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Short Communication

Application of Chemistry in Development of Africa Using Local Resources: Production of Malt Drink from Millet

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Abstract

The millet grains were bought in our local market, "Ose" in Onitsha, Anambra State, Nigeria. The millet grains were cleaned and sorted, steeped in water for 48 hours and allowed to germinate for five days. The roots and shoots of the germinated grains were removed after drying from a local frying pan. Coarse grits were extracted out by grinding the grains. The millet malt grit was mashed at temperature below 70^{o}C for 15 minutes and allowed to cool. The results showed 83% germination, p^{H} value 3.87 and relative density 1.01 which compared favourably with the samples (Malta Guinness and the Hi-Malt) available in the local markets. Its production from locally available raw material will help to encourage local farmers and create employment for the youths. Millet as a legume will fix nitrogen in the African soil. This work will ensure eradication of poverty and sustainable development.

Keywords: Millet, malt, development and local resources.

Introduction

The production and consumption of non-alcoholic beverages have assumed alarming dimension in the world and choice of drink today. Beverages are food that are distinguished by its principal characteristics from other foods, first they are liquids that are consumed in the liquid state and secondly, they are either consumed for their thirst quenching properties or for their stimulating effect[1]. Some of the malted beverages in the Nigerian market include Guiness Malt, Bergdorf malt, Maltina, Vita-malt, Hi-malt to mention but few.

Malt is a partially Germinated Barley. Malting process, which involves soaking, germination and drying, aims to change grains into malt with high enzymes and vitamins content. The malt obtained is one of the raw materials used to prepare different traditional alcoholic beverages such as dolo (Burkina Faso or Tchoukoutou (Benin), non-alcoholic beverages such as pito or kunu or Brukutu (Nigeria, Ghana or Niger and Côte d' Ivoire. In the past the production of these malted drinks in Nigeria depended solely on imported raw materials from other countries. The fact that this did not augur well to our industrial sector, particularly those concerned with food processing is undisputable. The local raw materials if made available will be of immense financial benefit and as well boost the production capacity of our brewing and allied industrials.

Millet is food grain found and extensively cultivated in the Northern Nigerian. It belong to cereal specie and have varieties of botanical names (*Bajra Pennisetum Americanum, Bulrush Pennisetum Americanum, finger Elesusine Coracana, Foxtail Setaria Italica*).

Millet which is a legume has a cultural acceptance in the local beverage industry; this is evidenced in its use in the production of Burukutu a traditional beverage made from the principal use of millet. The principal use of millet grain is for food. The grain is ground to make flour or meal, which is used to make unleavened bread. Millet is also consumed in form of porridge from patched grain.

Studies showed that millet grain have 9-10% protein, fat 3-4.5%, fibre 2%, carbohydrate 75-88%, ash 1-2%, food energy 414 calories[1]. Other studies reveal that during the germination, there is a decrease in tannins and total phenol contents, vitamins (A, B, C, and E) content increases significantly during germination[2]. Malting process help to improve phytase activity by reducing the phytate level of grain and improve iron[3,4,5] and zinc bioavailability. Process of malting is weakly used at high production level[6,7,8]. Condition in which traditional malt is processed involved the presence of cyanogenic compound, mould and Enterobacteria development, which need to be avoided for infant production[9,10].

This study aims to examine and analyse the use of millet a local raw material readily available in all parts of Africa in the production of malt. During the course of the project the following activities will be conducted.

Grain analysis, Germination potential, Wort quality analysis Caramel colour preparation, Production of malt drink, Comparism with the existing brand in the market.

Materials and Method

Sufficient quantities of the fresh grain of millet in the Northern part of Nigeria, was obtained from Ose market Onitsha, Anambra State, Nigeria were carefully sorted to remove foreign particles, stones, broken and unwholesome ones. Some of the grains were picked at random and counted in other to account for percentage of germination of the grains. Two randomly picked samples were steeped in two separate containers. The first sample contained 100 grains of millets and the second sample contained 564 grains. The samples were steeped in water for 48 hours. The steep water was drained every 12 hours with gentle stirring at each period. After steeping, the steep grains were spread evenly on a sack to germinate.

The samples were gently turned daily and sprinkled with water; this is to avoid surface drying within the period of 3 to 4 days the germination occurs. On the fifth day, the germinated grains were picked thereby separating them from those that didn't germinate. The millet was dried for 5 hours in a gallenkamp moisture extraction oven. Finally, the drying was completed using local frying pan with low flames. The roots and shoots were removed after drying by gentle hand rubbing and secondly sifting with a sieve. The millet were then grounded using corona manual grinding machine to extract coarse Grits after drying and kilning.

Caramel colour was prepared by weighting out 100g of granulated sugar; 50mls of water was mixed with the sugar to get syrup. The mixture was heated gently to boil. At the boiling point about 3mls of ammonium sulphate was added followed by continuous stirring to prevent formation of lumps. Heating continued until the required brown colour and consistency was achieved. It was cooled and kept until use.

Production of the malt drink was carried out by mashing the millet malt Grit at temperature below 70^0C for 15-30 minutes after mixing with water to form slurry. Later the slurry was left to rest for about 30 minutes. This is the "protein rest period" and is accompanied by the final conversion of the protein into amino acid.

After 30 minutes elapse, the top was decanted and the bottom of the slurry was heated to gelatinize at temperature below 70^0C. The slurry was cooled for some minutes and the decanted liquid added back to the slurry. The sample was kept to rest for some hours. This was assumed to be actual saccaharification time for the beta-amylases. It was again heated for 30 minutes at temperature slightly below 70^0C for action of alpha- amylases which requires higher temperature and the mashing was completed.

The separation of the sweet wort from grain particles was carried out using filtration process. This was done accordingly using filter paper and cheese cloth. Some quantity of water (half litre) was added to the separated grain in the cheese cloth to remove some trapped sweet wort. One litre of the sweet wort was extracted and the remainder stored in a clean volumetric flask. When it was due to boil, (the sweet wort, 1 litre), 60g of the granulated sugar was weighed and added to it.

One litre of the sweet wort extracted was boiled for one hour to sterilize the wort and make the enzymes very inactive. The colour of the wort looked darker when compared with the colour being put to boil. Presumably the concentration increased as well. Another filtration was carried through using the cheese cloth. The filtration was somehow delayed, due to the presence of coagulated proteins which were trapped at the cloth (cheese).

The wort was kept for some minutes to cool. The colour of the wort was improved later by using laboratory prepared caramel. The colour of the sweet wort was darkened. Within some intervals the addition of 0.5g citric acid followed to prevent attack by fungus. The bottle was rinsed with warm water and tested to ensure caustic soda free by using phenolphthalein. The prepared drink was then filled in the bottle.

Analysis of wort quality was carried out by determining the p^H and the relative density using standard method. The p^H and the relative density of Guinness Malt and Hi-malt bought from the market they are also determined.

Results and Discussions

Table -1
The percentage germination of sample A and B of the millet

Samples	Percentage Germination
Sample A	83%
Sample B	78%

The water content of the samples grains increased after 48hours of steeping. This was evidence by the proper germination of the grains. Steeping help in germination because before steeping there was no sign of germination. The high percentage germination rate exhibited by the millet grain in short period implies a good viability value for the

production. After germination and drying, a malty flavor was observed. The millet grains were sweeter than the unmalted grain when tasted.

Table-2
The p^H and relative density of the existing malt brand in the market and the experimented malt

Samples	p^H	Relative Density
Experimental Malt	3.87	1.01
Hi malt	4.72	1.72
Malta Guinness	4.58	1.74

The p^H and relative density of the malt from the millet was 3.87 and 1.01. When compared with brands of malt in the market, the corresponding values were similar to the experimental malt. The odour perceived was similar to the products in the market especially the Hi-malt. The experimental malt had almost the same degree of coloration when compared to the malt bought from the market.

The result in the table 2 further shows that millet grain can serve as a reliable raw material (Worth malt) used in the production of malt drink and other beverages in our continent. Thereby possessing the ability to help and sustain our economy as well as improving the life of People living in Nigeria and Africa by being a powerful tool for development.

Conclusion

The results obtained in this study show that millet grain has an excellent germinating properties which determines the quality of worth malt used in production of malt drink and other beverages. The physicochemical analysis of the experimental malt compared favourably with the samples bought from the market. Millet is a legume which fixes nitrogen to the soil [11], which implies that the cultivation of it will aid in the fertility of the soil. Consequently, the consumption and cultivation of the millet grain should be encouraged in Africa for human and environmental sustenance that will lead to development in Africa which is one of the millennium development goals.

References

1. Thekororonye A.I. and Ngodely P.O., Integraded Food Science and Technology for the Tropics. Macmillan Publishers, Ltd, London and Bsingstoke, (**236),** 243 – 244, **(1995)**

2. Taur A.T., Pawar V.D. and Ingle U.M. Effect of fermentation on nutritional improvement of grain sorghum (sorghum bicolor (L) Moench). *Indian J. Nutr. Diet,* **(21),** 129 **(1984)**

3. Malleshi N.G. Desikachar H.S.R. and Venkat Rao S. Protein quality evaluation of a wearning food based on malted ragy and green gram. Qual. PLANT, Plant Foods Hum. *Nuta,* (**36),** 223 – 230 **(1986)**

4. Elkhalil E.A.I. El Tinay A.H. Mohamed B.E. and Elsheikh E.A.E. Effect of protein digestibility of sorghum flour, *Food Chemistry,* **(72),** 29 – 32 **(2000)**

5. Mahgoub S.E.O., Elhag S.A. Effect of milling, soaking, malting, heat – treatment and fermentation on phytate level of four Sudanese sorghum cultivars, **61(12),** 77 – 80 (**1998**)

6. Agbigbey – Tasas R. Contibution a la valorization des aliments traditionnels beninois: etude comparative ve de deux technologies a base de sorgho malte pour la production de gowe. These de fin d'etude ingenieur agronome, FSA/UAC., *Benin* (**2003**)

7. Zohoungbogbo M.A., Etude comparative ve de deux technologie de production de gowe a base de sorgho au Benin. These de fin d'etude d'ingenieur agronome. FSA/UAC., *Benin* (**2004**)

8. Houndelo M.E.S. Amelioration de la qualite et test de mise en marche du *gowe,* pate fermentee a base de sorgho. Memoire de fin d'etude d'ingenieur. INP/ESA Yamoussokro-FSA/UAC., *Benin* (**2004**)

9. Lasekan, O.O., Lasekan, W.O. and Idowu, M.A. Flavour volatiles of "malt. Beverage" from roasted sorghum. *Food chemistry* (58), 341 – 344, (**1997**)

10. Traore T., Mouquet C., Icard-Verniere C., Traore A. and Treche S., Changes in nutrient composition, phytate and cyanide contents and a-amylase activity during cereal malting in small production units on Ouagadougou (Burkina Faso), *Food Chem*., (**88),** 105–114, (**2004**)

11. National Research Council 'Bambara Bean" lost crops of Africa, Volume II Vegetables, (**2006**)