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EFFECT OF FERMENTATION TIME ON NOTABLE QUALITY ATTRIBUTES OF PITO (A CARAMELIZED FERMENTED CORN DRINK PRODUCT) DRINK.

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Abstract

Comparative evaluation of the effect of fermentation time of pito drink prepared from caramel and ogi supernatant with the addition of fruit juice extracts (Pineapple and orange) were evaluated. The sample were coded AMI, BAS, KHA, HAM and SEK respectively. Samples were prepared with ogi supernatant at 0hr, 12hr, 24hr, 36hr and 48hr fermentation time. Physico-chemical and sensory analyses were carried out using standard analytical procedures. Data obtained were subjected to analysis of variance (ANOVA) with the means separated using Duncan Multiple Range Test (DMRT). The vitamin C content range from 15.47 to 85.55 mg/100ml (significant different at $P \leq 0.05$ for all the samples). The percentage brix varied between 0.00 to 11.50. The colour parameters analyzed were lightness (L^*) redness (a^*) and yellowness (b^*) ranging from 24.21 to 27.62, 21.11 to 9.17 and 2.23 to 8.8 respectively; indicating significant differences in colour analysis ($P<0.05$). The selected mineral evaluated in the pito drinks were significantly different at $p<0.05$ with the values for Manganese, Copper, Magnesium and Calcium ranging from 0.155 to 0.78, 0.02 to 0.03, 18.60 to 24.50 and 1.23 to 3.55 mg/100g respectively. The sensory evaluation result rated SEK(48hrs fermentation) significantly higher ($P<0.05$) for all the attributes, including the overall acceptability. Therefore, this study has confirmed that fermentation time improved the organoleptic characteristics as well as mineral composition of pito samples

Keyworks: Fermentation, Quality, Pito, Caramelized Drink, Fruit Extract

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INTRODUCITON

The brewing and drinking of traditional beverages are intrinsic part of the culture of the African people. Traditionally brewed beverages are characterized by good mineral composition such as calcium, magnesium, sodium, zinc, potassium and iron, which are necessary for regulating and building the living cell (Kolawole et al., 2007; Daudu et al; 2012). Maize (*Zea mays l*) also known as corn is a cereal grain that was originally domesticated in Mesoamerica (OECD2003) and forms an essential component of the global food security as a major part of the diet of millions of people (Kamanula et al; 2011). Indigenous traditional beverages play a vital role in the daily social, economic, nutritional and cultural aspect of peoples life especially in developing Countries (Kadjogbe et al; 2015; Fowopo and Ogunbanwo, 2016).

Pito is a caramelized fermented corn drink that is widely locally brewed and consumed by people. The crops such as maize (*Zea mays*), millet (*Panicium milliaceum*) and sorghum (*Sorghurm bicolor*). Fermented food exhibit beneficial effect on health by reducing blood cholesterol level, protecting against pathogen, fighting carcinogenesis, osteoporosis, diabetes, obesity, allergies and atherosclerosis and alleviating the symptoms of lactose intolerance (Tamang and Kailasapathy, 2010).

A lot of researches have been carried out fermented drink such as burukutu, kunu-zaki, orika, zobo, fora-de-nunu as well as pito. Adewara and Ogunbanwo (2013) studied the effect of processing variables on the production of burukutu while Akanor et al., (2014). Studied the physicochemical characteristics of non-alcoholic beverage produced from malted roasted varieties of maize. Also, (Fadahunsi et al., 2013) researched on microbiological and nutritional assessment of burukutu and pito; and Obadina et al; (2008) studied the effect of steeping time of milled grain on the quality of kunu-zaki. The potential for upgrading traditional fermented food through biotechnology was studies by Achi (2005. However, the objectives of this present work are to determine the effect of fermentation on some quality attributes of pito produced from caramel and ogi supernatant with the addition of fruit juice. Such as attributes include organoleptic (sensory) properties, colour, pH, vitamin C, brix, and major mineral contents

Materials and methods

Source of materials

Dried corn grains, mature pine apple, oranges were obtained from the school farm of the Federal Polytechnic, Ilaro, Ogun State while granulated sugar (Dangote), packaging bottles were bought from a reputable store in Ilaro metropolis.

Production of caramel

A sauce pot (Stainless) was placed on controlled cooking gas cooker and 500g granulated sugar was put into the pot (stainless), stirred continuously until a desired colour (dark brown) was noticed.

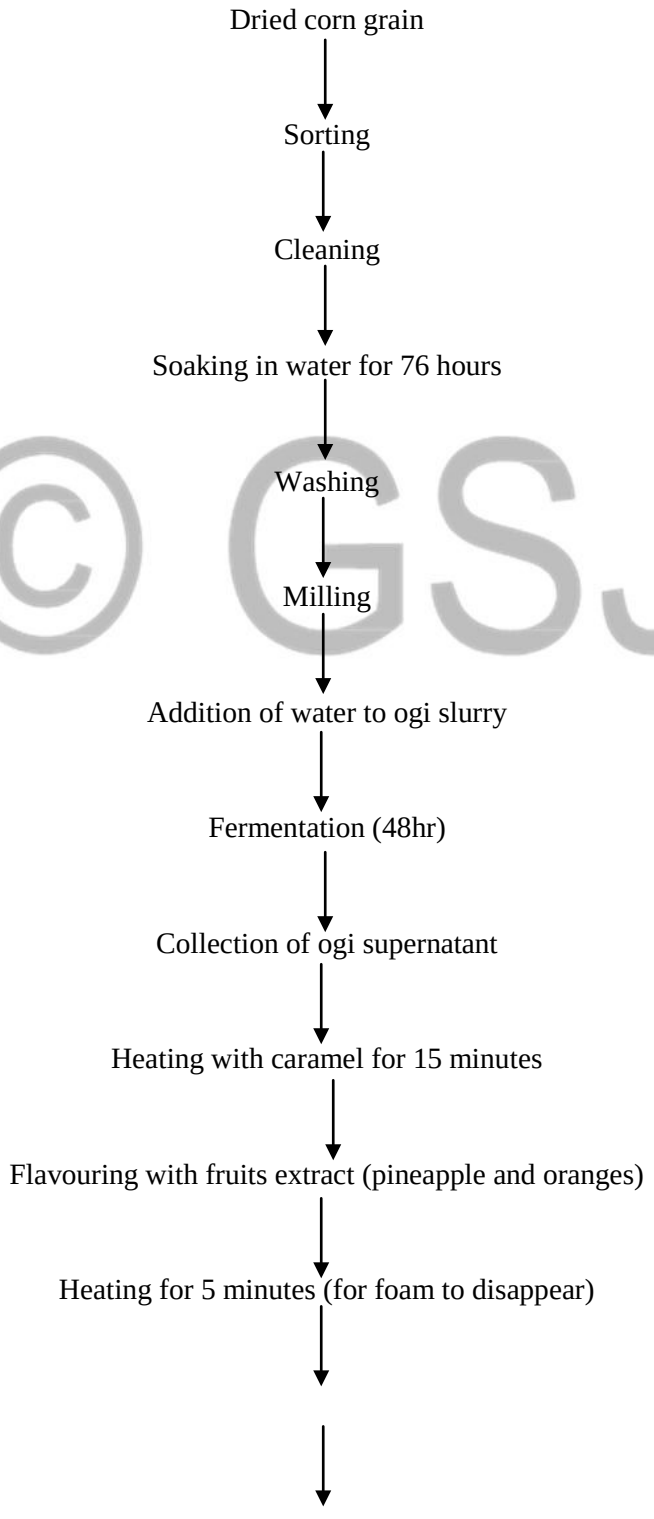
Production of ogi

1 kg of sorted corn grains were washed, soaked in potable water (5 litres) for three (3) days. The soaked soft corn grains were then decanted, washed and milled using attrition mill. The

slurry obtained was sieved with the aid of muslin cloth to free it form hulls. The starch (ogi) was collected in a clean stainless bowl. Water was then added to the slurry and left for 48 hours to activate the fermentation process further.

Production of pito drink

About 50ml of caramel was added to 500ml of the ogi supernatant at 0, 12, 24, 36 and 48hours respectively and boiled for 15minutes. 286 ml of fruit extract (250ml of pineapple and 36ml of orange was added and further heated for 5 minutes. The pito produced was allowed to cool, sieved using muslin cloth and then aseptically bottled in transparent glass bottles. The bottled drink were then stored in the refrigerator for subsequent analyses. All reagents and chemical used were of analytical grades



Cooling

Sieving

Bottling

Storing/Refrigerating

Fig1: Flow chart for the production of pito drink

Analytical Procedure

The vitamin C of the pito drink was determined by the standard ascorbic determination using 2,6dichlorophenol-indophenol titration method (AOAC 2000). The pH was determined using pH meter (Radiometer PHM 92) Radiometer Analytical A/S, Bagsvacrd Denmark) after collection using standard buffer solution. The percentage of Brix was determine using Abbey Refractometer. A drop of the sample was dropped on the lens of the refractometer and the sugar level observed by positioning the device in the direction to an illumination and the percentage of the sugar was read on the calibrated mark on the lens.

Colour Analysis

Colour was evaluated using digital colourimeter. Results are expected by CIFLAB System, L^* a*and b* value. Value of L^* vary from back (0) to white (100). Values of a* ranges from green (-60) to red (+60).

Mineral Analysis

Selected mineral composition (Calcium, Magnesium, Manganese and Copper) were determined by Atomic Absorption Spectro-photometry method (BUCK, 201 Vo1 Vap-Perkin Elmer 1982)

Sensory Evaluation

The sensory evaluation of each pito sample fermented at length 0hr, 12hrs 24hrs, 36hrs and 48hrs were assessed by staff and student of the Federal Polytechnic, Ilaro who are familiar with the product. A total number of 60 panelist was used to indicate their preference in terms of colour, aroma, taste, flavour and overall acceptability. However, the sample were coded AMI (0hr), BAS (12hrs), HAM (24hrs), KHA (36hrs) and SEK (48hrs) for easy identification. Data obtained were analysed using analysis of variance (ANOVA) and difference in mean value calculated using Duncan Multiple Range Test (DMRT)

RESULTS AND DISCUSSION

Table 1: Showing the Result of Vitamin C, pH and Brix Content of Fermented Pito Drink

SAMPLE	PARAMETERS		
	Vit C	**pH**	**Brix**
AMI	18.55 ± 0.07^{e}	4.53 ± 0.01^{e}	11.50 ± 0.00

BAS	16.29±0.08[d]	4.49±0.02[d]	10.50±0.00
HAM	16.03±0.07[c]	4.44±0.01[c]	10.00±0.00
KHA	15.77±0.08[b]	4.44±0.02[b]	9.50±0.00
SEK	15.47±0.07[a]	4.44±0.02[a]	9.00±0.00

Value are mean of triplicate determination for ± standard deviation

Means value with different superscript within the same column are significantly different at 5% level

Table 2: Showing the Result of Colour Analysis of Fermented Pito Drink

SAMPLE	**PARAMETERS**		
	L*	a*	**b***
AMI	25.44±0.78[b]	5.94±0.16[b]	5.34±0.38[c]
BAS	24.21±0.24[a]	2.11±0.12[a]	2.23±0.69[a]
HAM	25.85±0.07[b]	7.14±0.12[c]	6.07±0.04[c]
KHA	25.85±0.07[b]	7.14±0.12[c]	6.07±0.04[c]
SEK	24.90±0.45[ab]	5.72±0.30[b]	4.37±0.28[b]

Value are mean of triplicate determination for ± standard deviation

Means value with different superscript within the same column are significantly different at 5% level

Table 3: Selected Mineral Analysis of Fermented Pito Drink

SAMPLE	PARAMETERS			
	Mn	Cu	Mg	Ca
AMI	ND	ND	23.78±0.13[d]	3.55±0.43[cd]
BAS	ND	0.03±0.003[b]	18.60±0.01[a]	1.23±0.20[a]
HAM	ND	0.002±0.00[a]	19.84±0.59[b]	3.61±0.21[d]
KHA	0.15±0.003[b]	ND	20.66±0.33[c]	2.96±0.02[b]
SEK	0.78±0.09[c]	ND	24.50±0.01[e]	3.14±0.07[bc]

Value are mean of triplicate determination for ± standard deviation

Means value with different superscript within the same column are significantly different at 5% level

Table 4: Sensory Evaluation of Fermented Pito Drink

SAMPLE	PARAMETES				
	COLOR	AROMA	TASTE	FLAVOR	OVERALL
AMI	7.11±1.45[a]	7.67±1.00[a]	7.11±1.45[b]	7.44±1.33[b]	7.89±1.05[b]
BAS	7.00±1.22[a]	6.67±1.73[a]	5.78±1.2[a]	6.11±0.05[a]	6.33±1.32[a]
HAM	6.67±0.87[a]	6.78±0.97[a]	7.22±0.97[b]	7.00±0.87[ab]	7.33±0.5[ab]
KHA	6.78±0.83[a]	6.67±1.41[a]	6.89±1.76[ab]	7.33±1.22[b]	7.44±1.33[b]
SEK	7.33±1.22[b]	7.67±0.87[a]	7.89±0.93[b]	7.78±0.67[b]	8.22±0.97[b]

Value are mean of triplicate determination for ± standard deviation

Means value with different superscript within the same column are significantly different at 5% level

DISCUSSION

Vitamin C, pH and Brix content

The results of the vitamin C, pH and Brix content of the fermented pito drink are as shown in Table 1. There are significance difference ($P<0.05$) in the vitamin C, pH and Brix content of the sample. The Vitamin C ranged from 15.47mg/100ml to 18.55mg/100ml i. e pito with zero (AMI) fermentation had the highest value of vitamin C while fermented 48hrs (SEK) had the least value. Ascorbic acid is an effective quencher of singlet oxygen and other radicals. It enhance absorption of inorganic iron and inhibits the formation of nitrosamines in the stomach. A decrease in the ascorbic acid content of the drink was observed as the fermentation time increases. Adetuyi *et al;* (2008) reported in a similar work that the reduction in Vitamin C might be as a result in the activities of the enzymes ascorbate oxidase that might have been produced by fermentation microorganisms which strongly depend on the pH of their fermentation environment. The pH of all the pito drink ranged from 4.44 to 4.53. The decrease in pH might be as a result of the activities of microorganisms on the fermentation substrate which leads to the hydrolysis of complex organic compounds of the substrate. The acid produced leads to decrease in pH level which is desirable and necessary to facilitate lactic acid bacteria growth, which are responsible for lactic acid fermentation to prevent unwanted microorganisms so as to maintain the pH value (pH <4.0) to prevent the growth of non-beneficial bacterial and ensure the safety of the pito drinks (FAO 1998).

Brix contents of 11.50, 10.50, 10.00, 9.50 and 9.00 were obtained for the pito drink fermented for 0hr, 12hrs, 24hrs, 36hrs and 48hrs respectively indicating a decrease in brix content as fermentation time increases. This observed trends might be as a result of the sugar present in the drinks being utilized by the fermenting organisms during the process of fermentation which eventually led to reduction of sugar contents.

COLOUR ANALYSIS

The result of colour analysis of the fermented pito drink are presented in Table 2. It was generally observed that there are significance difference ($p<0.05$) in the sample. The lightness (l^*) ranged from 24.21 to 27.62 redness (a^*) ranged from 2.11 to 9.17 while yellowness (b*) varied from, 2.23 to 8.88 respectively for all the sample. The lightness (l*), redness (a*) and yellowness (b*) colour parameter obtained for the pito drink showed decreasing trend from sample fermented as 0hr to 12hrs (AMI to BAS), but before a decrease was later observed at pito fermented for 48hrs (SEK) for all the sample. Paola *et al* (2018) reported an increase in redness of fermented milk during storage time. There was also an increase in the level of redness (a*) during storing of fermenting yoghurt as reported by Trigueros et al (2012)

SELECTED MINERAL ANALYSIS

Selected minerals analysis result are as sown in Table 3. The selected minerals viz manganese, copper, magnesium and calcium evaluated in the fermented pito drink showed significant differences among sample ($p<0.05$). Manganese ranged from 0.15mg/100g to 0.78mg/100g, copper ranged from 0.02mg/100g to 0.03mg/100g, magnesium varied between 18.60mg/100g and 24.50mg/100g while calcium ranged from 1.2mg/100g to 3.61mg/100g respectively. Manganese is an essential mineral that helps to activate powerful antioxidant. It is required for normal functioning of brain. The result however showed that manganese was not detected in the sample fermented at 0hr, 12hr and 24hr (AMI, BAS & HAM), but as fermentation progressed, there was an increase in Manganese value from 0.15 - 0.78mg/100g in sample fermented for 36hr and 48hr respectively. Copper was only detected in pito drink fermented from 12hr and 24hr, while none was present at 0hr, 36hr and 48hr of fermentation.

Copper was observed to decrease as fermentation increased and this may be due to the fact that microorganism utilized copper element for their growth as observed in reported work of Rainboult (1998). At the inception of fermentation, magnesium and copper were found to be high but decreasing with increase in fermentation time and later increased as the fermentation time progressed. However, the increase in some of the mineral contents of Mg, Mn and Ca may be due to the reduction in the anti-nutrient content of processing method (fermentation). These anti-nutrient normally bind with some mental like Ca and Mg thereby preventing that bioavailability.

SENSORY ANALYSIS

Sensory evaluation results for the pito fermented at different time are presented in Table 4. The result showed significant difference ($p<0.05$) among pito drinks in terms of colour, aroma, taste, flavor and overall acceptability. Colour is an important sensory attributes of food because of its influence on acceptability. The colour of the pito drink ranged from 6.78 to 7.33 indicating no significant difference among samples treated, but sample fermented for 48hrs (SEK) was most preferred. The aroma of the pito drinks showed no significant difference ($p<0.05$), but sample fermented at 0hr and 48hr were most preferred in terms of aroma. There are significant difference in terms of taste, with sample fermented from 48hr most preferred (SEK). This may be due to the sour taste produced as fermentation increases. As reported by Demulyakor (1994), the intensity of sourness is a reflection of the product acidity and the right degree is considered as part of the general characteristics of a good pito drink. The flavour of the pito drink revealed significant differences among samples. The overall acceptability of the pito drinks showed that pito fermented from 48hrs was most preferred.

CONCLUSION

The study has shown that fermentation time can play significant effect on the quality attribute of pito drink with addition of fruit juice extracts from pineapple and orange especially in mineral, pH, colour and Brix contents. It was further revealed that pito fermented form 48hrs was generally accepted as the best in terms of the a sensory evaluation, thereby signifying that fermentation has improved the organoleptic characteristics of the product.

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