

Investigating Wild Yeast Baking Potentials

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Abstract: Yeast strains isolated from locally brewed beverages (Burukutu and Palm Wine) was identified to be *Saccharomyces cerevisiae*. They were tested for markers characteristics such as sugars fermentation ability, growth at elevated temperatures, growth in 3.0% NaCl, 3.0% ethanol and 50.0% glucose were found to be identical with the standard strain of *Saccharomyces cerevisiae* characteristically. The two isolates compared favorably with the commercial baker's yeast strain (control), thus confirmed their baking potentials. The finding in this study has shown that it is possible to isolate pure culture of *Saccharomyces cerevisiae* from local beverages and use them for bread baking instead of importing the commercial strains of baker's yeast that are highly expensive. These local isolates if used will conserve our foreign reserve.

Key words: Fermentation • *Saccharomyces cerevisiae* • Burukutu • Palm wine • Yeast strains

INTRODUCTION

Bread is reported to be one of the most ancient human foods that was produced with the help of microorganisms at an ancient Egyptian bakery at the Giza Pyramid area in the year 2575 B.C [1]. *Saccharomyces cerevisiae* is the most commonly used species of *Saccharomyces* in bread baking and it has been employed as baker's yeast in manufacturing bread for at least 6,000 years [2,3]. During bread baking, the yeast grows aerobically resulting in increased carbon (iv) oxide production and minimum alcohol accumulation via fermentation of sugars[1]. According to Pattison and Von-Holy [4], increased production of carbon (iv) oxide increases the dough size thus giving bread its characteristics of being light and spongy texture. They further stated that the yeast is so vital in baking industry that its functions can not be substituted with any other component or ingredient. According to Alcamo [2], fermentation of bread involves the activities of alpha and beta-amylases present in the moistened dough to release from the starch, maltose and sucrose. He also stated that addition of baker's yeast strain (*Saccharomyces cerevisiae*) that produces enzymes such as maltase, invertase and protein digesting enzymes enhances the production of carbon (iv) oxide in the dough.

In Nigeria, baking industry is very costly due to the high cost of imported baker's yeasts from the developed countries such as Europe and America, a process that drains its foreign reserve. The scarcity of bakers yeast has resulted in poor production of bread by bakers and making consumption of bread almost beyond reach.

This study was undertaken with the view to isolating and identifying the wild yeast strains used in brewing the local alcoholic beverages (Burukutu and Palm wine) and thus profer their potentials in bread baking.

MATERIALS AND METHODS

A local beverage "Burukutu" (BKT) was purchased from the producer in Zaria and fresh Palm wine (PW) was obtained from Kwoi about 200km south of Kaduna and a commercial baker's yeast "yeast Pakamaya" (YPK) was purchased from Zaria market for use as a control.

The beverages and the control (YPK) were serially diluted. Using spread technique, an aliquot of each sample was subculture on appropriately labeled Sabouraud Dextrose Agar(SDA) plate and incubated at 28°C for 48 hours. Colony counts were made and results recorded. Yeast colonies having morphological characteristics similar to the control strains were repeatedly sub-cultured on fresh sterile SDA plates and the pure isolates were purified and identified using

standard yeast identification technique [5]. The isolates obtained from the beverages were tested for fermentative ability, growth at elevated temperature, growth in the presence of 3.0% sodium chloride, growth in 3.0% ethanol and in 50% glucose. These are characteristics known of the control yeast strain (YPK).

Our local strains were coded BKT (yeast strains from burukutu) and PW (yeast strain from Palm wine) respectively while the commercial bakers yeast strain was yeast Pakamaya (YPK) strain.

RESULTS

The control baker's yeast strain (YPK) had the highest cell count of 9.2×10^6 cfu/ml. This is indicative of its viability and how actively it will leaven the bread. The local isolates (BKT and PW) had the counts of 2.6×10^6 cfu/ml and 3.5×10^6 cfu/ml respectively (Table 1). The performance of the yeast strains on the basis of markers has shown very strong acid and gas production by both the local and commercial yeast strains.

Table 1: Colony counts on SDA

| Sample | Yeast counts (cfu/ml) |
|----------------|-----------------------|
| Burukutu | 2.6×10^6 |
| Palm wine | 3.5×10^6 |
| Yeast pakamaya | 9.2×10^6 |

YPK is the commercial yeast strain used as control.

Table 2: Biochemical Characteristics of Yeast Isolates

| Yeast Isolates | Sugar Fermentation | | | | | | Nitrate Assimilation | | | | Isolate |
|----------------|--------------------|----|---|----|---|----|----------------------|-----------------------------------|-----------|----------------------|---------|
| | a | b | c | d | e | f | KNO ₃ | (NH) ₄ SO ₄ | Ascospore | | |
| YPK | AG | AG | - | AG | - | AG | - | + | + | <i>S. cerevisiae</i> | |
| BKT | AG | AG | - | AG | - | AG | - | + | + | <i>S. cerevisiae</i> | |
| PW | AG | AG | - | AG | - | AG | - | + | + | <i>S. cerevisiae</i> | |

Key : A = Glucose, B = sucrose C = Galactose D = Maltose E = lactose F = Raffinose

AG = Acid and Gas production, A = Acid production only, + = growth, - = No growth

*= Control yeast strain, *S. cerevisiae* = *Saccharomyces cerevisia*

Table 3: Performance of Yeast Strains Based on the Markers

| Isolates | Fermentative ability | Growth in | | | Growth at elevated temperature (°C) | | | |
|----------|----------------------|-----------|--------------|-------------|-------------------------------------|----|----|----|
| | | 3.0% NaCl | 3.0% Ethanol | 50% Glucose | 30 | 35 | 37 | 42 |
| BKT | +++ | + | + | + | + | + | + | - |
| PW | +++ | + | + | + | + | + | + | - |
| YPK | +++ | + | + | + | + | + | + | - |

Key: +++ = very strong acid and gas production

+ = positive - = negative

The fermentative abilities of the wild yeast isolates are identical with the control strain (YPK) (Table 2). The abilities of isolates to grow at elevated temperatures ranging from 30°C - 37°C and growth in 3.0% NaCl, 3.0% ethanol and 50.0% glucose have confirmed that they are identical with the commercial baker's yeast strains.

The performance of yeast strain based on markers is shown in Table 3. Generally, the colonial morphology, gram-staining reaction (G+ Oval shaped cells) and the biochemical characteristics of the wild yeast isolates were identified as *Saccharomyces cerevisiae*.

DISCUSSION

The two wild yeast strains isolated from local beverages were coded BKT and PW, that is yeast strains from burukutu and Palm wine respectively. The two isolates were found to be characteristically identical with the commercial yeast strain that is yeast pakamaya (YPK) by having fermentative ability, growth in the 3.0% Sodium chloride, 3.0% ethanol, in 50.0% glucose and at elevated

temperatures respectively. Hence they were identified as *Saccharomyces cerevisiae* strains. Fermentative ability is often used to compare wild yeast activity against commercial strains [3]. The control yeast strain (*Saccharomyces cerevisiae*) had the highest yeast cell count of 9.2×10^6 cfu/ml followed by palm wine (PW) isolates with 3.5×10^6 cfu/ml while Burukutu had the lowest count of 2.6×10^6 cfu/ml. This variation can be attributed to the effects of perishable parameters such as storage, processing, freeze-thaw, osmo-tolerance, resistance and colour [4]. The low count of the burukutu strain could be as a result of the processing technique employed by the producer. The high plate counts of these wild yeast strains in this study have shown that the yeast cells were viable and active while the beverages were being drunk.

The isolation of these wild yeast strains from local beverages and their identification as *Saccharomyces cerevisiae* have confirmed earlier reports that Burukutu and Palm wine are good sources of *Saccharomyces cerevisiae* to be used in baking industries [6,7]. Our finding is also in agreement with the report that 89-92% of the total *Saccharomyces* spp is *Saccharomyces cerevisiae* and that Palm wine is the major source of *Saccharomyces cerevisiae* [8]. The ability of the local *Saccharomyces cerevisiae* isolates to tolerate and grow in high level of ethanol has confirmed report that of the two most commonly used species of *Saccharomyces* (*S. cerevisiae* and *S. ellipsoides*), *S. cerevisiae* is used for both bread baking and alcohol production, while *S. ellipsoides* is use for alcohol production only [2].

This result lends support to the previous report that *Saccharomyces cerevisiae* is one of the micro-flora in burukutu [9]. The abundance prevalence of wild yeast strains in local beverages has provided one of the basic requirements in fermentation industry. It is therefore recommended that greater work be carried out to produce pure isolates of *Saccharomyces cerevisiae* from our local beverages for use in bread baking and alcohol production.

When such efforts are actualized, there will be higher bread production and prices will come down thus making bread available. For the vision 20:2020 not to be a mirage, Nigerian government should encourage serious scientific researches by pumping considerable amount of money to various areas of researches on our local resources.

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