

The Rising Costs of Tomato Fruits: Banga Soup, a Substitute to Tomato Paste

Oricha Kokori Audu & Suleiman Raji I'D

Department Of Biology, Federal College Of Education, Okene,
Kogi State, Nigeria

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Abstract

This study was to make comparative evaluation on the use of tomato paste and palm oil sludge, especially in these era of rising costs of tomato fruits in the open market. Utilization of palm oil sludge (banga soup) as substitution to tomato paste in soup making is of great importance. During the cause of study it was discovered that palm oil sludge (banga soup) can be made and used as soup for rice, semovita, wheat which compared favourably with tomato paste in taste, colour, texture and flavor. Palm oil sludge (banga soup) can be used as total replacement for tomato paste in regions where tomato is scarce and expensive. Hence palm oil sludge (banga soup) can be recommended as substitution of tomato paste and it could be a viable and sustainable venture if undertaken on a small, large or commercial scale using appropriate technology.

Keywords: *Banga soup, Tomato pastes, Palm oil sludge, Substitute, Palm kernel shell*

INTRODUCTION

Background

The common African oil palm belongs to the family *Palmae* and is classified *Elaeis guineensis*. It is believed to be indigenous to West Africa because the specific name, *guineensis* shows that the first specimen described was collected in Guinea, West Africa. The stem is stout and stands erect (Dowson, & Pansiot, 1995). It could attain a height of 30m when fully grown. The plant is an un-branched monoecious (bears both the male and female flowers), the fruit is a drupe. Oil palm (*Elaeis guineensis*) is not a native plant of Malaysia; it was introduced in 1875 as an ornamental plant. The oil palm products started attracting commercial value as cash crop and to some extend as food crop in 1917. The crude palm oil is orange- red in colour obtained by milling mechanically ("Banga Soup (Ofe Akwu)",(2020).

Palm oil sludge is gotten from the various processing of palm fruit and it is the material that remains after decanting the palm oil mill effluent ("Banga Soup, (Ofe Akwu)",(2020). It is rich

in organic matter such as protein, carbohydrates, lipids, vitamins and minerals. The fruit produces two types of oil, the palm oil from the mesocarp and the kernel oil from its kernel. Red palm oil contain 50% saturated, 40% monounsaturated, 10% polyunsaturated fatty acids and it is used for combating vitamin A deficiency in developing countries. The carotenoids give the palm oil is characteristic color (Meléndez-Martínez, Stinco, & Mapelli-Brahm, 2019).

The carotenoids together with vitamin E, ascorbic acid, enzymes and proteins are members of the biological antioxidant network converting highly reactive radical (OH) and free fatty proxy radials to less active species, thus protecting against oxidative damage of cells. The vitamin A content of the red palm oil plays important roles in growth, development and in visual process (Hackshaw-McGeagh, Perry, Leach, Qandil, Jeffreys, Martin & Lane, 2015). The use of palm oil for frying purposes at high temperatures lead to losses of the beta-carotenes and the vitamin C contents as reported by Hackshaw-McGeagh, Perry, Leach, Qandil, Jeffreys, Martin & Lane (2015)

Statement of the Problem

The production of tomato is low in South-West and the cost of purchase is very high which result in minerals and vitamin deficiency on adult and children because a lot of families cannot afford it. One of the efforts will be to assess the nutritional content in palm oil sludge (Banga soup), because oil palm is grown more in South-West.

Justification

Fruits and vegetables are generally abundant during rainy season and scarce in dry season. This seasonal variation affects consumption level. Tomato fruit and palm fruit is seasonal, it is equally very important to study the effect of domestic food processing techniques. The result of this study would encourage farmers and consumers to enlarge their food use by consuming more of banga soup than tomato paste soup and to produce more for sales especially for people in South-West.

General and Specific Objectives

The broad objective of this study is to evaluate palm oil sludge (banga soup) as substitute for tomato paste.

Significance of the Study

The result of this study will provide a data base on fruits (palm fruit and tomato fruit) and their nutrient composition. The data to be collected generally assist food scientist and nutritionist to compile food composition table for use in Nigeria. Consumers will get encouraged by the output of this research, the physical, nutritional and sensory properties of palm oil sludge (banga soup) made available instead of tomato paste.

Description of palm fruit

Palm oil being the world's most promptly growing and essential vegetable oil in tropical climate such as Indonesia and Malaysia, has made these countries to flourish in natural resources, Arar

(1995). Several steps are incorporated in palm oil mill processing plant to extract palm oil sludge from the fresh fruit. The total land under palm oil cultivation for year 2017 hit almost 5.77 million hectares. One hectare of oil palm produced between 10-35 tons FFB (fresh fruit bunch) per year. The lifecycle of oil palm is over 200 years, whereas the productive life is approximately 20-25 years. The plant market is between 11 and 15 months while the first harvest can be carried out after 32-38 months of planting (Nixon & Carpenter, 1998). The peak yield of palm oil takes 5-10 years which is about 45-56% of FFB. The mesocarp of the fruit is used to generate oil. Almost 40-50% of the yield is from kernels. Both kernel and mesocarp of the fruit generate approximately 17t/h. in which 1 ton of crude palm oil (CPO) can be generated from 5.8 tons of fresh fruit bunch (FFB). The oil extraction process generates a significant amount of by-products, including oil palm trunks (OPT), oil palm fronds, empty fruit bunch, palm pressed fibres, palm kernel shells and palm oil mill effluent (POME). Discharge of these by-product and effluents into the environment causes adverse effects and environmental pollution. Malaysia has become a prominent producer of POME at the global arena with approximately 50 million tons of production at annual rate. POME is characterized by high organic acid content, carbohydrate, minerals and proteins that makes these waste resources a suitable nutrient for growth of biomass. In particular, POME refers to a waste product that is harmful to be discharged into the environment. Aerobic and anaerobic methods can be applied to treat POME. In aerobic digester, oxygen is used during the procedure due to the high growth rate of micro-organisms in aerobic condition, lower retention time is required to promote anaerobic digestion. This anaerobic digestion technique has been widely applied in treating POME due to its high production rate with low energy consumption and flexibility in using a wide range of organic wastes enriched with carbohydrates which include the sewage sludge and POME this process is composed of three reactions: hydrolysis, acidogenesis and methanogenesis. During the hydrolysis process, fermentative bacteria convert complex organic compounds to monomers such as amino acids, monosaccharides and fatty acids.

Origin of palm fruit and Banga soup

It is globally accepted that the oil palm originated in the tropical rain forest region of West Africa. Nigeria used to be the World's largest producer of oil palm before the oil boom era. Arar (1995) reported on the origin of the oil palm and claimed that this tree crop from West Africa was first introduced to Brazil and other tropical countries in the 15th century by the Portuguese but the propagation did not start immediately until the 19th century.

Although, oil palm originated from West Africa, South-East Asia, particularly Malaysia and Indonesia, are now the leading producers of palm oil and palm kernel (Dates production. FAOSTAT; "FAOSTAT (2014).

Banga is a type of palm fruit soup from Southern the Niger Delta Nigeria particularly the Urhobo ethnic group and Igbo land. It is known as Oghwo Amiedi in Urhobo language and Izuwo Ibiedi in Isoko language. Banga soup is served with starch by the Niger Delta people but can also be consumed with eba, semovita, wheat or fufu (akpu), "Banga Soup Recipes | Food Network Canada"(2020); "Banga Soup (Ofe Akwu)", (2020).

Composition of palm fruit

Palm fruit consist of:-

- . Fruit/bunch 40%
- . Kernel/fruit 20%
- . Mesocarp/fruit 30%
- . Shell 10%

Medicinal value of palm fruit/palm oil sludge

1. Palm oil in banga soup is very rich in vitamin K that plays important role in blood clot. It is essential for building strong bones and prevents heart disease.
2. The vitamin K, which contains antioxidant present in palm kernel Juice prevents cancer.
3. Vitamin K properties contributes to prevent Alzheimer's disease. Vitamin K improves insulin sensitivity.
4. Magnesium content in palm kernel juice play important role in over 300 enzymatic reactions with the body including the metabolism of food and synthesis of fatty acids and proteins.
5. Magnesium is involved in neuromuscular transmission and the activity of muscle relaxation. No wonder after consuming a plate of banga soup there is general body relaxation.
6. In the elderly, intake of banga soup made with palm kernel juice helps to prevent the prevalent of insulin resistance (diabetes), coronary heart disease (heart failure, abnormal heart rhythm), metabolic syndrome and osteoporosis.
7. Researches showed that consumption of palm kernel juice in soup such as banga contains magnesium with combination vitamin B6 appears to be efficacious to reduce the effect of premenstrual syndrome symptoms such as insomnia, weight gain, bloating, leg swelling and breast tenderness.
8. Palm kernel juice also contain Vitamins A that is essential for healthy vision and may slow down retinal function in people with retinitis pigmentosa.
9. Vitamin A is also ensure healthy growth of the bone; the state of health of the reproduction and immune systems. It also helps the skin and mucous membranes repel bacteria and viruses more effectively.
10. It also contains vitamin E which is a powerful natural anti-oxidant that help in protection against cancer and guarantees to give your skin a fresher look and lowers your cholesterol level, thus protecting against heart diseases. Vitamin E also prevent cataracts, Alzheimer's disease and diabetes.

Description of tomato/tomato paste

Tomato (*Lycopersicon esculentum*) plant can be erect with short stems or vine-like with long, spreading stems. The stems are covered in coarse hairs and the leaves are arranged spirally. The tomato plant produce yellow flowers, which can develop into a Cyme of 3-12, and usually a

round fruit (berry) which is fleshy, smooth skinned and can be red, orange or yellow in colour, (Jones, 2012). The tomato plant can grow 0.7-2m (2.3-6.6 ft) in height and is harvested after only one growing season(annual). Tomato may also be referred to as love apple (Jones, 2012). Processing of tomatoes into puree or paste is an added value, as it frees lycopene from the tomato matrix, thus enhancing its bio availability (Commodity Fact Sheet, 2016). Lycopene content in raw tomato varieties and the processed tomato depend on the function of three different isomers (cis, all trans and 5 cis) as well as the variation in blanching time due to the difference in size, texture and composition of tomatoes. The adequacy of blanching for each variety was tested by the method described by Stahl & Sies (2012). Bright red colored soft tomatoes are required to make the paste. Blanching is minimally decontaminant treatment which produced softer tomatoes and their firmness decreased (Stahl & Sies 2007). Reduction of residue level by blanching, canning, peeling and washing of fruits was observed and indicated in Encyclopaedia Britannica, (2018). The choice and order of processing treatments can have a large impact on both lycopene bioavailability and texture of tomato product. It has been observed that the lycopene was relatively stable during thermal treatment, whereas B carotene was significantly ($p<0.05$) reduced by all heat treatment except for low temperature blanching in Encyclopaedia Britannica, (2018). They studied that in-vitro bio accessibility of lycopene was significantly increased from 5.1 ± 0.2 to 9.2 ± 1.8 and 9.7 ± 0.6 mg/kg for low and high temperature blanching respectively. Blanching is a pre-treatment operation whose aim is to inactivate enzymes such as polyphenolase, peroxidase and pectinase in fruit and vegetables, FAOSTAT. 2019.

Medicinal Value of Tomatoes

It is rich in Lycopene, which may have beneficial health effects such as decreasing the risk of conditions such as cancer, osteoporosis and cardiovascular disease (Aust, Stahl, Sies, Tronnier, & Heinrich, 2005; Schneeman, 2005; Petruk, Del, Giudice, Rigano, & Monti, 2018).

Conclusion

Utilization of palm oil sludge (banga soup) as substitution to tomato paste in soup making is of great importance. During the cause of study it was discovered that palm oil sludge (banga soup) can be made and used as soup for rice, semovita, wheat which compared favourably with tomato paste in taste, colour, texture and flavor. Palm oil sludge (banga soup) can be used as total replacement for tomato paste in regions where tomato is scarce and expensive.

Hence palm oil sludge (banga soup) can be recommended as substitution of tomato paste and it could be a viable and sustainable venture if undertaken on a small, large or commercial scale using appropriate technology.

Recommendations

1. Food nutrition and Home Sciences Department should be aware of this findings to enable them impact the knowledge of preparing palm oil sludge (banga soup) and tomato paste in soup making.
2. The health and nutrition unit should be informed of the findings of this work to enable them disseminate the information in their counseling programme to rural area.

3. The findings of this work should be made available to schools in order to enrich their information base.
4. Vegetarians should also be made aware of this discovery.

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