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

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 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.

Key word: Baker's yeast, Flour, Fermentation, pH, Temperature

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. (Gelinas, P, 2009). 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* (Kanamori *et al.*, 1997).*Saccharomyces cerevisiae* is unicellular eukaryotic, microorganisms classified as fungus and they are also known as baker's yeast or beer yeast. 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 (Neiman, A.M., 2011). 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 (Beudeker *et al.*, 1990). 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 (Loveday, 2012). Yeast needs energy to survive, and has a number of ways to attain this energy; fermentation and respiration are two ways (Yerushaml and Volesky, 1981). 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.

MATERIALS AND METHODS:

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 250g each. Out of the 30 bakeries currently in operation in Jos, 10 bakeries houses using these seven different types of yeast were randomly selected.

The Flour Used

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

Determination of Yeast Viability

This was carried out according to the methylene blue staining method adopted by Rocken and Staruss (1976) using Thoma counting Chamber. Exactly 0.1g of each type of yeast under test was weighed in to 10ml warm sterile distilled water. Thereafter 1g of glucose was added and the

content was properly shaken to dissolve yeast and sugar completely, this was left in an incubator at 30 ^{0}C for 3 hours. The stock was diluted 10 fold by taking 1mL of sample (stock), plus 1mL of methylene blue and 1mL of 5N acetic acid and finally made up to 10mL 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 $\frac{\text{Number of live yeast (unstained cells)}}{\text{Total number of yeast cells (dead and living)}} \times 100$

Measurement of Fermentation rate in Bread Yeast

This was carried out according to the methods of Association of Official Analytical Chemists (AOAC, 1980). 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 150mL 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.

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 (1980) 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 (1980). 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 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 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 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.* (1983), beer (pH 4.5 to pH 4.0), and wine (pH 4.0 to pH 3.0) (Hough *et al.,* 1994). 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 (1987), the stronger the acidic environment or suspension, the lower the pH. Brown and Booth (1991) 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.

Table 2: pH variation as a function of time at 26^0 C

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

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.

REFERENCES

A.O.A.C. (1980). Official Method of Analysis. William Horwitz, ed. 13th ed. Association of Official Analytical Chemist. P.O Box 540, Benjamin Franklin station, Washington D.C. U.S.A. PP. 100-130.

Beudeker, R.F; Vandam, H.W; Vander plah, J.B. and Vallenga, K. (1990). Development in Baker's yeast production. In; yeast Biotechnology and Biocatalyst, marcel Deker, New York. Pp 50-120.

Brown, M.H. and Brooth, I.R.(1991). Acidulant and low pH. In Russel, N.J. and Gould, G. W. eds. Food preservation. Blackie published, Glasygow, pp 20-45.

Campbell, I. (1980). Fermentation; An introduction to Brewing Science and Tecnology. Rainbow, C and float, G. E.S. eds. The institute of Brewing, 33 charges street London, WIY8VE, England part ii pp 1-5.

Gèlinas, P (2009). Inventions on baker's yeast strains and specially ingradients. Recent Pat. Food Nutrifion. Agric.**1**:104-132.

Hough, J.S; Steven ,S.R. and Young, T.W. (1994). New Brewer. In; J.R.A. Pollock eds. Malting and Brewing Science, volume **1**, no 2. Champman and Hall London. pp 4-15.

Kanamori, T.J; Nishikawa, S.J; Shin, I.J; Schultz, P.G. and Endo, T. (1997). Probing the environment along the protein import pathways in yeast mitochondria by sit specific photocross linking. In; proceedings of Natural academic of sciences of united state of America, volume **94**, 480-490.

Loveday, S. M; Huang, V. T; Reid, D. S and Winger, R. G (2012). Water dynamics in fresh and frozen yeasted dough. Crit. Rev. Food Science Nutrition, **52** (5):390-409.

Monica- cheesebrough (1984). Introduction to mycology, medical laboratory manual for tropical countries volume **2**, pp 372-376.

Neiman, A.M. (2011). Sporulation in the budding yeast Saccharomyces cerevisiae, Genetics, volume **189,** 737–765.

Onuorah, S.I,; Adesiyun, A.A. and Adekoye, J.O. (1983). Survival and multiplication of Staphylococcus aureus and *Escherichia coli* in a nigerian cereal drink. *Journal of food and Agriculture* volume **1** (3) pp 169-173.

Rocken, W.and Staruss, M. (1976). E.B.C. Yeast Group, Journal of the institute of brewing volume **5**, pp.209.

volume **189,** 737–765.

Yerushaml. L. and volesky, B. (1981). Experimental Bioenergetics of Saccharomyces cerevisiae in Respiration and Fermentation. Biotech and Bioeng., **23** : 2373-2390"

Appendix

One-Sample –t –Test (Table 3)

Test Value = 0

					95% Confidence Interval of the Difference	
	Mean	Std. Deviation	Mean Difference	df	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)

					Collinearity Statistics
Model	Beta In	t	Sig.	Partial Correlation	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