻⁷ The highest loaf-height i.e. 34 mm was recorded when 5% dry yeast was added to the dough, and at 230°C where the baking time was only 18 minutes which was the lowest minimum time. The average minimum baking time was required when the doughs were baked at 230°C.

In bread making, oxidants play a very important role. It helps to raise the loaf-height as well as reduces the time of dough fermentation. With oxidant, after 70 minutes of fermentation of dough, the highest loaf-height i.e. 38 mm was recorded; whereas without oxidant, to raise the loaf-height upto 34 mm, 180 minutes was required for fermentation. However, from the overall results of the effect of fermentation time and oxidants on baking results, it is evident that the fermentation of dough with oxidant took lesser time to raise the loaf-height than that of the dough without oxidant. Therefore, the use of oxidant during fermentation of dough reduces the baking period to achieve the same loaf-height.

However, after the above discussion on the experimental results, it could be concluded that the additives such as dry yeast, oxidants etc. in the formulation and the factors like, fermentation time of dough, baking temperature and time etc. have remarkable effect on short-time bread-making system.

References

1. Finney P L, Magoffin C D, Hosenev R C and Finney K F 1976. Short-time bread making systems. I, Interdependence of yeast concentration, fermentation, proof-time and oxidation requirement, *Cereal Chem.* 55:126.
2. Magoffin, C D, Finney P I and Finney K F 1977. Short-time bread-making systems. II. A 70 minutes sugar-free formula for conventional and high-protein breads. *Cereal Chem.* 54:760.
3. Potter N N and Hotchkiss J H 1995. 'Some principles of baking'. In *Food Science*. 5th Edn. Chapman and Hall, New York.
4. Wu, J Y, Maningat J I, Ponte J G Jr and Hosenev R C 1988. Short-time bread-making system, effect of formulation, additive, temperature and flour quality. *J Food Science*, 53(2):535-539.
5. Fernandes, C F, Dubash P J and Walker C E 1985, Accelerated bread-making process at two fermentation temperature. *AACC* 62(5):413-415.
6. Finney K F 1984. An optimized straight-dough bread-making method after 44 years. *AACC*. 61(1):20-27.
7. Faridi H A and Rubenthaler G I. 1984. Effect of baking time and temperature on bread quality, starch gelatinization and starting of Egyptian balady bread. *Cereal Chem.* 61:151-154.
8. Cooper E J and Reed G. 1968. Yeast formulation, effect of temperature, P^H, ethanol, sugar, salt and osmotic pressure. *Baker Dig.* 42(1):22-4, 26, 28, 29, 63.