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Comparative Efficacy of Different Brands of Baker's Yeast Used in Bread Production in Jos Metropolis, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Consumption of bread and other baked aerated wheat flour products has spurred the needs to determine the leavening ability of different brands of baker's yeast used in bread production. In this study we assessed the leaving ability of different brands of baker's yeast in production of quality bread and the flour used in baking test was Dangote flour. Seven brands of different commercial baker's yeast were collected from the 13 different brands sold in Jos market. These brands includes: Angel instant active dry yeast (ANGY), Saf-instant active dry yeast (SAFY), Food mont instant active dry yeast (FOMY), Pasha instant active dry yeast (PASY), STK- Royal active dry yeast (ROYA), Vahine active dry yeast (VAHY) and Fermipan active dry yeast (FEMY). The results

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of the viability tests for the different brands of active dry yeast indicated that six out of the seven brands were 100% viable while one had only one dead cell. Statistical analysis (one-sample-t- test) revealed that there was significant different among the different brands of yeasts used ($p<0.05$), however ANGY had the highest performance viability ($p<0.002$) and PASY had the least ($p<0.039$) as shown in Table 3 in appendix. The result of the pH variation as function of time at 26^0C shows steady decrease in pH values of all the different brands of yeast suspension. Using regression analysis, pH at 150 minutes contribute 96 percent to the leavening ability of different brands of baker's yeast used in bread production and 30 minutes contribute the lowest 9.1 percent as shown in the Table 4 in the appendix. It was concluded that all the seven brands of baker's yeast tested were suitable for use in bread production when compared with the standard.

Keywords: Baker's yeast; flour; fermentation; pH; temperature.

1. INTRODUCTION

Bread is a staple food prepared from dough of flour and water, usually by baking. Consumption of bread and other baked aerated wheat flour products has spread in Nigeria and other developing countries of the world. The capacity of some yeasts to bring a rapid and efficient conversion of sugars into alcohol and carbon dioxide give a great contribution to the progress and well being of the human race more than any other group of microorganism since 2000 B.C. [1]. The bread consumed today is the result of the discovery by a French chemist, Louis Pasteur, who proved that, fermentation; an enzyme induced chemical alteration in food was caused by yeast. Although, many genera and species of yeast exist in nature, the most technologically well known and commercially significant yeast in bread making are the related strains and species of *Saccharomyces cerevisiae* [2]. *Saccharomyces cerevisiae* is unicellular eukaryotic, microorganisms classified as fungus and they are also known as baker's yeast or beer yeast [3,4]. Yeast cells reproduce asexually by a process called budding in every 90 minutes and their diameter is usually between 3 and 4 µm. When yeast cells stored under adverse conditions, such as lack of nutrients in the medium or high temperatures, they do not die but undergoing a process called sporulation. Yeast spores can with-stand long times without nutrients, at the low and high temperatures, until the conditions are favourable for reproduction and then they start to sprout all over again [5]. These organisms which are used as baker's yeast are classical examples of microorganisms which exhibit both aerobic and anaerobic metabolism which are important in commercial circles [6]. Yeast is the most important ingredient in dough preparation used for bread making or some other Products. Dough should be with an excellent viability to attain the best leavening power necessary for the production of good quality bread. Water is an integral part of wheat flour dough; the amount, physical state and location of water are crucial to the formation of dough that will hold gas and produce an open, aerated crumb structure in the final product [7]. Yeast needs energy to survive, and has a number of ways to attain this energy; fermentation and respiration are two ways [8]. Fermentation is favoured more by reducing sugars such as glucose, fructose, maltose and sucrose, producing alcohol and carbon dioxide gas in the process. The carbon dioxide produced is trapped within the elastic dough resulting in flavoured fermented taste desirable to consumers. The bread produced from different Bakeries in Jos metropolis reveals some glaring variations in taste, flavour and texture when different brands of bread yeasts are used with the same type of bakeries flour. The objective of this work was to assess the efficiency of the different brands of yeast used in dough rising.

2. MATERIALS AND METHODS

2.1 Samples Collection

Seven brands of baker's yeast were collected from the 13 different brands sold in Jos market. These brands includes: Angel instant active dry yeast (ANGY), Saf-instant active dry yeast (SAFY), Foodmont instant active dry yeast (FOMY), Pasha instant active dry yeast (PASY), STK- Royal active dry yeast (ROYA), Vahine active dry yeast (VAHY) and Fermipan active dry yeast (FEMY). These brands were readily available and are commonly used by bakers within jos metropolis and were duly purchased in packs of 250 g each. Out of the 30 bakeries currently in operation in Jos, 10 bakeries houses using these seven different types of yeast were randomly selected.

2.2 The Flour Used

The flour used in baking test was Dangote flour. Using a cylindrical polished metal trier - 13 mm diameter with a slit 1/3 of the circumference flour samples from ready to use sack for bread making were carefully taken (500 g) and put in to clean dry containers and sealed to maintain air tight condition until when required for use.

2.3 Determination of Yeast Viability

This was carried out according to the methylene blue staining method adopted by [9] using Thoma counting Chamber. Exactly 0.1 g of each type of yeast under test was weighed in to 10 ml warm sterile distilled water. Thereafter 1 g of glucose was added and the content was properly shaken to dissolve yeast and sugar completely, this was left in an incubator at 30°C for 3 hours. The stock was diluted 10 fold by taking 1 mL of sample (stock), plus 1 mL of methylene blue and 1 mL of 5N acetic acid and finally made up to 10 mL by the addition of 7mL of sterile distilled water. This process was repeated further to make the dilution to 10^{-2} such that the cell concentration was between 15-300 cells present per microscope field. The drop of the mixture was applied to the ruled grids of the Thoma haemocytomter chamber. By counting the total number of cells in the number of squares and counting the number of blue cells in the same group of squares, the percentage of dead cells were calculated from the total number of cells present.

Thus: % viability = (Number of live yeast (unstained cells) / Total number of yeast cells (dead and living)) X 100

2.4 Measurement of Fermentation Rate in Bread Yeast

This was carried out according to the methods of Association of Official Analytical Chemists (8). Standard buffer solutions with pH near that of the sample and two others to check linearity of electrode response were prepared (pH 4. pH 7 and pH 10). Thereafter a solution of the yeast under test was prepared by adding one teaspoonful in to 150 mL warm water followed by the addition of a pinch of sucrose in to the solution. The pH equipment was standardized with the standard buffer solutions of pH 4, pH 7 and pH 10 respectively. The electrode was then washed 6-8 times with portions of the sample (yeast) solution and thereafter inserted into the fresh yeast sample solution. The temperature was determined and pH readings were taken at intervals of 30 minutes for 3.5 hours. The fermentation rate which corresponds to the degree of respiratory rate of the yeast was computed by taking the readings of the changes in pH of the yeast solution against time Specify that this is the decrease in pH.

3. RESULTS AND DISCUSSION

The result of the viability tests for the different brands of active dry yeast was shown in Table 1. The results indicated that six out of the seven brands were 100% viable while one had only one dead cell. Statistical analysis (one-sample-t- test) revealed that there was significant different among the different brands of yeasts used ($p<0.05$), however ANGY had the highest performance viability ($p<0.002$) and PASY had the least ($p<0.039$) as shown in Table 3 in appendix. The mean percentage significance difference between Angel instant active dry yeast and six others used by these Bakers could have been due to the yeast inability to retain and regain activity after a prolonged storage period, stability and consistency as a result of initial lower processing temperature or increase or reduction of water activity which may usually lead to death or retardation of growth. All the Seven brands of yeast evaluated had high viability values when compared with the standard obtained by Campbell [1] who reported that yeast cells meant for commercial use should attain percentage viability of 80% and above. Even though, the percentage viability of Fermipan active dry yeast was significantly what compared with the six others, its problem for consideration for commercial usage would have become more significant and unsuitable if it had lower percentage viability as earlier reported by Campbell [10]. It is possible that the observed lower viability count of Fermipan yeast could have been attributed to differences in handling procedures, such as processing, packaging and environmental storage system. It therefore means that prudent processing of baker's yeast, such as adequate drying procedure, packaging, storage, transport and distribution to retailers and consumers should be intensified.

Table 2 shows the result of the fermentation rate in bread yeast as pH changes with time at 26^0C. The steady decrease in pH values of all the different brands of yeast suspension observed in this study Table 2 indicated that the suspension

Table 1. Viability of different active dry yeast brands

Brands of active dry yeasts	Cell counts		No. of dead cells	Percentage viability
	a	b		
ANGY	151-0	152-0	Nil	100
VAHY	101-0	107-0	Nil	100
SAFY	152-0	162-0	Nil	100
FOMY	112-0	114-0	Nil	100
FEMY	74-0	80-0	1	99.4
ROYA	108-0	109-0	Nil	100
PASY	112-0	99-0	Nil	100

Key: ANGY - Angel instant active dry yeast, VAHY - Vahine active dry yeast; SAFY - Saf- instant active dry yeast; FOMY - Foodmont instant active dry yeast; FEMY - Fermipan active dry yeast; ROYA - STK-Royal active dry yeast; PASY- Pasha instant active dry yeast

Table 2. pH variation as a function of time at 26ºC

Bakers yeasts	0	30	60	90	120	150	180	210	240
ANGY	5.43	4.34	4.18	4.08	4.00	3.98	3.94	3.94	3.88
VAHY	5.68	5.35	5.13	5.08	5.03	5.00	4.95	4.90	4.88
SAFY	4.93	4.08	3.93	3.83	3.78	3.72	3.70	3.70	3.63
FOMY	4.68	4.33	4.05	4.03	4.00	3.88	3.78	3.65	3.60
FEMY	4.73	4.25	4.08	4.03	3.95	3.93	3.90	3.83	3.83
ROYA	4.53	4.20	4.00	3.95	3.80	3.73	3.65	3.60	3.58
PASY	5.23	4.93	4.73	4.65	4.53	4.50	4.40	4.33	4.28

Key: ANGY - Angel instant active dry yeast, VAHY - Vahine active dry yeast; SAFY - Saf- instant active dry yeast FOMY - Foodmont instant active dry yeast; FEMY - Fermipan active dry yeast; ROYA - STK-Royal active dry yeast; PASY - Pasha instant active dry yeast

became more acidic as fermentation proceeded. This confirms similar falls in pH values in acidic food such as gruel-Kunu (pH 5.5 to pH 3.0) as reported by Onuorah et al. [11], beer (pH 4.5 to pH 4.0), and wine (pH 4.0 to pH 3.0) (11). Yeast cells are regarded as single cell proteins (SCP) and for every enzyme; there is an optimal pH value at which the enzyme is most active as a catalyst. An increase or decrease in pH value away from the optimum value will cause a decrease in enzyme activity. According to Monica [12], the stronger the acidic environment or suspension, the lower the pH. Brown and Boot [3] stated that a decrease in pH is a sign that the sources of fermentable Carbohydrate in the food or system have been exhausted and that the metabolisms of nitrogenous compounds have started. The finding in this study confirmed this report because there was observed steady decrease in pH values in all the different brands of yeast as fermentation proceeded indicating concomitant increase in acidity due to microbial activities. Hydrogen ion (H^+) concentration is therefore of considerable importance for all living organisms such as bread yeast because any small changes in pH values will be accompanied by marked changes in metabolic processes which could lead to economic loss in commercial spheres.

4. CONCLUSIONS

Based on the percentage viability, the seven brands of yeast evaluated had high viability values when compared with the standard and are therefore suitable for use in bread making. The indicator of yeast activity is carbon-dioxide production coming from decomposition of carbohydrate, the CO_2 output for Vahine active dry yeast and Pasha instant active dry yeast were too low when compared with the five other brands of yeast and therefore should be considered for economic reasons. All baker's yeast samples tested were of good quality.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

One-Sample –t –Test (Table 3)

	Test value = 0					
	Mean	Std. deviation	Mean difference	df	95% confidence interval of the difference	
					t	Sig. (2-tailed)
ANGY	151.50	.707	151.500	1	3.0302	.002
VAHY	104.00	4.243	104.000	1	34.667	.018
SAFY	157.00	7.071	157.000	1	31.400	.020
FOMY	113.00	1.414	113.000	1	1.1302	.006
FEMY	77.00	4.243	77.000	1	25.667	.025
ROYA	108.50	.707	108.500	1	2.170E2	.003
PASY	105.50	9.192	105.500	1	16.231	.039

REGRESSION (Table 4)

Model	Beta In	t	Sig.	Partial correlation	Collinearity statistics tolerance
(Constant)	.306	.144		2.118	.088
150 MINUTES	.960	.035	.997	2.743E1	.000
0 MINUTES	.101[a]	2.242	.088	.746	.363
30 MINUTES	-.091[a]	-.273	.798	-.135	.015
60 MINUTES	.184[a]	.434	.687	.212	.009
90 MINUTES	-.114[a]	-.268	.802	-.133	.009
120 MINUTES	-.540[a]	-1.093	.336	-.479	.005
180 MINUTES	.237[a]	.417	.698	.204	.005
210 MINUTES	.240[a]	1.017	.367	.453	.023
240 MINUTES	.118[a]	1.359	.246	.562	.149

a. Predictors in the Model: (Constant), 150 MINS
b. Dependent Variable: DV

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