

# PRODUCTION AND TOXICOLOGICAL ASSESSMENT OF IMPROVED YELLOW CASSAVA (MANIHOT ESCULENTA) FUFU FORTIFIED WITH TIGERNUT (CYPERUS ESCULENTUS) FOR DIABETIC PATIENTS

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**Abstract:** Instant flour was produced from tigernuts and was blended with yellow cassava flour at different levels of constitution (YCF:TNF- 100:0, 90:10, 80:20, 70:30, 60:40, 50:50). Improved instant cassava fufu was produced from the flour blends. The flour blends were analyzed for their functional, proximate, anti-nutritional and microbial properties using standard analytical methods. The sensory properties (colour, flavor, taste, after-taste, mouth feel and overall acceptability) of the improved fufu produced from the different flour blends were also determined. The result of the analysis shows that the blends of YCF: TNF- 70:30, 60:40, 50:50 had the highest rating in all parameters tested including the overall acceptability. Also the analysis of variance carried out shows a mean score with P-value<0.05 to confirm that yellow cassava may be improved with tigernuts flour at 30%, 40%, and 50%, levels for the diabetic patients.

**Keywords:** Yellow cassava flour, tiger nut, total viable count, oil absorption capacity, least gelation concentration.

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## 1. INTRODUCTION

Yellow cassava is a newly improved vitamin A cassava with yellow roots. Regular cassava is a staple crop in tropical countries which 300 million people rely upon for at least 10% of their daily caloric intake, in 15 African countries like the Democratic Republic of the Congo, cassava is estimated to provide more than 1000 Kcal/day to over 40 million people (Ukpabi et al., 2014). Three yellow root cassava varieties, UMUCASS 36, UMUCASS 37, and UMUCASS 38, are being grown in Nigeria for their high concentration of  $\beta$ -carotene (Alhassan, 1991). B-Carotene is a precursor to vitamin A. Vitamin A deficiency is a major issue, especially in Africa. Nigeria in particular sees a prevalence of Vitamin A deficiency in nearly one third of children under five years old (Alhassan, 1991). Since cassava is a major staple food, yellow cassava shows great potential to alleviating Vitamin A deficiency in Africa. Tiger nut (*Cyperus esculentus*) has been reported to be high in dietary fiber content, which implies that it could be effective in the treatment and prevention of many diseases including colon cancer, coronary heart disease, obesity, diabetes, and gastro intestinal disorders (Anderson et al., 1994). Tiger nut flour has been demonstrated to be a rich source of quality oil and contains moderate amount of protein. It is also an excellent sources of some useful minerals such as iron and calcium which are essential for body growth and development (Oladele and Aina, 2007). Its tubers are also said to be aphrodisiac, carminative, diuretic, emmanagogue, stimulant and tonic (Cooke, R.D. et al., 1988).

## 2. MATERIALS AND METHOD

Dried tiger nuts were sorted to remove bad and damaged tubers and extraneous materials like stones, metal scraps etc. the clean tubers were thoroughly washed with clean water and sundried for a week. The clean and dried tubers were broken in a hammer mill. The broken tiger nuts were reconstituted with water and dried in an oven for 2 hours at 60°C. The pre-gelled, broken and dried tubers were cooled and milled into flour. Yellow cassava flour on the other hand was reconstituted on the basis of about 200g of flour to 300mls of water to form a paste. Yellow cassava paste was then oven dried at 60°C for 2hrs. The pre-gelled and dried yellow cassava was then pulverized/milled into flour. The two flours i.e. tiger nut and yellow cassava flours were composited/blended to become improved cassava flour for fufu at various levels of constitutions. Functional properties like determination of water absorption capacity, determination of oil absorption capacity, bulk density, least gelation concentration, was conducted. Also proximate composition like moisture content determination, crude protein content, crude fat content, crude fiber content, ash content, carbohydrate content, determination of toxicological/anti-nutrient properties of the flour samples like tannin, phenols, hydrogen cyanide determination, microbiological analysis like the total viable count, coliform count, mold count, sensory evaluation were all determined.

## 3. RESULTS AND DISCUSSION

Improved instant cassava fufu was produced with yellow cassava and tiger nut flour blends at various levels of substitution. The flours were analyzed for their functional, nutrient/proximate composition, anti-nutrient and microbial properties. Results obtained from these analysis showed notable changes in the functional properties and increase in protein, ash, fibre and fat. The samples that contain the highest percentage of tiger nut substitution were preferred most in all the parameters tested. Thus, fortification of yellow cassava with this high fibre tiger nut. The microbial analysis carried out showed no trace of fecal contamination and that the product can keep for long. The increase in tiger nut fat should not raise any alarm because tiger nut oil is a poly-unsaturated oil which lowers the low density lipo-protein, the bad cholesterol and increase the high density lipo-protein, good cholesterol. Thus, tiger nut fat is heart friendly. The reduction in least gelation concentration of the flour samples with increased tiger nut substitution indicates that the samples that have higher content of tiger nut will take lesser time to gel or get done.

## 4. CONCLUSION

Research results indicated that inclusion of tiger nut to yellow cassava for fufu at least 10-50% brought about increase in the protein, fat, ash, and fibre content of the improved cassava. Increase in dietary fibre and decrease in carbohydrate contents of the flour blends are of utmost importance in this research work. The intended aim of this study, to produce and evaluate improved cassava fufu from yellow cassava-tiger nut composite flour that will add to the diet of the diabetics was actualized.

## 5. DECLARATIONS

1. *Availability of data and materials:* All data generated or analyzed during this study are included in this published article.
2. *Acknowledgement:* Not applicable.
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4. *Conflict of interest:* The author have no conflicts of interest to declare.

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