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Enterprise combinations in cassava based food crop farming system in Nigeria: Evidence from Ogun State

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Abstract

This study examined the enterprise combination in cassava based food crop farming system in Ogun state. Three stage sampling technique was used to select 120 cassava farmers from the study area. Data were analyzed using descriptive statistics, economic land equivalent ratio, linear programming and stochastic production frontier. Most of the farmers are in their late 40s with the mean age of 48.2 years with 6years of formal education and farming experience of 19 years. The farmers cultivated area of land that varied between 0.5ha and 5ha with a mean of 2 hectare. All enterprise combinations were profitable; however, cassava/maize/vegetable production enterprise was the most profitable with net farm income of N36649.90/ha closely followed by cassava /maize with N36462.67/ha. The optimal cassava based combination was actualized by linear programming model which shows that cassava/maize andcassava/maize/vegetable were the optimal combination because only the two combinations contributed to the gross margin and also added zero opportunity cost to the total cost of production. The result also shows that land and capital are the limiting resources whereas labor is not which means that for optimal cassava based production land and capital investment should be increased.In lieu of these findings, farmers in Ogun state farmers should intercrop cassava, maize and vegetables or intercrop cassava and maize, this will not only increase their net farm income per hectare, it will also ensure flow of income during on and off seasons. Farmers should also increase the utilization of the limiting resources, that is capital and hectrage of land cultivated.

Keywords: Enterprise, cassava, farming System, optimality, profitability

Effect of Drying Method and Storage Time on the Functional Properties of Cassava Chips

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Abstract

Cassava chips (cassava in dry form) have numerous applications. The influence of drying, physicochemical properties behaviour and packaging plays a major role on its industrial utilization. The functional properties of chips from different cassava varieties, drying methods and packaging materials stored over a period of twelve (12) weeks. The result showed that the moisture content ranged from 6.52% to 12.68% over the storage time and packaging materials. Cassava chips dried in oven dryer contained lower moisture compared to chips dried in cabinet and solar dryers, this is an indication that oven dryer is the most efficient of the drying methods. The water absorption index that ranged from 108.00% to 376.40% over the storage time, the water binding capacity that ranged from 119.24% to 257.15% over the storage period, the amylose content that ranged from 11.63% and 24.94% over the storage time. The degree of starch damage is within 0.45% and 7.40% over the storage time. The swelling power ranged from 9.48% and 20.15% over the storage period. The water solubility index ranged from 2.62% and 47.36% over the storage period. The result obtained showed that there was significant difference ($p<0.05$) in moisture content of the chips while there was no significant difference ($p>0.05$) in swelling power. Result of the research into different cassava chips produced from different cassava variety, drying methods and packaging materials subject to their functional properties showed that cassava chips should be made from "Oko-iyawo" variety dried with oven and packed inside polyethylene bag material.

Key words: Cassava chips, drying method, storage time and functional.

Effect of Drying Method and Storage time on the Pasting properties of Cassava Chips

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Abstract

An agricultural product that has a wide range of domestic and industrial applications is cassava chips (cassava in dry form). The industrial uses of dried cassava chips and flour are primarily determined by its pasting properties. The pasting properties of chips from different cassava varieties, drying methods and packaging materials stored over a period of twelve (12) weeks. The peak viscosity during the heating was found to be from 140.50RVU to 480.30RVU. Trough is the lowest viscosity during the holding period of the test, in RVU. The trough viscosity ranged from 76.00RVU to 228.09RVU Breakdown viscosity recorded ranged from 64.09RVU and 271.92RVU. The value of the final viscosity ranged from 102.38RVU and 296.93RVU. Setback viscosity ranged from 26.38RVU and 112.56RVU. The value of peak time ranged from 3.14minutes and 4.26minutes. The pasting temperature values ranged from 63.73oC and 65.40 oC. From the results, peak viscosity is strongly correlated with trough, breakdown and final viscosity ($p<0.01$) and also correlated with peak time ($p<0.05$). Result of the research into different cassava chips produced from different cassava variety, drying methods and packaging materials subject to their pasting properties showed that cassava chips should be made from "Oko-iyawo" variety dried with oven and packed inside polyethylene bag material had the best storage stability.

Key words: Cassava chips, drying method, storage time, packaging material and pasting properties.

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Root and Tuber crops Germplasm research conserved at Plant Resources Center of Vietnam: A key contributes to food and nutrient security, energy security, and maintaining agro-biodiversity

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Abstract

Economic root and tuber crops (hereafter called root crops) are likely to have an increasingly important role in food and nutrient security, energy security and agro-biodiversity under adverse impacts of climate change and rapid increase of food price circumstances. Vietnam is located within the Southeast Asian region that appears to be a cradle of origin for root crop species. Root crops have had long cultural and economic history among the diverse ethnic communities within Vietnam. There is not only a wealth of biological diversity among the economic root crops of Vietnam, but also a wealth of local knowledge concerning the planting, care, harvest, storage and use of root crops. The Plant Resources Center (former Plant Genetic Resources Center) is a focal point of the National Plant Genetic Resources conservation network in Vietnam and has conducted field surveys, collecting missions, and conservation efforts for economic root crops and related knowledge in Vietnam. We will introduce the previous history, study, and utilisation of root crop collections at the Plant Resources Center. The Center currently maintains 2,600 accessions of 30 root crop species as Sweet potato, Taro, Cassava, Canna, Yam and minor root crop species. We will also discuss root crops conservation strategies for Vietnam in the future.

Keyword: Economic R&T crops; food and nutrient security; Ago-biodiversity

Effect of Pre-Process Holding of Cassava Tubers on Quality Characteristics of Cassava-Wheat Composite Bread

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Abstract

The effect of pre-process holding of cassava tubers on the functional and proximate composition of cassava-wheat composite (10:90) flour as well as the physical, sensory properties, microbiological status of its bread were investigated. Freshly harvested cassava roots were stored on the farm covered with cassava leaves for a period of 0-120hr. Samples were drawn hourly from the stored tubers and processed into cassava flour. Ten (10) part cassava flour in each case was blended with ninety (90) parts wheat flour on w/w basis to give six different composite flour namely 0hrCWF, 24hrCWF, 48hrCWF, 72hrCWF, 96hrCWF and 120hrCWF respectively. Proximate and functional properties of the composite flour developed were evaluated using standard analytical procedures. The flours were used to bake bread to give six corresponding bread samples namely 0hrCWB, 24hrCWB, 48hrCWB, 72hrCWB, 96hrCWB and 120hrCWB respectively. Some size related parameters, proximate composition, sensory properties and microbiological status of the baked breads were evaluated. There was no significant difference ($P>0.05$) in the proximate content and functional properties of the control and other composite flour samples. Also, there was no significant difference ($P>0.05$) in consumer preference in the taste, aroma, appearance, internal texture, crumb colour, crust, and general acceptability of the bread samples. The specific volume of the bread ranged from 3.2-3.8 with increasing hours of storage. The aerobic plate count and coliform count ranged from (3.40 -4.40) log cfu/g and (3.08-3.60) log cfu/g respectively. The findings suggests that pre-process delay of cassava tubers within 5days (120hr) does not significantly ($P>0.05$) affect the proximate and functional properties of its flour and bread baked from a composite of such flour with wheat flour would still be acceptable by consumers.

Key words: Pre-process delay, Cassava-wheat composite flour, bread.
w/w= weight per weight

Development of Combined Cassava Wet Mash Process Handling Machine

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Abstract

Cassava roots rot quickly after harvesting, processing into industrial flour known as High Quality Cassava Flour (HQCF) is one of the product formulated to reduce post harvest losses. HQCF production time is critical after harvesting; exposure of workers to toxic cyanide in fresh mash is a problem at handling *stages.* Rapid dewatering and quick breaking of mash-cake became a challenge. A combined machine was developed to solve these problems. The development involves investigations into cassava mash dewatering factors. Traditional methods of conveying, dewatering, pulverizing and sieving mash were modified into one complete process line. Engineering design was carried out, components were fabricated and assembled. Performance evaluation of the machine was carried out. The results show a reduction in moisture content of cassava mash cake from about 72% mcwb to 46.6% mcwb. The machine product was compared using ANOVA and Duncan multiple range tests with the traditionally produced pulverized mash. A significant difference was noticed with the product moisture content and production capacity, no differences was noticed with the bulk density of both mash produced with the machine and traditional method, confirming the efficiency of the machine. The use of the prototype handling machine resulted in elimination of drudgery and toxic exposure. The machine will drastically improve production of mash for HQCF production when commercially developed.

Key words: Dewatering, Mash, cassava and flour

Effect of weevils (C*ylas formicarius*] on the yield of Sweetpotato varieties

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Abstract

Sweetpotato weevil (*Cylas formicarius)* is the major important pest constraining sweetpotato production in Africa and even in the world. However, most of the effects occur when sweetpotato roots are already formed. As a result, the percentage of marketable roots is reduced. This insect is often considered to be the most serious pest of sweetpotato, with reports of losses ranging from five to 97% in areas where the weevil occurs. The effects of sweetpotato weevil on the yield of 40 sweetpotato varieties were compared in two locations: University of Ibadan, Ibadan, Oyo State and Landmark University, Omu Aran, Kwara State. Significant (P>0.05) yield reductions were recorded in the infested field at Landmark University, Omu Aran while yields from the weevil-free field at Parry Road, University of Ibadan were significantly higher. Only one variety (199034.1, orange-fleshed) showed no significant reduction in yield due to weevil infestation, suggesting tolerance or resistance to the insect.

Key word: *Cylas formicrious*, sweetpotato varieties.

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Enhancing Trade Policy Flexibilities in the Root and Tuber Crops Sub-Sector: The Nigerian Experience

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Abstract

Though trade remains a potent economic tool for fostering economic development, it also exacerbates poverty, especially in the sub Saharan African (SSA) countries. Against this backdrop, this study analytically investigates the policy flexibilities available to Nigeria in its root and tuber crops sub-sector. It specifically aims at investigating the impact of selected trade preference schemes on the exports or imports of root and tuber crops sub-sector. Its research objectives are woven around the following questions:

i. What is the nature of Nigeria's domestic and foreign trade policies with particular reference to root and tuber crops sector?

ii. What are the patterns, magnitude, composition and trends in Nigeria's root and tuber crops trade?

iii. What is the impact of sub-regional trade liberalization scheme (ELTS) on Nigeria's roots and tubers exports to the West Africa or Rest of the World?

One of the crucial justifications for this study is to adequately enhance the root and tuber crops trade policy process in Nigeria by enhancing the trade policy flexibilities.

Key words: Trade, export, import, policies, root and tubers, Nigeria.

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Effect of Fortification on the Chemical and Sensory Properties of Pre-gellatinised, Cold Extruded Cassava Noodles.

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Abstract

Flours from cassava variety, 98/0505, were fortified with 5-30% levels of soy protein isolate (TTA of 3.85) and carotene from red oil. These blends were extruded through a 2.5mm die nozzle of a locally fabricated manual extruder. Unfortified cassava flour was used as the control. The extrudates were evaluated for chemical and sensory properties. Results showed that hydrogen cyanide reduced from 1.254ppm to 1.165ppm with addition of red oil. Carotene content was higher in oiled flours ($\approx$ 540.12? g/100g) than in the control (52.83? g/100g). There was significant increase in ascorbic acid content of the noodles (167.2mg/100g to 223.4mg/100g) as a result of fortification. The 5% soy protein fortification showed the lowest TTA (0.875) while the pH was highest in the flours ($\approx$ 6.84) and lowest in noodles with soy protein isolate (5.46). Addition of red oil reduced nitrogen solubility of the flours in neutral pH from 2.00 to 0.60% while extrusion reduced it from 3.96 in the control to 0.23%. 1n the 15% soy protein fortification, and in alkaline pH, nitrogen solubility was least (0.61%) in the noodles with oil, and highest in the control (3.033%). Sensory evaluation showed that all the noodles were moderately acceptable except those produced from 15% fortification which was most highly acceptable ($\geq$ 8.0 on a 9-point Hedonic scale) in terms of colour, texture, mouth feet and general acceptability. Fortification with oil improved the carotene level of the noodles made from cassava flours.

Key words: Cassava, carotene, fortification, soy-protein-isolate, extrusion, sensory evaluation

Effect of cooking on the nutritional, and phytochemical components of trifoliate yam (*dioscorea dumetorum*) and water yam (*dioscorea alata*).

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Abstract

Trifoliate yam (*Dioscorea dumetorum* pax) and water yam (*Dioscorea alata*) obtained from the yam programme of National Root Crops Research Institute, Umudike were assessed to determine if cooking duration had any effect on their nutritional and phytochemical components. The tubers were cooked for 30mins, 60mins and 90mins, the nutritional and phytochemical compositions were evaluated. GC/MS was used to identify the compounds in the raw tubers and those formed during processing. Significant differences were observed between the crude protein content of the raw and cooked tubers of all the varieties investigated. Cooking for 90 mins caused 29.81% loss in the crude protein of *D. dumetorum* while *D. alata* lost 30.83%. Duration of cooking also affected the ash and fibre contents of the different varieties but the lipid contents were not significantly affected. Cooking significantly reduced the alkaloid, saponin and flavonoid composition in the Dioscorea varieties investigated. The number of compounds identified in the tubers cooked for 90 minutes were higher than those identified in the raw tubers. The Compounds identified in the tubers include esters, fatty acids, alcohols, aldehydes and ketones.

Key words: Trifoliate yam, water yam, cooking, nutritional, phytochemical

Physicochemical properties of food grade acetylated cocoyam (*Xanthosoma sagittifolium*) starches

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Abstract

Starch was isolated from cocoyam (*Xanthosoma sagittifolium*). It was further modified by acetylation using NaOH and $NaHCO_3$ at room temperature (28±3ºC). The pasting and some physicochemical properties of the native and modified starches were then studied. Pasting properties of the alkaline modified cocoyam starches showed high peak viscosities (245.92 - 256.96 RVU) compared to low peak viscosity (215.5 RVU) of the native starch. The modified starches were characterized with high setback viscosities (112.79 - 110.17 RVU) in relation to native starch with low setback viscosity (105.88 RVU). Similarly, the alkaline modified starches were characterized with low gelatinization time (4.47 – 4.50 min) compared to the native starch with high gelatinization time (4.60 min). Other functional properties notably solubility and swelling power of the modified starches showed high swelling power (4.0 – 6.9%) and solubility indices (4.0 – 4.8%) compared to native starch with low swelling power (2.7%) and solubility index (0.9%). Cocoyam modified starches with degree of acetylation and substitution (DS) had values of 2.1 - 2.4 and 0.08 - 0.09, respectively.

Key words: Cocoyam starch, NaOH, $NaHCO_3$, modification, pasting properties, physiochemical properties.

Consumer acceptability of coated fried yam chips

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Abstract

This study investigated the role of hydrocolloid and egg content as coating ingredient on the sensory quality of fried yam chips. The independent variables studied include hydrocolloid type (xanthan gum, gum tragacanth and carboxymethyl cellulose (CMC)), hydrocolloid concentration (0.5-1.5%) and egg content (egg white or whole egg). The coated chips were evaluated for appearance, texture, taste, flavour and overall acceptability using nine-point hedonic scale. Fried chips without coating were used as the control samples. Hydrocolloid type, concentration and egg content had significant effects mainly on the appearance and texture of the fried yam chips ($p<0.05$). Only the hydrocolloid concentration significantly influenced the overall acceptability of the samples. Samples containing CMC and egg-white had higher mean score for appearance and texture. Generally, the acceptability scores decreased significantly with increased hydrocolloid concentration ($p<0.05$). Also, coated fried chips were rated better than the control. Appearance had highest significant correlation ($p<0.01$, $r=0.764$) with overall acceptability. This study shows that careful selection and formulation of coating ingredient could help to improve on consumer acceptability of coated fried yam chips.

Key words: Consumer acceptability, coated fried yam chips, Hydrocolliod concentration

Production and Characterization of Raw- starch Digesting Glucoamylase from *Aspergillus niger*

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Abstract

The raw starch digesting glucoamylase activity of a parent strain of *Aspergillus niger* was enhanced by Ultraviolet mutation. After screening and optimization a leucine deficient mutant (KS7) was isolated and found effective for the production of raw starch digesting glucoamylase with about 2-fold increase in enzyme activity compared to the parent strain after 72h of culture on solid rice bran medium. Crude amylase extract was purified with Imarsil in tandem with gel filtration chromatography (Sephadex G-100). The purified amylase gave a major protein band with an apparent molecular weight of 36kDa on SDS-Polyacrylamide gel electrophoresis. The enzyme was able to hydrolysed raw starch granules from cassava, maize, millet and potato. It is optimally active at 50^0C and pH 6.5 which provided an opportunity for its utilization in the bioprocessing of starch.

Key words: *Aspergillus niger* KS7, UV mutation, raw starch-digesting glucoamylase.

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Proximate and Functional Properties of Wheat/Beetroot Flour Blends

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Abstract

The study assessed the proximate and functional properties of Wheat/Beetroot flour blend. Beetroot (*Beta Vulgaris)* was processed into flour and used as substitute for wheat flour at level 0, 20, 40 and 50%. Functional properties as well as proximate composition of the 0 level of substitution (i.e 100% wheat flour (Control) used were assessed using standard procedures. The contribution of each level of substitution (with beetroot flour) to the functional and proximate composition of the flour was then assessed using the same procedures. Result showed a significant difference ($P<0.05$) in the functional properties of the 100% wheat flour and that of the wheat-beetroot flour blends. Foaming capacity, swelling capacity, water absorption and bulk density decreased significantly ($P<0.05$) with increasing addition of beetroot flour. There was no significant difference ($P>0.05$) in the oil absorption capacity of the control flour and blended samples. Moisture content, protein, fat, ash, crude fibre and carbohydrate content of flour samples range from (9.27-9.87%), (9.97-11.23%), (0.37-0.5%), (0.53-2.37%). (0.27-1.97%) and (74.00-79.07%), respectively. Moisture content of composite flour (80:20 W:B) was significantly ($P<0.05$) lower than the that of the control while other ratio had significantly ($P<0.05$) higher moisture content. Protein, fat, ash and crude fibre content of all the composite flour were significantly ($P<0.05$) higher than that of the control. Carbohydrate content of all composite flour samples were however significantly ($P<0.05$) lower than that of the control. The finding suggests that beetroot-wheat composite flour will be suitable in baking processes most especially the 80:20 level of substitution.

Key words: Beetroot, beetroot-wheat composite flour, functional properties, proximate composition
W:B = Wheat:Beetroot

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Effect of Mechanised Shredding of Cassava tuber on the Hydrogen cCyanide (HCN) and Moisture Content of the Shreds - a response surface analysis

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Abstract

A wide variety of products are obtained from the processing cassava, ranging from fermented cassava flour, roasted fermented cassava grits, fermented cassava mash, steamed and fermented cassava chips, fermented steamed cassava grits and smoked fermented cassava balls. Little or nothing has been reported of the cassava product produced from steamed, shredded and dried cassava, whose processing is traditionally done by rural women, who spend enormous time and energy on the process.Fresh, steamed and dry cassava tubers were shredded with a mechanized shredder. Effects of shredding on the HCN and moisture content of the shreds were investigated using Response Surface Analysis (RSA). The moisture content of the shreds was influenced significantly ($p \leq 0.05$) by the condition of the cassava tubers used. The optimum moisture content for ease of shredding was 69.84% from fresh cassava tubers at a shredder speed of 975rpm. Linear and quadratic effects of the condition of cassava tubers had significant effects ($p \leq 0.05$) on the HCN content of the shreds. The lowest HCN content was obtained from 3mm shredder aperture and from steamed cassava roots. Mechanized shredding affected both the HCN and moisture contents of the product.

Key words: Mechanized shredding, Hydrogen cyanide, moisture, Response Surface Analysis

Genetic Transformation of Potato with a Triple R Gene Construct to Confer Resistance to Late Blight

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Abstract

The cultivated potato, *Solanum tuberosum* is affected by a variety of diseases with late blight (LB) caused by *Phytophthora infestans* being the most severe. The disease is mostly controlled by the application of large quantities of fungicides, which represent a financial burden on farmers in developing countries and pose risks to both human health and the environment. A more effective and environmentally friendly strategy to prevent damages caused by *P. infestans* is to use resistant potato cultivars.

In the early days of breeding for LB resistance, a small number of resistance (R) genes from the wild Mexican species, *Solanum demissum*, were introgressed into modern potato varieties. These genes conferred race-specific resistance, which was rapidly overcome by new isolates of the pathogen. Recently, a number of new R genes have been identified and cloned from several wild potato species .Taking advantage of genetic engineering, our strategy is to use three of these new R genes (*RB, Rpi-blb2* and *Rpi-vnt1.1*) in a triple gene construct, p CIP 99, based on the hypothesis that simultaneous mutation for pathogenicity against all three genes is unlikely, and therefore the resistance conferred by the construct should be durable. We plan to deploy the three stacked R genes into the potato variety "Victoria" (known in Kenya and Uganda as "Asante"). To date, we have produced more than 100 transgenic events which are currently being characterized. The pathogen population will be characterized concurrently to assess the expected durability of this resistance.

Key words: Potato, late blight resistance, R genes, genetic engineering

Evaluation of pasting properties of yam flour made from *Fusarium* spp infected yam tubers

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Abstract

Yams (*Dioscorea* spp) are among the oldest food crops. It is estimated that after six months of storage up to 56% of the crop is lost to rot. In Nigeria, fresh yam tubers are used for production of *Elubo* (yam flour) for longer storage. This flour is used for preparation of *amala,* as it is called among the Yoruba in Western Nigeria, and *akwunaji* in the east of the River Niger. This study evaluated any possible effect of *Fusarium* spp infection on the pasting properties of yam flour made from infected yam tubers. The yam (*Dioscorea rotundata* Poir) tubers Nwopoko and TDr95/19177 used were harvested at matured stage from Yam programme of the National Root Crops Research Institute (NRCRI), Umudike. The yams were infected with *Fusarium nygamai* pure culture, stored for 12 weeks, after which flour (*Elubo*) were produced from it. Pasting properties of the flour were determined. Pasting peak was higher in both wholesome yam samples than in *Fusarium* infected ones. Breakdown values of 144.41RVU and 151.25RVU were observed in the wholesome yam samples as against 50.54RVU and 22.33RVU in *Fusarium* infected ones. This implies less stable paste from *Fusarium* infected yam flour. The reduction in the setback values- 181.835 and 187.915RVU to 82.795 and 63.415RVU in *Fusarium* infected yam flour will also affect the stability of food products from them. The pasting temperature of 81.70°C and 80.80 °C for wholesome Nwopoko and TDr95/19177 respectively while those of *Fusarium* infected flour were 88.25 °C (Nwopoko) and 90.13 °C (TDr95/19177) were observed. Peak time was also higher (5.40min and 5.74min) in the flour from infected tubers as against 4.54min and 4.70min in wholesome yam tubers. More energy will be required in the reconstitution of the flour "*Elubo"* to paste *(amala)*, due to higher peak time and pasting temperature observed in the *Fusarium* infected yam flour. In the amylograms of wholesome and *Fusarium* infected yam varieties the most pronounced observable effect of *Fusarium* infection on the pasting pattern was the significant increase in the hold viscosity due to *Fusarium* infection. The pasting pattern was markedly altered as a result of infection. Peak viscosity indicates the water-binding capacity of the starch. It is often correlated with the final product quality, and also provides an indication of the viscous load likely to be encountered during mixing.

Keywords: Yam, *Fusarium*, yam flour, *elubo*, pasting property.

Batter Rheology, Baking and Sensory Qualities of Cake from Blends of Cassava and Wheat Flours

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Abstract

Wheat flour was replaced with cassava flour (30 to 100%) to produce cake. Composition and pasting properties of the flours and their composite flour blends were determined. Baking and sensory qualities of the resulting cake samples were evaluated**.** Protein starch and fiber contents of the cassava and wheat flours were 2.6; 61.30;7.79% and 10.9; 69.89;2.81% respectively, which significantly influenced their pasting and baking characteristics and also reflected on their composite blends. Peak, holding, breakdown and final viscosities of the blends ranges from 122.3 to 147; 85.4 to 98.6; 28.74 to 49.18 and 128.6 to 147.4 RVU respectively. Specific volume decreased from 1.40 to 1.06 ml/g. Cake of comparable qualities with that produced by conventional method were obtained within 30% substitution level.

Keywords: Cassava, batter, rheology, baking, cake, sensory analysis

Traditional processing of Fermented Sweet Potato Flour ('Elubo'), Consumption Pattern of Sweet Potato Stiff paste ('Amala') and Awareness of Orange-fleshed Sweet Potato (OFSP) in Selected States in Nigeria: A baseline survey

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Abstract

A baseline survey was conducted in six states within the North-central/South-West geo-political zone of Nigeria on traditional processing methods of fermented sweet potato (SP) flour ('elubo'), consumption pattern of SP stiff paste ('amala') and level of awareness of orange-fleshed SP variety. Structured questionnaires were administered to 300 respondents, using direct interviews and quantitative measurements. Descriptive statistics were used to summarize the data, Pearson Chi square χ^2 analysis to test associations among the demographic variables and each theme of the study, and Kruskal Wallis test to determine the differences between average rankings for different types of 'amala'. Only 8% of the respondents, concentrated within Kwara and Osun states, engaged in processing. Soaking in cold water and parboiling were the processing methods used to produce SP 'elubo', with each method resulting in different sensory quality of SP 'amala'. 34% of the respondents consume SP 'amala' with consumption influenced by availability of the 'elubo', sensory appeal and low cost. More often, SP 'elubo' is mixed with flour from other crops to improve the sensory quality of the 'amala'. Only 16% of respondents had ever heard of orange-fleshed SP while 98% were not aware of the health benefits, although 78% were willing to taste it. The study has shown prospects for increased processing of sweet potato 'elubo' if efforts are directed towards its promotion. There should be strategic and sustainable efforts targeting Nigeria for the promotion of OFSP not only by creating awareness of its health benefits but more importantly by making it available.

Key words: Sweet potato, processing, orange-fleshed sweet potato, consumption

In vitro Culture of Medicinal Dioscorea sp.: strategies for Rapid Microtuberization

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Abstract

Millions of people in Africa, Asia and South America depend on the tubers of Dioscorea, (yam) species of the family Dioscoreaceae for food and medicines. The pharmacologically active components of these species; diosgenin a steroidal saponin, and dioscin; a form of diosgenin with sugars are found in greater quantities in the tubers also. Extracts from *D. floribunda* tubers are of importance in the industrial manufacture of cortisone, progesterone and other steroids using the *Marker Degradation* pathway. Crude extracts of yams are also currently used in treatment of some cancers e.g. osteosarcoma and in relieving dysmenorrhoea and menopausal symptoms.

Yam tubers usually exhibit strong dormancy that may start with or after tuber initiation during their growth. This is a barrier to rapid progress, as only one generation per year can be grown. The wild species are even more recalcitrant. Microtuberization was initiated with nodal explants of *D. floribunda* using Murashige and Skoog (MS) medium supplemented with varying quantities of plant hormones; Naphthalene acetic acid (NAA), Indole-3-butyric acid (IBA), Benzyl amino-purine (BAP) and Kinetin. There was a differential response in the medium consisting of hormones and their concentrations, our results reveal that the faster multiple shoot formation and microtuberization is achieved more efficiently in liquid media than in solid.

Key words: Microtuberization, wild Dioscorea, steroids, plant tissue culture.

Production and quality evaluation of edible aerial yam (*Dioscorea bulbifera*) flour (Elubo) and fufu

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Abstract

Arial yam (*Dioscorea bulbifera*) is among the nine varieties of yam cultivated in Nigeria but less consumed and underutilized. The yam is consumed after boiling and addition of palm oil. The production and evaluation of yam flour (Elubo) and 'fufu' from this yam species will be desirable. The proximate composition, functional and microbial qualities of the 'elubo' as well as the sensory properties of the 'fufu' were assessed. The proximate composition of the flour showed 7.20% moisture, 0.92% ash, 5.29% crude fibre, 20.25% crude protein, 0.004% fat and 66.34% carbohydrate while the functional properties were 2.46g/ml, 1.52 and 3.40 for bulk density, swelling index and whippability respectively. The total viable counts of the flour were $2.43x10^4$cfu/g after two weeks of ambient storage. The sensory evaluation of the fufu indicate that there were no significant difference in the texture of the sample ($p>0.05$) with that produced from *D. alata*(control) while significant differences existed in the colour and aroma with the control being more preferred in colour and *D.bulbifera* in aroma.

Key words: Aerial yam, elubo, fufu, microbial, proximate, sensory.

Genotypic Variation in Fresh Root Colour, Harvest Period and Dry Matter Content of Improved Cassava Genotypes.

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Abstract

An attempt has been made to increase the carotene levels through gene pool development from existing International Institute of Tropical Agriculture (IITA) and National Root Crops Research Institute (NRCRI) cassava germplasms. Among thirty-eight cassava pre-release and released varieties in Nigeria, eight promising genotypes were selected on the basis of flowering ability, dry matter, pests and disease resistance and carotene content; and used to develop a crossing block at the NRCRI cassava breeding farm. These eight genetic materials were harvested and screened for total carotene and dry matter content at NRCRI laboratory. Carotene content ranged from 0.80ug/100g to 15.25ug/100g flesh weight among the genotypes. Colour pigmentation in the root parenchyma correlated positively with high carotene as determined by standard colour chart and spectrophotometer readings, but dry matter content was negatively correlated with carotene at the two harvesting periods. Genotype 01/1368 (recently released UMUCASS series) has the highest value of carotene while genotype 98/0505 has the lowest value. In addition, genotype 97/2205 has the highest value (44.39%) of dry matter content (DMC %) while genotype 01/1371 (another UMUCASS series) has the lowest value (25.31%) of DMC respectively. Farmers are sensitized to grow more yellow fleshed root cassava to address vitamin A deficiency in Nigeria and to increase their livelihoods.

Key word: Carotene, germplasm, Spectrophotometer, colour, vitamins

The Effect of modified cocoyam starch on the quality characteristics of stirred yoghurt

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Abstract

Yoghurt was formulated with gelating (Control); native cocoyam starch (NCS); and modified cocoyam starch (MCS) (acid thinned). Yoghurt samples were evaluated for chemical (fat content, total soluble solids, pH and titratable acidity) and physical (viscosity, synerisis) properties. Yoghurt from market shelve was used for comparison. The performance of the MCS and NCS in stirred yoghurt was investigated to assess their microbiological properties in this application. Functional properties (swelling power, solubility, gelatinization temperature, water holding capacity and viscosity) of native and modified cocoyam starch were; 36.6%, 9.7%, 80ºC, 63.3ºC, 1272cp and 13%, 11.6%, 61.6ºC, 55ºC, 3264cp, respectively. pH, total soluble solids, titratable acidity, fat content, synerisis index and viscosity of the market sample, yoghurt stabilized with native cocoyam starch, gelatin and modified cocoyam starch were, 4.28, 0.24%, 0.47%, 0.5529g 4.7ml/g and 497Cp; 4.25, 0.16%, 0.46%, 0.5404g 10ml/g and 556Cp; 4.29, 0.19%, 0.49%, 0.4886g, 5.0ml/g and 451Cp; 4.27, 0.20%, 0.41%, 0.6562g 5.0ml/g and 426Cp, respectively. Yoghurt formulated with MCS had good sensorial mouth-feel compared with NCS. The microbial analysis indicated that yoghurt formulated with MCS exhibited a significantly greater storage modulus and firmness compared with NCS stabilized yoghurt, the coliform and and fungal count were nil; indicating microbial safety of all samlples. The study concludes that modified cocoyam starch may be used as an alternative stabilizer in stirred yoghurt.

Key word: Cocoyam starch, modification, stirred yoghurt.

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Estimating costs of seed tubers from mini-sett, mini-tubers, and vine cuttings in *Dioscorea rotundata*

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Abstract

The literature on generating seed tubers from mini-sett, mini-tubers, and vine cuttings is growing, but not much of the costs associated with these are available. This study attempts to budget for each and every step based on realistic process costs so that the system of seed yam tubers can be evaluated to enable comparison with traditional sourcing through milking of live immature plants. Seed yam tuber systems will depend on cost-effective deployment of efficient production schedules that combine the advantages of mini-sett, micro-tubers and vine cuttings to generate 200-250g seed tubers of the major commercial varieties traded in Nigerian markets and elsewhere. Ware tuber production is considered most appropriate to the common soil and solar conditions in the agro-ecologies where yam is principally produced in the country. Data from a series of trials and a review of past reported studies were employed to provide a window of understanding into the likelihood of the profit and loss we could realize from these techniques. Quantitative considerations show that the seed tuber size, quality, and variety influence seed yam tuber price. Prices vary from N40 to N120 per seed yam tuber depending on nearness to the planting time when it becomes more expensive. These technologies can be combined to investigate ways to reduce seed tuber price and promote greater availability for seed and other non-seed purposes.

Key words: Estimate cost of seed tubers, mini-sett, mini-tubers, vine-cutting, Dioscorea rotundata

Participatory yam breeding scheme for West Africa

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Abstract

Yam breeding programmes at international and national level have been conventional plant breeding (CPB) oriented, generating high yielding improved varieties. As a result, the time from creation to releasing a new variety last between 14 to 15 years and the few released varieties are not reaching farmers' field as expected; additionally, no strong breeding programs and no prospective research plan for yam were identified in the national research and extension systems in West Africa. The new overall objective of the yam breeding at IITA is to improve breeding efficiency and impact at both regional and national level, reducing the time to develop acceptable varieties. Effective participation of the national research and extension system, value chain demands and participatory yam breeding will be the main components; GIS based yam production system, yam growth models and genome sequencing will support the programme. Participatory value chain strategy will set priorities not only for research and development of yam but also for a consistent value chain articulation. Food security, food industry (flour, pasta, noodles, pancakes etc.), and pharmacology (drugs, cosmetics) will be the drivers to develop varieties of broad acceptability with good yield, good reaction to diseases and pests, and good adaptability at dry and soil of low fertility environments. The implementation of this new scheme in one hand will allow IITA to reduce the time to recommend varieties to the national system from 9 to 3.5 years; on the other hand, the national breeding programmes will improve their impact. Massive propagation systems will support the variety development, to provide in the right time, clean and enough planting material to the breeders and value chain stakeholders.

Key words: Yam breeding scheme, participatory value chain

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Potassium Efficient Cassava (*Manihot esculenta* Crantz) Genotypes for Domestic and Industrial uses

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Abstract

Escalating fertilizer price, its associated environmental hazards, low nutrient recovery efficiency, declining crop and soil response to fertilizers, diminishing raw material resource for fertilizers and the availability of sufficient cassava germplasm necessitated the identification of nutrient efficient genotypes as substitute for chemical fertilizers to meet the high nutrient requirement of cassava. As potassium (K) being the key nutrient in cassava productivity and tuber quality, the research work undertaken at CTCRI over the last 4 years since 2007 resulted in the evolution of two K efficient genotypes viz., Aniyoor for culinary (low cyanogenic glucosides) and 7 III E3-5 for industrial (high starch) uses through preliminary screening of 100 elite genotypes followed by field experiment for 3 seasons with 6 selected genotypes under 4 levels (0, 50,100,150 kg ha^{-1}) of K and evaluating the nutrient use efficiency (NUE) parameters viz., agronomic efficiency (AE), physiological efficiency (PE), agro physiological efficiency, apparent recovery efficiency, utilization efficiency, harvest index (HI), K harvest index, K uptake ratio, K utilization ratio, nutrient efficiency ratio, K utilization for biomass and tuber other than tuber yield, quality, sett establishment, plant architecture and CMD tolerance. The NUE parameters, yield, quality and tuber K were significantly influenced by genotypes than K levels and were significantly higher for the selected cultivars. Aniyoor and 7 III E3-5 respectively had tuber yield as 45.3, 43.1 t ha^{-1}, cyanogenic glucosides as 25.8, 41 µg g^{-1}, starch as 24.37, 31.05 %, HI as 3.63,1.81, AE as 571,490 kg tuber/kg K applied and PE as 30.9,49.6 kg plant biomass/kg K uptake.

Keywords: Cassava germplasm, nutrient use efficiency parameters, Aniyoor, 7III E3-5, Cyanogenic glucosides, starch

Propagation of Yams (*Dioscorea rotundata*) Using Sprouted Tuber-heads

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Abstract

The tuber-head is the corm-like structure found at the head region of the yam tuber linking the vine to the tuber. While in storage, a new sprout often emerges from the tuber-head and farmers prefer using seed tubers which possess the tuber-head. However, for ware tubers, the structure is detached and discarded because it is too fibrous and corky for use as food. Investigations were carried out on the possibility of using sprouted tuber-heads for yam production at IITA Station, Kubwa, Abuja, Nigeria, during the 2010 and 2011 planting seasons. Sprouted tuber-heads of two popular commercial varieties, Meccakusa and Ame, were planted in a randomized complete block design, while another set of six varieties (TDr 99/02674, TDr 94/01108, TDr 95/18949, TDr 95/19158, TDr 89/02672 and Meccakusa) were planted in non replicated plots for preliminary observations. In the first experiment, results showed that survival of plants at harvest was 64.5% for Meccakusa and 47.2% for Ame. Mean weights of tubers produced were 443 g and 333 g for Meccakusa and Ame, respectively. These weights are greater than the 200-250 g recommended for seed tubers. Preliminary results of the other six varieties showed that 71-91.6% of tubers from five of the varieties weighed more than 150 g. Meccakusa had more than 10% of its tubers weighing >1000 g with a maximum tuber weight of 4706 g. The study thus revealed that sprouted tuber-heads which are often wasted could be used to produce yams with more seed than ware tubers.

Keywords: *Dioscorea rotundata*, Tuber-heads, Propagation

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Gender, Diversity and Livelihoods in Yam Cultivation in Ghana

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Abstract

This paper reviews the available literature on gender and social diversity issues in yam production as well as postharvest systems in Ghana. It also explores the significance of yam in the livelihoods of men and women smallholder farmers and its importance for food security and incomes as well as current trends. It highlights the diversity of yam producing areas in terms of agro-ecology and culture. The socio-economic and cultural circumstances and constraints influencing choices, benefits and risks for men and women and youth in relation to new yam technologies and market opportunities was assessed by studying the division of labour in yam production, postharvest activities and marketing systems in the study areas. The information generated, fed into to the design and implementation of yam research and development programme: Yams Improvement for Income and Food Security in West Africa (YIIFSWA).

Keywords: Gender, diversity, YIIFSWA

Two labour saving devices for small scale farmers

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Abstract

A major factor that limits food production in Africa is the over dependence on primitive tools for implementation of critical field operations. In Ghana, planting is generally done with hoes, cutlasses and even sticks. Generally one farmer with these implements uses 4 man days to plant one acre of a crop. There have been instances of poisoning or even death of farmers as a result of planting treated seeds with bare hands. A jab planter for planting large to medium seeded crops was evaluated for planting cowpea in 2011. Results of the work showed no significant difference in yield between jab and cutlass planted cowpea; but jab planting was about 3 times faster. Furthermore cutlass planting resulted in overplanting (seed wastage), which necessitated thinning. Importantly jab planting reduced (if not eliminated) the risk of poisoning since treated seeds was planted without contact with the user. Another important operation that depends on hoes and cutlasses is weed control after crop emergence. Typically one farmer with a hoe or cutlass uses about 8 man days to weed one acre of a crop. A knapsack shield for application of paraquat to control weeds in cassava +cowpea intercropping system was tested in 2009 and 2010. Results of the study showed no difference in yield between manual weeding at the recommended time and shielded weed control. However shielded weed control was faster and it gave significantly higher yields than delayed manual weeding.

Keywords: Jab planter, knapsack shield

Performance and Nutrient Digestibility of Growing Pigs Fed Cassava Leaf Meal as Protein Source

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Abstract

Varying levels of sun dried Cassava Leaf Meal (CLM) were included in the diets of growing pigs as substitute for conventional protein sources (Groundnut Cake and Soybean Meal) to investigate effects on performance and nutrient digestibility of the pigs. Sixteen growing pigs were used for the study. The animals were randomly allocated to four iso-nitrogenous experimental diets of 0, 7.5, 15 and 22.5% levels of inclusion of CLM, each animal being a replicate. The feeding trial lasted for 6 weeks during which feed intake and weight gains of the pigs were recorded on a weekly basis while the nutrient digestibility study lasted 5 days. The results showed that the diets had significant effects ($P<0.005$) on feed intake, nutrients digestibility, growth performance, protein efficiency ratio and economy of production. The 7.5% CLM diet gave comparable effects on performance, nutrient digestibility, and economy of gain of the pigs as did the conventional protein diet. The inclusion of CLM above the 7.5% level gave adverse effects on animal performance. Cassava leaf meal can be incorporated into the diets of growing pigs only up to 7.5% for optimum performance.

Key words: Performance, nutrient Digestibility, cassava Leaf Meal, protein Source, growing Pigs

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Utilizable Yield of Selected early Maturing Cassava (*Manihot esculenta* Crantz) Genotypes

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Abstract

Utilizable yield (UTY) in cassava is the digestible part of the root representing the dry root yield (DRY) less fiber yield (FY). For some end-users (e.g. gari producers), DRY represents their economic yield while others like fufu processors and starch industries will prefer genotypes with high UTY. Therefore, there is need for farmers to cultivate cassava varieties with high DRY and less fiber content to meet the desires of different end-users. The objective of this study was to determine UTY of some early-maturing (EM) cassava genotypes harvested 7 MAP at Umudike in 2008. UTY of thirty-two EM cassava genotypes and 2 checks was estimated from DRY and FY of the genotypes. FY ranged between 0.01 and 0.13 t/ha among the genotypes with COB-7-25 having the highest FY while COB-4-74 had the highest UTY of 5.89 t/ha. There were significant differences (p<0.0001) among the genotypes for dry matter content (DMC), FY, DRY and UTY at 7 MAP. There was significant correlation between UTY and each of FRY, DRY and DMC (r = 0.98, 0.99 and 0.47 respectively). Therefore, a cassava breeder can more reliably select for UTY in cassava using FRY or DRY of the cassava genotypes. However, the high variation observed among the genotypes for FY underscores the need for evaluation of cassava genotypes for the trait in breeding programmes to ensure that cassava cultivars grown by farmers are not only high yielding but also highly utilizable.

Key words: Early maturing cassava, fresh root yield, dry matter content, fiber yield, dry root yield, utilizable yield

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Analysis of relationships between production of yam [Dioscorea rotundata] and some of its determinants in Nigeria: a cointegration approach

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Abstract

The associations between the production on the one hand and some of the variously-debated factors that have the tendency to influence it, including cultivated land area, yield, and weather, on the other were investigated for yams (Discora Roundata), a leading tuber crop in Nigeria. Secondary data collected from two reliable sources covering the 1961-2008 periods were used for the study. Data were analyzed using advance econometric cointegration technique. Results of unit roots tests revealed that production, cultivated land area, and yield of yams were each integrated of order one, I(1), compelling their use for cointegration analysis. However, the two included weather variables, rainfall and temperature turned out to be mere "white noise", being integrated at levels, I(0), making them unsuitable for use in cointegration tests and were consequently dropped. *Results showed further that cointegration existed between* production and land area and production and yield of yams during the period. The resultant trace- and maximum eigenvalue statistics were calculated as 29.83 ($p<0.01$) and 29.22 ($p<0.01$) for test involving production and land area, and 29.85 ($p<0.01$) and 29.23 ($p<0.1$) for test between production and yield. Bivariate Granger causality tests could not reveal any causality either from land area to production or vise versa. Also, although causality could not be revealed from yield to production, an inverse, but weak, causality ($F=2.83$; $p<0.05$) was revealed from production to yield. The implication of the finding is that past values of cultivated land area and yield could not be used as reliable indicators for predicting the future values of yams production in Nigeria. A lot more other factors had contributed to past fluctuations in yam production and there was need to adopt an across-the-board approach in the development of the yams sector in Nigeria.

Key words: Yams, production, cultivated land area, yield, weather conditions, cointegration, Nigeria.

Evaluation of the Antimicrobial Properties of Ficus Species Extract on Fungi Causing Rot of Irish Potato

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Abstract

Post harvest spoilage is the most important period during the spoilage of Irish potato (*Solanum tuberosum*). This research was therefore carried out to identify and control the fungal pathogen responsible for the deterioration in Irish potato tuber. Plant extract of the Moraceae family was used during this study. *Ficus benajmina* and *Ficus natalensis* were used as antifungal agent and the susceptibility of the isolated pathogenic fungi were observed during culture. Culture of the potato tuber was done on potato dextrose agar and malt extract agar, isolates obtained includes; *Fusarium spp, Mucor species, Penicillium species, Aspergillus* fumigatus and *rhizopus stolonifer*. The most occurring organism was *Fusarium* spp. The organisms were then inoculated into a healthy Irish potato to test for pathogenicity which induced rot. *Mucor species* was the most virulent organism among all which induced severe rot in few days. The in-vitro screening of the plant extract was carried out on pathogenic isolate at various concentrations of 25%, 50%, 75% and 100% with ethanolic plant extract of *Ficus benjamina* and *Ficus natalensis*. The fungal growth was inhibited by the ethanolic extract of the plant after two days. Therefore the plant extract has displayed antimicrobial activity and therefore justified it ethnobotanical use for the control of the spoilage organisms isolated from theIrish potato.

Key words: Ficus species, antimicrobial, Irish potato, spoilage fungi

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Microstructural and Rheological Characterization of Starches from some Cocoyam Cultivars in Nigeria

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Abstract

Six cultivars of Cocoyam (*Xanthosoma spp* –NXs 001,002 and 003 and *Colocasia spp* – NCe 001,002 and 003) tubers from the National Root Crops Research Institute, Umudike, Nigeria were characterized for starch microstructure, amylose content and pasting properties to determine their potentials in food and industrial applications.

The starch granule morphology obtained using polarized light microscopy showed significant variations among the cultivars. Granules of Colocasia spp series starches were small (1.02-3.30µm) and spherical while those of the Xanthosoma spp were round/polygonal with diameters ranging from 4.61-16.49µm. Cultivar NXs 001 has the largest granule sizes while NCe 002 has the least granule sizes. Significantly lower values of amylose content (10.10-10.18%) were observed in the Colocasia spp than the Xanthosoma cultivars (18.21-37.07%) ($p<0.05$)

The starches had peak viscosities of between 178.5 and 336RVU while the breakdown viscosity ranged from 54.64 to 180.58RVU. Peak time range was recorded at 4.8minutes for NCe 001 and 4.3minutes for NXs 003 while pasting temperature ranged between 72.25^{0}C and 86^{0}C. This study revealed that properties of the starches investigated varied significantly with cultivars. Due to its small and narrow granule size range, NCe series starches could be useful in applications requiring improved binding like pharmaceutical formulations.

Key words: Cocoyam, starch, microstructure, Amylose, pasting properties

Development of a Power-driven Gari fryer

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Abstract

A continuous process power-driven gari fryer was developed in the Federal Institute of Industrial Research, Oshodi, to fry large quantity of cassava mash. The fryer has two sections; one to gelatinize the cassava mash and the second to fry the mash into finish gari product. The fryer was tested at the initial mass of dewatered cassava mash of 15, 25 and 35kg with a resident time of 15 minutes. At constant speed of 8rpm of rotating paddle and a temperature reading of 120^{o}c of the frying trough, an output of 83.2 kg/hr. was established with a yield of 59.4% of dried gari of moisture content of 7.38, 5.89 and 2.78 % (w/w). The average capacity of the fryer is 500kg/day as against 5kg of gari product for about 30 to 35 minutes (100kg/day) obtained through traditional method.

Key words: Power-driven gari fryer; cassava mash; gari product

Evaluation of pando yam produced from selected white yam varieties

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Abstract

A technique was developed for processing yam into pounded yam flour (Pando yam). Five different varieties of white yams available in the western zone of Nigeria, namely; Danisha, Loko, Aro, Egumo and Apesan were used for the experiment. Six different samples were produced from each of the variety based on time of parboiling. An existing cassava peeler was adapted for two unit operations (peeling and grating) involved in the production of pando yam. The effect of samples on parameters of evaluation (organoleptic properties) was investigated. The organoleptic properties of samples include colour, odour, texture, taste and stiffness. Sample F among the six samples produced from each of the variety of yam used, was the best in terms of parameters of evaluation investigated. But, other samples were better in one property or the other for the yam varieties tested. Hence, these samples could serve as various food items of yams.

Key words: Pando yam; cassava peeler; organoleptic properties

Performance of two Sweet potato varieties under organic production system

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Abstract

Two field experiments were conducted in 2009 and 2010 at the Federal University of Agriculture Abeokuta, Nigeria, to assess the growth, tuber yield and quality of two sweet potato varieties in response to organic fertilizer. The treatments were arranged in a split-plot fitted into a randomized complete block design with four replicates. The main plot was sweet potato variety (yellow-fleshed cv. 'Shaba' and orange-fleshed cv. 199034.1 while the sub-plot was fertilizer rate. In June 2009 and May 2010, 10 cm long vines of two sweet potato varieties were planted at 0.5m x 0.75m spacing. Five weeks after planting, fertilizer treatments were applied. Data were collected on vine length, number of leaves, tuber yield and vitamin A content. In 2009 and 2010 respectively, cultivar 'Shaba' produced significantly ($p \leq 0.05$) longer vines (281.58 and 274.08cm) than cultivar '199034.1' However, in 2009, cultivar 199034.1 produced significantly more leaves (556) and larger tuber yield of 1.15t/ha. In 2010, variety did not significantly affect number of leaves and tuber yield but it significantly increased vitamin A (6.33 mg) content than cultivar Shaba. Application of 20t SOF/ha significantly increased number of leaves in both years (618 and 608) and vitamin A content (6.45mg) of tubers than other rate and control . There was no variety x fertilizer interaction for vine length and number of leaves in both years. Moreso, cultivar 199034.1 fertilized with 20t SOF/ha gave significantly higher tuber yield of 4.64t/ha and Vitamin A content (6.45mg) compared to other treatment combination. Consequently, for optimum tuber yield and nutritive value of sweet potato in South-western Nigeria,cultivation of cultivar 199034.1 and application of 20 t SOF /ha is recommended.

Keywords: Sweet potato varieties and organic production system

Performance Evaluation of Cockerels Fed Maize-cassava based Growers Ration

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Abstract

The effects of partial replacement of maize with graded levels (0, 5, 10, 15, 20, 25 and 30%) of sun dried cassava peels (SDCP) on feed consumption, growth rate, feed conversion ratio and economic feasibility were evaluated in a 6-week trial using, 2,835, 13-week-old Isa white cockerels. Seven grower's rations containing SDCP were replicated nine times in a randomized complete block design. A statistically non-significant ($P>0.05$) difference was noticed with regard to feed consumption and in the performance of the birds in term of growth rate. However, numerically, the birds fed ration containing 20% SDCP tended to respond better in terms of growth rate, feed consumption and feed conversion ratio than birds on all other rations. SDCP inclusion up to 30%kept the cost of production to the lowest level and appeared to be the most economically profitable. The respective percentage mortalities in birds fed 0, 5, 10, 15, 20, 25 and 30% SDCP were approximately 1.0, 0.5, 0.5, 0.7, 0.7, 1.7 and 1.5%, respectively. SDCP inclusion at 20% in ration for cockerel production is recommended provided the ration is adequate in protein.

Keywords: Cassava peel, cockerel, grower's ration, growth, feed conversion ration

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Morphological and Physiological Characterization of Improved Cassava Genotypes under Different Moisture Regimes

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Abstract

The influence of soil moisture stress on variation in shoot and root of cassava genotypes was determined during four cropping seasons from 2007 to 2011. Thirty genotypes were evaluated at three locations in Nigeria: Ibadan, Mokwa, and Zaria using a randomized complete block design with four replicates. Plants were established at 1m × 1m spacing in $36m^2$ plots. A separate screenhouse experiment evaluated twelve field selected genotypes using three moisture conditions of 75%, 50% and 25% field capacity in a factorial design replicated three times. In all trials data was taken for disease and pest reaction, yield components and leaf physiological traits. Field and screen house studies were subjected to analysis of variance to estimate variance components. GGE-biplot visually represented genotype by environment interactions. Variation was observed for all characteristics and genotypes differed significantly ($p<0.05$) within and across locations for most characteristics. Some genotypes exhibited good drought tolerance. Across all locations genotype IITA TMS I980581 was high yielding and very stable for root yield characteristics. Additional promising genotypes for fresh root, dry yield, aboveground biomass production or dry matter content included IITA TMS I950289, IITA TMS I010034, IITA TMS I010040, IITA TMS I9102324 and IITA TMS I990554. Most of these genotypes showed multiple pest and disease resistance.

Key words: Stay green, drought tolerance, cassava, genotype by environment interaction

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Agronomic Performance of Pro Vitamin A Cassava Varieties in Three Locations in Nigeria

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Abstract

In an early yellow root cassava study in 2003-2004, we investigated agronomic performance of pro Vitamin A (yellow fleshed) cassava genotypes in three locations in Nigeria (Ibadan, Mokwa, and Onne). Twenty-two clones and three checks were evaluated. A randomized complete block design was used with four replications. Characteristics showing significant differences among genotypes across all locations included sprouting, vigor, harvest index, root size, storage root yield, dry matter content and fibre content. Plant height, root mealiness and taste were different in only selected locations. Size clones showed stable performance across locations including IITA TMS I011413, IITA TMS I011442, IITA TMS I011663, IITA TMS I982132, IITA TMS I011277 and IITA TMS I011235. Clones IITA TMS I940330 showed the highest dry matter content of 38%. All clones exhibited good resistant to cassava mosaic disease, cassava bacterial blight, cassava green mite, and cassava anthracnose disease. These genotypes ranged in total carotenoid content from 3.4 to 8.2 µg/g fresh weight. In terms of yield, the best clones were IITA TMS I011368 (26 t/ha), IITA TMS I011663 (22 t/ha) and IITA TMS I982132 (25 t/ha). For garri yield clone IITA TMS I011649 gave 25%, IITA TMS I940330 gave 23%, IITA TMS I9001554 gave 23%. They were better than the best check IITA TMS I30572, with 22% garri yield. This study showed the early potential for biofortification of cassava as a valid strategy to approach the problem of micronutritient deficiencies of the population in the region where cassava is a staple food.

Key words: Cassava varieties, biofortification, pro Vitamin A, Nigeria

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Roots and Tubers for the Baking Industry in Nigeria: An overview

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Abstract

Roots and tubers are major economic and food crops in Nigeria, like in most tropical countries where they serve as major sources of energy. Over the years they attract more economic importance due to an increasing demand for their industrial utilization in various forms like starch, flour and extruded snacks.

One significant potential of flours or starches from roots and tubers is utilization in the baking industry either as 100% or as composite with wheat flour or any other starch or protein sources. Currently, incorporation of cassava flour at 40% level for bread making has gained attention at research, industrial and government levels. However, some elements of doubts is being expressed as to the technological capability of an average Nigerian Baker to handle such a diluted mix. Acceptability of the baked product by an average Nigerian whose palate has been used to the typical English bread is another issue.Other point worthy of consideration is the incorporation of other ingredients like protein fortifier, improvers, anti-staling agents and other additives.

In this paper a critical analysis is presented on Nigerian baking industry, composite flour technology, and previous attempts at commercializing composite flour technology by previous government since the 70s. Also importance of roots and tubers in reducing our import bill on wheat importation and enhancing the industrial and economic value are considered. The realities and technical challenges for successful implementation of composite flour technology in Nigeria are discussed.Conclusion is on the development of "Nigerian Bread" and other baked goods, with flour or starch from roots and tubers as the major base ingredient.

Key words: Roots, tubers, baking industry, Nigeria.

Feeding Values of fresh and dry Cassava Peels containing Dietary salts on West African Dwarf Goat Performance

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Abstract

A 70 –day feeding trial was conducted to estimate the effect of levels (0, 5, 10, and 15g/kg cassava peel, respectively) of common salt and cassava peels (dry and fresh); using *Gmelina arborea* leaves as a basal diet on the average daily gain, dry matter intake, feed conversion ratio and water consumption in West African Dwarf goats. Total dry matter intake, and average *Gmelina arborea leaf* intake increased with applied common salt, irrespective of cassava peel form. Increasing common salt level also increased average daily gain and feed conversion ratio in both dry and fresh cassava peels, but this was not accompanied by a remarkable gain beyond 5g common salt. Moreover, the average cassava peel intake increased but not significantly ($P>0.05$) with salt level of up to 10g beyond, there was a sharp decline and an insignificant gain with dry and fresh cassava peels, respectively. Goats fed on dry cassava peels, significantly ($P<0.05$) consumed more water as the salt level increased in the diet. It was concluded that application of 5g common salts per kg dry cassava peels promoted highest daily gain, optimum dry mater intake and feed conversion ratio in West African Dwarf goat production. However, the response with fresh cassava peels revealed no statistically significant difference in average daily gain, total dry mater intake and feed conversion ratio.

Key words: Salt, cassava peels, West African goat, performance, *Gmelina arborea.*

Yam Staking and the Need for Control of Deforestation: a case study in four local government areas around Ogbomoso in Oyo State.

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Abstract

Twenty eight yam farms were surveyed in four local government areas around Ogbomosho in Oyo State to identify the (tree/shrub) species used for yam staking and to consider their conservation status. The vegetation of the areas surveyed is derived savanna, an ecology already identified as severely degraded. Among the farms surveyed, 96.4% of the yam farms were staked with one type of stake or the other. 42.9% of yam farms surveyed were staked with in-situ dry sorghum bent about 1.0m above the ground to form a low trellis. 7.1% of the yams farms were staked with a mixture of both in-situ dry sorghum stems and in-situ natural growing trees.17.9% were staked with purely in-situ growing trees. 14.3% were staked with small slender dry sticks, while 3.6% were not staked at all. It is apparent from the survey that there is a shortage of stakes. It is therefore important to research into a combined system of restoration with new trees that will serve a dual purpose of nursing the yam and providing tree cover on site in support of the control of climate change. Further the need is rife for research into possibility of cheaper and more available yam stakes in yam growing areas of Nigeria. The need to consider conservation staking for yams (CSY) is very important if the condition of conversion of forest trees and shrub species to yam stakes will be reduced.

Key words: Stakes, gene pool, conservation yam staking, derived savanna, in-situ, trellis.

Economic Analysis of Sweetpotato Production in Osun state, Nigeria

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Abstract

The economics of Sweetpotato was carried out in Osun State, Nigeria which is one of the major producing areas in the South-west region. A total of 120 potato farmers were purposefully selected and data obtained were analyzed using descriptive statistics, costs and returns analyses and the multiple regression analyses. The average age of farmers was 54.6 with a farm size of 1.28 hectares and a yield of 5.7 tonnes per ha. Farmers realized a gross margin of N13, 073.85 ($81.7) and net profit of N9,849.50 ($61.6) per ha with a Rate of Return on Investment (RRI) value of 0.096. The Cobb-Douglass production function estimation revealed that farm size, herbicide and labour had significant positive effect on output ($p<0.01$). The resource-use efficiency analysis showed that land and herbicide are underutilized while labour is over-utilized. The return to scale value of 0.84 revealed that potato farmers in the area are operating on the stage II of the production surface which is a stage of decreasing positive returns to scale. In the opinion of the farmers, lack of capital, pest and diseases infestation and inadequate extension services were the most striking problems confronting potato farming in the area. The study recommended the provision of credit facilities and improved extension services geared towards increased potato production.

Key words: Sweetpotato, economics, profitability, resource Use

Performance of Starter and Finisher Broilers fed Unpeeled Cassava Root Meal based diets supplemented with free Amino acids

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Abstract

This study was conducted to determine the effect of replacing maize with unpeeled cassava root meal (UCRM) with or without free amino acid (FAA) supplementation in the diets of broilers at the starter and finisher phases. Four experimental diets were used in which UCRM replaced maize in the control diet at 0 and 400g/kg levels with or without FAA supplementation. Forty day old broiler chickens were alloted to each of the four diets and further divided into four replicates of ten birds each (160 birds in all). The birds were fed *ad-libitum* throughout the 7weeks of experiment. Feed intake, body weght and feed conversion ratio were used as criteria of response.The data were subjected to ANOVA in a 2 (0 and 400gkg UCRM) by 2 (with or without FAA) factorial arrangement. Significant means were separated using Duncan's Multiple Range Tests. UCRM inclusion and FAA supplementation did not affect ($P>0.05$) the weight gain, feed intake, final weight and, feed conversion ratio at the starter phase. However, at the finisher phase, weight gain was reduced ($P<0.05$) when UCRM replaced maize at 400g/kg level. FAA supplementation did not affect any of the performance characteristics. Interactive effect of UCRM inclusion and FAA supplementation, was significant for feed intake, where birds on control diet without FAA supplementation had the highest value. It was concluded that UCRM can successfully replace maize in practical broiler starter and finisher diets up to 400g/kg without necessarily supplementing with FAA.

Key words: Broiler, unpeeled cassava root meal, amino-acids, performance

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Capacity Development of Local Machine Fabricators from the CFC-WA Project Countries

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Abstract

The capacity of local Cassava Processing machine fabricators in Nigeria, Sierra Leone and Benin Republic were enhanced from the cassava value chain developmentproject, sponsored by the CFC and implemented by the International Institute of Tropical Agriculture from 2008 to 2011. The identified fabricators were engaged with IITA engineer in equipment fabrication and installation at the project locations. They were exposed to IITA standards in equipment finishing and use of good grade quality materials. The fabricators are now independently fabrication mechanical roaster (Sierra Leone), stainless steel fryer and graters (Benin Republic) while Nigerian fabricators have moved equipment from the South West to North Central, Nigeria including other countries. The fabricators reported to have gained more quality skills in fabrication in other equipment, trainings of technicians, visibility and patronages in their countries. They reported challenges of appropriate fabrication materials like stainless steels at affordable rate to produce cheaper machines, more working capital and regional industrial exposures.

Keywords: Capacity development, local machine fabricators, CFC-WA project countries

Determination of the Best Time of Introducing Cassava into Yam Minisett/Maize Intercrop for Optimum Productivity of the Cropping System

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Abstract

A research was conducted at the National Root Crops Research Institute's farm at Umudike Nigeria, in 2004 and 2005 cropping seasons to determine the best time to introduce cassava into yam minisett/maize intercrop for optimum productivity of the system. The treatments comprised complete factorial combination of five relative times of introduction of cassava (0, 1, 2, 3 and 4 months after planting yam (MAPY) and two cassava varieties (highly branching NR 8082 and sparsely branching TMS 96/0304). Time of introducing cassava (irrespective of cassava variety) into yam minisett/maize intercrop did not significantly affect maize grain yield in both seasons studied. Planting either cassava var. NR 8082 or 96/0304 and yam minisett at the same time decreased seed yam yield compared to when cassava was introduced one month after yam minisett and maize were planted. Introducing cassava into yam minisett/maize intercrop at one month after yam minisett and maize have been planted also resulted to optimum productivity of the intercropping system. It was therefore recommended that cassava should be introduced into yam minisett/ maize intercrop one month after yam minisett and maize have been planted.

Key words: Time, introduction, yam, cassava, intercrop, productivity

Sweetpotato Marketing System in Nigeria: an Analysis of Market Concentration

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Abstract

The study was purposively carried out in 2010 in the south east agro ecological zone of Nigeria to determine the structural characteristics of the market for sweetpotato with respect to the degree of market concentration. Purposive and multistage random sampling techniques were used in selecting agro ecological zone respondents and markets. A total of 360 respondents comprising 240 retailers, 120 wholesalers and 24 markets were randomly chosen. The list of wholesalers and retailers who pay stallage fees formed the sampling frame. Primary data were collected using structured questionnaire and interview schedule. Analyses of data were done with descriptive statistic and Gini coefficient model. The results of the findings revealed that the Gini coefficient obtained from the wholesale and the retail markets were G = 0.51 and G = 0.56 respectively. This implies that market concentrations in both markets were high. The results however indicated a relatively greater degree of concentration in the retail market than the wholesale. The magnitude of these market concentrations is an indication of a monopolistic tendency and imperfect market competitiveness. It is therefore recommended that the most effective way of reducing concentration is through improved transportation system, provision of market stalls and good access to credit facilities.

Key words: Sweetpotato, marketing, market concentration and Nigeria

Adopted villages/communities cluster initiative as effective extension delivery and impact option for increased diffusion of developed technologies: NRCRI experience in Nigeria

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Abstract

Existence of wide-spread poverty in Nigeria despite its agricultural potentials is inconsistent with principle of sustainable development. A major challenge is partial accessibility of small-holder farmers to improved technologies from the National Systems of Innovation as there is lack of effective linkage between extension, research and farmers. Government and donors expect that impact of investment in research and extension be felt in quantifiable terms. The Agricultural Extension in Nigeria was recently challenged to show in practical terms the direct benefits of the research findings to farmers. As a result, the concept of Adopted Villages/communities as a cluster model was developed. The objective is to link these villages to knowledge centers and infuse innovation and competitiveness in the production system to strengthen the agribusiness value chain in the communities, thus encouraging large scale adoption of technologies for economic empowerment of farmers and creating job opportunities for youths. Two villages and two schools were selected by NRCRI within 20 kilometers where the institute demonstrated to the villagers and school children current recommended packages of technologies. Farmers groups were formed in clusters and Agricultural Schools Outreach Centers (ASOCs) established. This innovative approach proved successful in dissemination of technologies. The Adopted Villages and ASOCs provided an effective and alternative linkage between research and farmers. There was increased adoption of institute's mandate commodities up to 50%, emergence of units of profitable farming enterprises and increased employment for youths. Implementation of ASOCs in secondary schools increased interest among students in agriculture and home economics, increased percentage offering agriculture in tertiary institutions and school graduates who go into agriculture as business.

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Value Addition to a Nigerian Traditional Cassava-Based Product (*Fufu*): Contribution of CFC-WA/IITA

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Abstract

Cassava value chain development project added value to a traditional cassava based product, *fufu* in its pilot small-medium enterprise (SME) plant in Nigeria, to diversify from poorly patronized high quality cassava flour (HQCF). The popular *fufu* dough was processed into instant flour for increased and easier consumption especially in the urban setting. *Fufu* with its typical long drudge processing technique, unappealing odour, sold in wet form and short shelf life was upgraded into high quality odourless instant flour through the aerodynamic principle of flash drying, following strict adherence to standard operating procedures and good manufacturing practices provided by the project. The branded product was packed in a hermetically sealed high-density polyethylene bag, subjected to and passed series of market tests for consumer acceptability. It was also registered with the National Agency for Food and Drug Administration and Control (NAFDAC) to boost local and international markets. The product was linked up for markets with corporate bodies (hotels, eateries, restaurant, prisons, etc) and also introduced to super and open markets, the experience of which was appreciable in term of demand. The value added to the product has not just increased food product diversification in Nigeria but also created jobs and increase income of both direct and indirect beneficiaries of the project with, demonstrated possibility of replicating the plant model in future, for developmental purposes.

Key words: Cassava, diversification, *fufu* flour, Processing, value addition.

Process technology and chemical composition of fermented cocoyam (*Xanthosoma Sagittifolium)* flour (*Elubo*)

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Abstract

Effects of steeping times and drying temperatures on the quality of fermented cocoyam (*Xanthosoma sagittifolium)* flour (*elubo*) were investigated in a 3 by 3 Factorial Experimental Design with replicated analyses using sun-dried samples as control. Combine effects of steeping times (12, 24 and 36 h) and oven-drying temperatures (50, 60, 70°C) showed variation in the results of chemical values (proximate, acidity, pH, minerals and calcium oxalate). Cocoyam flour from 24 h steeping time had the highest protein (8.50%), crude fibre (3.32%) and metabolizable energy (374.36 kcal/100g). Oven drying temperature of 60°C for all steeping times in the samples resulted in highest protein values while the protein content of sun-dried samples decreased as the steeping time increased. Ash content of the samples decreased with increase in the steeping times (12 h >24 h > 36 h). Moisture content of sun-dried samples (11.00-11.60%) at various steeping times were significantly higher ($p<0.05$) than their respective oven-dried samples (9.60-10.55%). Lowest calcium oxalate (32.41mg/100g) was found in sample processed by steeping for 36 h. The pH decreased (7.39 to 5.89), while titratable acid increased (0.95 to 1.95) as the steeping time increased. Steeping for 12 h gave flour samples with highest contents of iron (56.50ppm), phosphorus (39.00ppm), magnesium (79.00ppm) and copper (2.66ppm), while calcium (39.93ppm) and zinc (41.50ppm) were highest in samples steeped for 24 h. Steeping for 12 h gave highest mineral contents, 24 h (oven dried) highest protein content and 36 h lowest calcium oxalate.
Key words: Process technology, chemical composition,

fermented cocoyam (*Xanthosoma Sagittifolium)* flour (*Elubo*)

Effect of enrichment of cocoyam flour with soyflour on the rheology of the reconstituted composite flour

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Abstract

The effect of addition of soyflour on the viscosity of reconstituted cocoyam flour from was evaluated. Cocoyam flours were separately produced from three cultivars of cocoyam (*Xanthosoma saggittifolium* cv Edeuhie. *Colocasia esculenta* cv Ede Anambe, *Colocasia esculenta* cv Ede Cocoindia. Soyflour was produced from roasted soybean *(Glycine max*) of TX1056 Variety and used for the formulation of composite flours with the flours from the different cocoyam cultivars at cocoyam flour : soyflour ratio of 100:0, 99:1, 98:2, 97:3, 96:4, 95:5. The different flour samples were analyzed with Brabender Amylograph to determine gelatinization temperature, peak gelatinization temperature, peak viscosity, setback (viscosity at 92^0C v_r) and stability. Ede uhie with added 5% soyflour had the highest peak viscosity (2000BU). The least peak viscosity (490BU) was for cocoindia with 5% soyflour addition. Soyflour addition generally reduced the peak viscosity of the reconstituted composite flours. The reconstituted Ede uhie dough firm compared to the Anambe that remained soft and could not be moulded. The poor mouldability of flour from the Anambe cultivar could not be altered by the added soyflour and its low viscosity was sustained. The Anambe cultivar may not be suitable for products where moulding and shape retention is required. The Ede uhie will be better suited for such products.

Key words: Effect, enrichment of cocoyam flour, soyflour, rheology, reconstituted composite flour

Goken Rapid Multiplication Technology: A Novel Approach for Cocoyam Multiplication and Soil Recapitalization

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Abstract

Scarcity of planting materials and declining soil fertility are major challenges to sustainable cocoyam (*Colocasia* and *Xanthosoma* species) production. The National Root Crops Research Institute, Umudike, Nigeria, developed Gocken Rapid Multiplication Technology (GRMT) as a sustainable land husbandry that recapitalizes depleted soil resource base and rapidly multiplies cocoyam. The GRMT uses $\leq$ 7 g micro setts and micro cormels generated from cocoyam cormels. A density of 50,000 plants /ha was maintained using NCe 002 and NCe 003 of *Colocasia esculenta*, as a test crops on a sandy loam Haplic Acrisol, at Umudike in 2008 and 2009. Four t/ha of rice mill waste was incorporated at pre-cropping followed by 400 kg /ha NPK 15 15 15 at 6 weeks after planting. Post-cropping soil analysis was used as a measure of the net worth (soil assets that remain after harvest). Results showed that seed harvest multiplication ratio (SHMR) ranged from 33.0 - 75. Post cropping soil analysis showed that soil pH inceased by 16.7 %, total N and available P by over 60 %, and exchangeable K by 150 % relative to control plots. The GRMT is, therefore, recommended as a novel approach to rapidly multiply cocoyam and recapitalize Haplic Acrisols.

Key words: Gocken rapid multiplication technology; soil recapitalization; cocoyam; Haplic Acrisol.

Genetic Variability Studies and Character Association in Ginger grown at Umudike, South east Nigeria

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Abstract

Genetic variability studies and character association in ginger were studied at National Root Crops Research Institute Umudike, during the 2009- 2010 cropping seasons. Umudike is located at longitude 07^{O} 33" and latitude 05^{o} 33" with an Altitude of 122m above sea level. The soil is classified as sandy loam ultisol (Agboola, 1979). Five exotic genotypes with two local genotypes were evaluated for agronomic traits such as plant height, rhizome yield, stem girth, number of tillers and number of leaves in a randomized complete design replicated 4 times. Genotypic coefficient, phenotype coefficient of variation, broad sense merit ability, genetic advance and correlations were estimated. The result indicated that significant difference exist among the traits studied. Number of tillers per plant was found as strong trait for rhizome yield improvement because it had higher genotypic coefficient of variability, genetic advance and highly significant positive correlation.

Key words: Ginger, genotypes, Agronomic characters.

Evaluation of the functional properties of composite flours from selected white yam (*Dioscorea Rotundata*) and wheat for muffin preparation

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Abstract

In the Nigerian traditional setting, yam is regarded as a prestige crop, and industrially, it is mainly processed into flour using different methods. This study evaluated the functional properties of composite flours from selected white yam varieties and wheat for muffin reparation. Flours of five yam varieties (TDR 89/02665, *Hembakwashe, Okpani, Pepa* and *Nwopoko*) were used for the experiment. Wheat: yam composite flours of the five varieties were developed using the following ratios; Wheat:**:**Yam 50:50, 70:30, 30:70. Whole (100%) wheat and yam flours were used as controls. Muffins were produced from these flours. Functional properties of the whole (100%) yam and wheat flours were determined. Sensory evaluation of the muffins was carried out. Functional properties of the flours showed that bulk density ranged from 0.79g/ml to 0.84g/ml. Water absorption capacity was highest in TDR 89/02665 and *Pepa* flour*s* (2.50g/g). Oil absorption capacity was highest in *Aloshi* flour (3.50g/g) and lowest in *Nwopoko* flour (1.00g/g). Gelatinization temperature was lowest in *Hembakwashe* and *Aloshi* flour (44°C) and highest in *Nwopoko* (52°C). Sensory evaluation of the muffins produced from different composite flours of yam varieties and wheat were not acceptable to the panelists. The study revealed that production of muffin using wheat: yam composite flours or whole yam flours were not suitable. However, modification of the flours may help to improve on the acceptability of the products as these flours were found to have good functional properties.

Key words: White yam, composite flour, muffin, functional properties, wheat

Economics of Ginger Production in the Guinea Savannah of Nigeria

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Abstract

The study was conducted at the research farm of the National Root Crops Research Institute, Ginger Research Station Maro in Kaduna state of Nigeria, during the 2010 and 2011 planting seasons. The objectives of the study include: to estimate the cost and returns of ginger production, determine the benefit cost ratio of cultivating one hectare of ginger and assess the contribution of the various cost items to the total cost of production in the study area. To achieve these, one hectare of ginger was planted out with the UG1variety, during the two seasons. All agronomic practices were applied as recommended. Data were collected using the cost route approach on all the inputs used. Data analyses was carried out using the income statement to determine the gross return, total cost of production, profit and the benefit cost ratio. The result shows that an average profit of ₹ 1,209,305 was realizable in the cultivation of one hectare of ginger in the study area. Also a benefit cost ratio of 1.6 was obtained. This implies that a ginger farmer in the guinea savannah of Nigeria will gain 1.6 of his capital investment in ginger cultivation. Among the various inputs, cost of planting materials imparted most on the total cost of production.

Key words: Economics, ginger Production, Guinea Savannah, Nigeria

The Use of Bio-gas Production Residues as Bio-fertilizer for Sweet potato (*Ipomea batatas*) Production

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Abstract

Field experiments were conducted during the 2009 and 2010 cropping seasons to evaluate different biofertilizers from dried (slurry and sludge) after gas extraction as soil amendments for sweet potato (*Ipomea batatas* (L) Lam) production. Each trial was a randomized complete block design (RCBD) replicated three times. The treatments were paper (PA), paper plus cow dung (PACD), plantain peel plus cow dung (PPCD), plantain peel plus swine dung (PPSD), poultry manure (PM) while sweet potato variety was Tis 2532-0P-1.13. Sweet potato cuttings were planted at a spacing of 50 cm apart. Data were collected on survival count, number of branches, root weight and root quality. Highest and significant tuber yields were obtained with paper and poultry manure soil amendment while lowest tuber yield was recorded where paper combined with cow dung in 2009. In 2010, poultry manure amended soil gave the highest tuber yield while plantain peel combined with cow dung recorded the lowest tuber yield. The import of this study is that every organic material employed in industrial production can be a useful raw material in agriculture (crop) production

Key words: Biogas, Production, residues, biofertilizers, sweet potato

The level of heavy metals in street vended cocoyam (*Xanthosoma Sagittifolium*) chips sold along Sango-Oshodi expressway in Ogun and Lagos State of Nigeria

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Abstract

Street vended food though contributes substantially to the diet of the people, may at the same time, pose potential health risks. Eighty samples of street vended fried cocoyam (*Xanthosoma sagittifolium*) chips were purchased from vendors in Sango (Ogun state), Abule-egba, Iyana Ipaja and Oshodi, Lagos state of Nigeria. The samples were digested carefully and metal elements (Iron, Lead, Cadmium and Arsenic) were analysed using Atomic Absorption Spectrophotometer (Thermoscientific S series, S4AA system). The content of iron, cadmium and arsenic were 0.80, 0.001 and ranged from 0.2249 to 0.2250 mg/L respectively in Sango. The content of iron, lead and arsenic ranged from 0.6552 to 0.6558, 0.0031 and 0.2253 to 0.2254 mg/L respectively in Abule-egba. The content of iron and arsenic were 0.6530 and ranged from 0.2214 to 0.2250 mg/L respectively in Iyana Ipaja. Iron, lead, cadmium and arsenic results ranged from 0.6589 to 0.6611, 0.0019, 0.001 and from 0.2246 to 0.2253 mg/L respectively in Oshodi. Lead was not detected in samples purchased in Sango and Iyana Ipaja, cadmium was not detected in Iyana Ipaja and Abule-egba samples. **The results of t**he present study showed that metal elements except arsenic were within the maximum permitted level (0.1mg/kg for lead, cadmium and arsenic; 1.5mg/kg for iron) by Nigerian Industrial Standard and Codex Alimentarius for street vended food. However, these findings give reasons for concern, particularly as arsenic (heavy metal) are bio-accumulative in the system and portend a serious health risk to man such as cardiovascular disease, hypertension, infertility and so on.

Key words: Metals, vendor, fried cocoyam chips.

Nutritional Composition of Composite flour and Sensory Qualities of meals from Sweet potato, Maize and Soybean blends

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Abstract

Protein-energy malnutrition (PEM) is common nutritional phenomenon in most of the developing countries of the world especially Africa as a consequence of food insecurity partly because people failed to effectively combine and utilize available stable crops in their diet options. This research work evaluates the nutritional composition of the composite flour as well as the sensory qualities of the meals produced from blends sweet potato, maize (dehulled) and soybean in the ratio 33:33:34 (BA); 30: 40: 30 (BB); 30: 30:40 (BC); 30: 20: 50 (BD); 30: 10: 60 (BE) respectively. The result of the proximate analysis of the flour samples show that the moisture content ranges between 8.51 - 8.69%, crude protein 12.56 - 17.34%, crude fibre 1.13 -1.27%, and ash 1.65 - 2.24%.The sensory analysis of the developed meals from the composite flours show a significant differences ($P<0.05$) in the panelist rating of all the sensory qualities (color, mouldability, texture, taste, and overall acceptability) of the prepared dough. Meal prepared from blend BC (30: 30:40) was adjudge to be the best by the panelist in terms of the overall acceptability.

Key words: Food insecurity, composite flour, proximate composition, sensory analysis.

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An assessment of the performance of stakeholders in seed potato management for sustainable production in Nigeria

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Abstract

The assessment of the performance of stakeholders in seed improvement was conducted to determine the efficiency of seed potato production and to design a sustainable frame-work for an efficient seed system. The assessment was carried out in 2010 in the major potato producing areas of Jos Plateau. The primary data was collected through structure questionnaire on the cost of production inputs and outputs in the dry and rainy season, storage structures, seed production and activities of relevant stakeholders in potato production. Purposive and random sampling were used to select ten farmers each from five major local Government areas in Plateau state cultivating potato and five each from the research institute, traders, extension agents and the quarantine agents to assess the performance of the seed potato production and seed quality maintenance. Cobb-Douglas stochastic production function was used to assess the efficiency of the seed potato production by farmers in the rainy and dry season production. Descriptive statistics was used to assess the performance of other relevant stakeholders in seed potato production and a seed system frame-work designed for the sustainable seed potato production in Nigeria. The result from Cobb-Douglas stochastic production function indicated that land preparation, Seed rate, labour and fungicides positively and significantly increase dry season seed potato production. Fertilizer and herbicide negatively and significantly decreases dry seed production. Age, family size and extension visits were determinants of dry season seed potato production. In the rainy season land preparation, seed rate, fertilizer and herbicide application positively and significantly increase rainy season seed production. Farm size and labour negatively and significantly decrease rainy season seed potato production. The determinants of rainy season seed production were education and membership of cooperative society. Dry season seed potato production was technically more efficient than rainy season. The response from descriptive statistics showed inefficiencies in the maintenance of quality seed potato in Research, Marketing, source of seed, seed storage and government policies. Research Extension Farmer input linkage system in seed potato development was also poor. The study recommends the following: Seed potato extension service should be commercialized; government should encourage the private sector through good policies to enhance the provision of quality farm inputs, education and farm machineries to reduce drudgery in production; establishing seed potato disease cleaning facilities in the potato research. A re-organization of seed potato system based on the frame-work designed.

Key words: Assessment, performance, stakeholders, seed Potato Management, sustainable Production

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Studies on Regeneration and *Agrobacterium*-Mediated Genetic Transformation of Potato

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Abstract

In vitro direct regeneration and *Agrobacterium*-mdiated genetic transformation of potato was carried out. Five different media compositions were tested to standardize a suitable protocol for *in vitro* plantlets production. Among them, MS medium supplemented with 0.5 mg l^{-1} IBA along with 3% sugar produced suitable *in vitro* plantlets. Healthy and vigorous shoots were also obtained earlier in liquid MS medium compare to semi-solid. Among the different concentrations of BAP, TDZ and ZR, MS medium supplemented with 5 mg l^{-1} ZR showed the best performance for *in vitro* direct regeneration of potato from internode and leaf explants without callus phase. But MS medium supplemented with BAP and TDZ did not produce any shoots from leaf explants. However, internode explants of 13-16 days and 19-22 days old from *in vitro* plantlets raised in liquid and solid media, respectively showed the excellent results for direct regeneration. Half strength MS medium supplemented with 0.5 mg l^{-1} IBA resulted the best performance as to the rooting from ZR treated regenerated shoots. An efficient and reproducible genetic transformation protocol was established for the development of transgenic potato using *Agrobacterium*-mediated gene delivery system. Internode explants used for inoculating *Agrobacterium timefaciens* strain LBA4404 carrying binary vector PBI121.The vector contains selectable marker gene *nptII* which confirms resistance to kanamycin and *GUS* reporter gene. Explants infected with 30-minute and 3-day co-cultivation confirmed *nptII* positive through PCR amplification resulted transformation rate of 28.97% and 24.69% in Asterix and Diamant varieties, respectively. Kanamycin @ 100 mg l^{-1} was found optimum for selection of transformed shoots. *GUS* histochemical assay revealed the successful transformation and expression of reporter gene in the regenerated tissues of transformed plantlets.

Key words: Regeneration, *Agrobacterium*-mediated genetic transformation, potato

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Periodic Harvesting, Fertilizer rates and growth and yields of some Sweet potato cultivars on an ultisol*

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Abstract

A study was conducted at the Teaching and Research Farm of University of Uyo located at Use Offot, Uyo, Nigeria to assess the effects of periodic harvesting (4, 5 and 6 months after planting – MAP) and NPK (15:15:15) fertilizer rates (0, 200, 300 and 400kg/ha) on the growth and yields of three sweet potato cultivars (TIS 87/0087, TIS 2351.0P.1.13 and 440216 – yellow orange flesh). Split-split plot in a randomized complete block design was used and replicated three times. The main treatments were the cultivars while fertilizer rates and harvesting periods constituted the sub and sub-sub treatments. Results indicated that TIS 87/0087 established significantly ($P < 0.05$) better than others by 26%. Growth parameters of TIS 87/0087 were generally better than other cultivars. TIS 87/0087 outyielded other cultivars by 9-41%. Harvesting at 5 MAP significantly ($P< 0.05$) outyielded other months irrespective of fertilizer rates and cultivars. The tuber yield was 35.7, 34.2 and 24.4 t/ha for TIS 87/0087, TIS 2351.0P.1.1.3 and 440216, respectively. The application of 400kg/ha significantly outyielded other rates irrespective of harvesting periods and cultivars. The study indicates that cultivar TIS 87/0087 has potentials than others for this agro-ecology particularly with 400kg/ha rate and harvesting at 5 MAP.

Key words: Periodic harvesting, fertilizer, sweet potato cultivar.

Physico-chemical characterization of Selected Cocoyam varieties

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Abstract

Post-harvest characteristics of cocoyam such as physico-chemical properties unravels the opportunities offered by this tuber crop in facilitating efforts to improve the agro-industrial possibilities for its expanded utilization. Five experimental varieties of cocoyam; Nce 001, Nce 002, Nce 006, Nxs 001 and Nxs 002 processed into fermented (F) and unfermented (U) flours were characterized based on their physico-chemical properties to evaluate their possible utilization in the development of various food forms. Results showed that the moisture and ash contents of the samples ranged from 6.22-7.40% and 2.48-5.20% respectively. Water absorption capacities of the flour samples ranged from 2.28-3.31ml/g while oil absorption capacities ranged from 1.55-2.01ml/g with Nce001(U) having the highest value and Nxs001(U) having the least value. For bulk densities, Nxs001(U) had the highest value (0.95g/g) and Nce006(F) had the lowest value (0.86g/g). This study shows that the cocoyam varieties processed into fermented and unfermented flours gave attributes good for the production of confectioneries.

Key words: Cocoyam varieties, physico-chemical, fermented, unfermented

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Evaluation of the Performance of Ginger (*Zingiber Officinale Rosc.*) Under Oil Palm Plantation Environment in South Eastern Nigeria

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Abstract

The growth and yield performances of four ginger varieties under oil palm plantation environment and different mulch management practices in South Eastern Nigeria were evaluated in a field study conducted in 2007 and 2008 cropping seasons at the National Root Crops Research Institute, Umudike, Abia State, Nigeria. Treatment consisted of four ginger varieties {Yellow ginger (UG1), Black ginger (UG2), Wynad Local (WYL) and Himachel Pradesh (HPL)} in combination with two mulch management practices (mulched and unmulched). The treatments were laid out in a split plot arrangement fitted into a randomized complete Block design with three replications. Results showed that although fresh rhizome yield was consistently lower under the oil palm plantation environment relative to the control, there was a delay and significant reduction in the occurence of yellow leaf spot disease in the plantation compared to the control. UG1 and Wynad Local varieties out-yielded Himachel Pradesh and UG2 in both plantation environment and in the control irrespective of mulch management practice.

Key words: Evaluation, performance of Ginger (Zingiber Officinale Rosc.), oil palm plantation environment, South Eastern Nigeria

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Progress on implementation of an accelerated sweetpotato breeding scheme in Ghana

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Abstract

The sweetpotato support platform for West Africa was established at the CSIR-Crops Research Institute in Kumasi, Ghana in early 2010 with the objective of supporting cultivar development in Ghana and elsewhere in West Africa through the development of adapted less sweet germplasm, and through a participatory approach. The accelerated sweetpotato breeding approach in Ghana uses multi-locational clonal evaluation of seedling families to identify promising families and genotypes, followed by 2 years of additional multi-locational evaluation in target environments. Superior early selections may be used as parents in population improvement in order to speed genetic gain for various attributes. In 2010, roughly 250 genotypes from 34 families, from Ghana, Uganda and Kenya were evaluated at 3 locations, and high yielding, virus resistant genotypes were selected, some at 2 or more locations. In 2011 selected genotypes and introduced clones from diverse sources (330 genotypes) were evaluated in replicated trials at 5 locations covering major production zones and agroecologies. At harvest, farmers were involved in assessment of performance and taste, and selections were evaluated for sugars, minerals and carotenoids using near infrared reflectance spectroscopy. Sixteen genotypes are in advanced trials in 2012.

Key words: Multi-locational testing, seedling trial, NIRS

Physical properties, Storability and Microbiological assay of Pelletized and Un-pelletized Cassava based diets.

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Abstract

Postharvest storage of cassava has been a major problem for production, marketing, utilization and industrialization. A study was carried out to determine physical properties, storability and microbiological assay of pelletized and unpelletized cassava by- products based diets. Four experimental diets were used as follows: T_1, T_3 contained 0g/kg foliage with 600g/kg peels each while T_2, T_4 each contained 200g/kg foliage with 400g/kg peels. T_1 and T_2 were pelletized, T_3 and T_4 unpelletized. Other ingredients (g/kg) that made up each of the treatments were as follows: cassava sieviate, 205; molasses, 100; sulphur, 3; corn bran, 80; salt, 7; vit./min. Premix, 5. Media used were *Salmonella Shigella* agar, Potato dextrose agar, Manitol salt agar and Eosine methylene blue agar. Samples (1g) taken at intervals of 0, 21, 42 and 63 days. The total bacteria count (Cfu/g) for each sample was determined using pour plate technique. Data generated were subjected to one way Analysis of Variance using completely randomised design. No visible colour change, caking and mould growth was observed. Most of the bacteria and fungi isolated (*Staphylococcus aureus, Enterobacter spp, Mucour spp, Aspergillus spp,)* were persistent throughout the storage period. The trend of microbial concentration showed it was constant with the length of storage. There was no significant difference between microbial profile and total viable counts of the diets forms. Pelletizing showed no positive effect in the reduction compared with the microbial load in the unpelletized feed form. Thus, no prospect for the storability of pelletized compared with unpelletized.

Key words: Processed cassava based diet,pelletizing, storability,

Feeding value of yam peel meal on the growth performance of Broilers.

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Abstract

Ninety (90) 4-weeks old Anak broiler chicks with an average initial live weight of 850g were used to determine the feeding value of yam peel meal on the growth performance of finisher broilers. The animals were assigned to three treatments based on their initial live weight. The diets were formulated to be roughly isonitrogenous. The control diet was based on maize and soybean meal. Feed and water were offered *ad libitum*. The growth performance of broilers fed on various levels of yam peel meal substituted maize at 0%, 35% and 70% showed that average daily feed intake increases with increase in yam peel meal in the diet. This could be that the presence of yam peel meal improved the palatability of the diet thus making diet III (70%) to be the most acceptable. Feed conversion ratio increased as the quantity of yam peels meal increased in the diets. The results suggest that 35% replacement of maize with yam peel meal produced no negative effect on the production performance of finisher broilers.

Key words: Yam peel meal, growth performance, Anak broiler chicks.

Economic Analysis of Irish Potato Production in Plateau State (a Case Study of B/Ladin L.G.A.)

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Abstract

This study investigated the economics of Irish potato in B/Ladin Local Government Area, Plataeu State. The primary data used in the study were obtained with a simple random sampling technique using structured questionnaires administered on 100 Irish potato farmers (respondents). Descriptive statistics, gross margin and regression analysis were used for the analysis of data. The result shows that 90% of the farmers are male, with 60% between the age range of 40-50 years and 35% with post secondary education. 57% of sampled household heads use manual labour and hand tools for cultivation. The period of sales of Irish potatoes was mostly after harvesting (70%) as a result of poor storage facilities. Estimated gross margin was N40,0000/ha with an output/input ratio of 1.45 which shows that sweet potato production is profitable in the study area. The regression result shows that labour, fertilizer, seed (vines) and agrochemicals were positive and significantly at 5% related to output (Y). Measure of the resource use efficiency shows that all the resources used with the exception of labour and seed were underutilized. It is recommended that Irish potato production should be increased. Efforts should be made by research on product and market development as well as measures to solve the short storage life and perishable nature of Irish-potatoes. Inputs such as fertilizer, agrochemicals should be subsidized to encourage the use, as this will go a long way to increase production.

Key words: Resource use efficiency, profitable, Irish potato and production

The effect of flavouring agents on extrusion cooking of white yam (*Dioscorea rotundata*) and Bambara groundnut (*Vigna Subterranean*) flour blends

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Abstract

The effect of thermo-extrusion cooking on a feed blend of yam grits (750 micron) and Bambara groundnut flour (250 micron) at varying levels of added flavouring agents of sugar and salt was investigated in this study at fixed moisture content of 17.5%, barrel temperature of 145^{0}C and at 70 rpm screw speed. The experimental design was done at five levels of sugar, 5 levels of salt at the given extrusion conditions. The study showed that there was significant difference ($p \leq 0.05$) among the extrudates in terms of bulk density, expansion ratio, textural properties (load at break, energy at break and strain at yield) and organoleptic qualities. The bulk and loose density values ranged between 0.72 to 0.85g/ml and 0.76 to 0.84g/ml respectively with extrudates D1 recording the lowest values. The expansion ratio ranged between 0.38 and 0.84 with DF1 recording the highest expansion ratio. The textural properties of the extrudates showed that the load at break values obtained ranged between 99.03 and 974.80N, energy at break ranged from 0.05 to 0.35Nm and strain at break ranged between 36.70 and 50.26%. Organoleptic qualities showed that the yam-Bambara extrudates were acceptable by the panelists used and the extrudates (DF1) was the most preferred as compared with the control commercial sample (cheese ball). The study has shown that a careful combination of yam grits and Bambara groundnut flour at the given extrusion conditions with added flavouring agents could be utilized for production of locally processed extruded food products

Keywords**:** Yam-Bambara blend, extrudates, expansion ratio, Texture, organoleptic

Production of Novel Food Product from Sweet Potato (*Ipomea batatas*): Effect of Baking Temperature on the Quality of Baked Sweet Potato

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Abstract

The study investigated the effect of baking temperature on the quality characteristics of baked sweet potato chips. The developed products were baked using 5 baking temperature levels (110, 120, 130, 140 and 150^{0}C). The result of the proximate analysis shows that moisture content ranged between 3.31% to 5.76%, ash 2.56% to 3.59%, crude fibre 2.59% to 4.79, crude protein 0.61% to 3.22%, Fat 8.93% to 14.01% and carbohydrate 70.86% to 78.15%. The results of the textural properties of the developed baked sweet potato chips showed that using baked chips of the same width and thickness the force at peak required to break the chips ranged between 2.30 and 18.63N, energy to peak ranged between 0.01 and 0.04Nm, deformation at peak ranged between 1.33 and 2.23mm while deformation at break ranged between 1.88 and 3.69mm. The force required to break the chips continued to increase as the baking temperature increased up to 140^{0}C and reduced drastically at 150^{0}C, a similar trend was observed with the energy to peak. The deformation at peak reduced as the baking temperature increased except at 130^{0}C while the deformation at break also increased as the baking temperature over the initial except at 130^{0}C. Sensory evaluation of the baked chips shows that the chips baked at 120^{0}C were the most acceptable product in terms of the desirable quality parameters investigated. There is however need to strike a balance between the desirable sensory qualities and the textural properties for pilot scale up.

Key word: Sweet potato, baked chips, proximate properties, textural characteristics, sensory quality

Cocoyam Variety Trial on a Haphic Acrisol in Southeastern Nigeria – Higher Case

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Abstract

Cocoyam variety adaptability trial was conducted on a Haphic Acrisol at the National root Crops Research Institute Umudike, Southeastern Nigeria, in 2009 and 2011 Cropping seasons.
Treatments comprised five Cocoyam elite landraces. Three Colocassia species (NCe 001, NCe 003 and NCe 010) and two Xanthosoma Species (NXs 001 and NXs 002) were used. They were laid out in a Randomized Complete Block Design with three replications.
The crops were harvested at maturity (eight months after planting) each year.
Data collected were analysed using Analysis of Variance. Results showed that survival count ranged from 75-87% in the Xanthosoma spp and 82-100% in the Colocassia spp. Mean total Corm plus Cormel yields ranged from 5.50-6.70t/ha in the Xanthosoma spp and 5.30-6.30t/ha in the Colocassia spp. It is concluded that although higher survival percentage was slightly higher among the Colocassia than the Xanthosoma, nevertheless the total yield of both species are similar indicating that the Cultivars evaluated are adaptable to the area.

Key word: Cocoyam Variety Trial, Haphic Acrisol, southeastern Nigeria, higher Case

Achievement of CFC-WA in Cassava Value Chain Development in Nigeria

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Abstract

The Common Funds for Commodities sponsored Cassava Value Chain Development Project selected one small-medium enterprise factory and two micro processing sites in Nigeria to provide enabling environment for increased productivity and enhanced livelihood. This was done through the introduction and distribution of high yielding cassava varieties to clusters of 130 individual farmers, provision of modern processing equipments/machines as well as training and re-training of processors and other key stakeholders at the centres at different capacities; machine operators on equipment operation and maintenance, processors on high quality products and business plans. On output, there was an overall increase of cassava yields from 7-9 t/ha to 13-18 t/ha thus increasing the total yield per hectare of cassava and making the farmers benefit qualitatively and quantitatively from the improved varieties. This has also increased the production capacity of the factories with a record of 800tons/annum at the start of the project to 3500tons/annum for *gari* and 3tons/annum at the start to 70tones/annum for *fufu* flour. These two products were registered with the National Agency for Food and Drug Administration and Control thus making the products more marketable nationally and internationally. The project in Nigeria has successfully demonstrated the possibility of increasing rural household livelihood assets for improved and productive live. The beneficiaries have been able to increase assets especially financial, physical and social, which can be sustainable and adequate to reduce vulnerability in the context of structure, economic and seasonal stress by creating enabling environment for broader livelihood options.

Key word: Beneficiaries, cassava, productivity, livelihood, *gari, fufu* flour

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Physicochemical and rheological characterization of yam starch for industrial potentials

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Abstract

Yam is a significant economic and ceremonial crop in Nigeria, however despite producing about 68% of the world's annual total products of yams, Yam consumption and utilization in the country is limited to a narrow range of food products leading to some volatility of demand and instability of profit margin to resource poor farmers. The study was done to investigate the physicochemical and rheological properties of yam starches for potential industrial utilization. Starches were isolated from 16 varieties of yam from *D. rotundata, D. alata, D. bulbifera*, and *D.dumetorum*. Microstructure and particle size analysis was studied. Rheological properties (G' and G", tan α) of the starch gels were studied by means of a rheometer. Thermal properties of the starches were investigated by Differential Scanning Calorimetry. Digestibility of the starches was studied using termamyl (α-amylase). The shape of the starch granules of *D.rotundata* and *D.alata* were mostly oval and ellipsoidal, *D.bulbifera:* triangular, *D.dumetorum:* polyhedral. Mean granule size of *D.alata was* 29.39 µm, *D.rotundata*; 29.64 µm), *D.bulbifera*; 24.60 µm and *D.dumetorum*; 3.1 µm. *D.rotundata* starches had the highest storage modulus and greater tendency to form elastic gels compared to other species, it also exhibited higher enthalpy of gelatinization and transition temperature implying higher crystallinity and resistant to gelatinization. *D.dumetorum* starch was the most digestible among the yam starches while *D. bulbifera* was the least this may imply high quantity of resistant starch.
Variability in these properties among the yam starches indicate that they can have wide applications in both food and non-food industries.

Keywords: Yam starch, rheological, thermal properties, digestibility

Stability in nine Cassava (*Manihot esculanta Crantz*) Clones of Fresh root yield across three environments

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Abstract

The present study was carried out to quantify the Genotype x Environment Interaction and to estimate the phenotypic stability by GGE biplot of nine cassava clones comprising 5 hybrids, 3 parent checks and 1 improved variety. The identification of stable clones on the basis of preferred traits is a key objective of multi-environment trials in cassava. The study was planted across three different environments; Fumesua, Pokuase and Ejura representing forest, coastal savanna and forest transition zones respectively. Genotype main effect was significant ($P<0.001$) for fresh root yield and dry matter content, Genotype x environment interaction effect was significant ($P<0.001$) for fresh root yield only and environment main effect was significant ($P< 0.01$) for only fresh root yield. The most stable clone for fresh root yield with above average performance was la02/026 (hybrid). The high genotype and low environment effects, and the relatively low interaction on dry matter content implies that evaluation and selection can be effectively done in fewer environments to select clones with high performance for the trait whiles fresh root yield requires multiple environments to identify clones with broad and specific adaptation

Keywords: GGE biplot, stability, fresh foot yield, dry matter content, cassava

Genetic transformation of cassava (Nwibibi) – a farmer preferred cultivar in Nigeria.

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Abstract

Cassava is an important food security crop in the tropics and subtropics. Nutritionally, the low protein content of cassava, vitamins, and minerals is a source of concern for people whose diet is based mainly on this plant. Biotechnology has been identified as a powerful tool for genetic transformation. *Agrobacterium tumefaciens*, a ubiquitous soil borne pathogen employs a highly evolved and still incompletely understood gene transfer and integration system that appears optimized for efficient nuclear targeting and integration. A bacterial strain LBA 4404 containing a binary vector pB 2300 with npt11 gene as selectable marker and a green fluorescent protein (GFP) as a tracker was used for the experiments. Compared with the previously transformed model cultivar (60444), Nwibibi tissues were more amenable to the antibiotic cefotaxime and responded optimally to tyrosine. Subsequent selection of transformed tissues with cefotaxime and paramomycin resulted in the recovery of antibiotic-resistant, GFP-expressing lines of friable embryogenic callus, from which embryos and subsequent plants were regenerated. The positive response of this local Nigerian farmer preferred cassava cultivar to *Agrobacterium* transformation therefore supports the assertion that plants do not lack the biological capacity to respond to essential triggers of integrative transformation or have cellular mechanisms preventing integrative transformation. We now report a method for regenerating stably transformed Nwibibi cultivar after cocultivation with *Agrobacterium tumefaciens*. Such a breakthrough signals the possibilities for the modification of the cultivar and also opens up approaches to solve specific needs through biotechnology.

Key words: Genetic transformation, cassava, *Agrobacterium tumefaciens*.

Investigation of the Functional Properties of Cassava Starch Blended with Edible Seed Flour

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Abstract

This study investigated the functional properties of cassava starch (CS) blended with edible seed flour (ESF) rich in colloidal substances, namely, *Brachystegia eurycoma* (BSF), *Detarium microcarpum* (DSF), *Mucuna pruriens* (MSF) and *Afzelia Africana* (ASF). The CS:ESF blends were 90:10 and 95:5 %. Parameters investigated for each blend included the bulk density (BD), the emulsion activity index (EAI), emulsion stability (ES), water and oil absorption capacity (WAC, OAC), solubility index (SI) and swelling power (SP). The effect of each ESF on CS as composite in wheat bread baking was also investigated. Addition of ESF to the starch did not strongly affect the BD. The **CS** EAI increased with higher level of the ESF with the exception of DSF blend, showing increase from 49.0±3.56 to 50.0±2.83 (ASF 10% blend), 53.7±1.26 (MSF 10%) and 58.3±1.75 % (BSF 10%). However, the emulsion stability of the starch was only strongly enhanced by the addition of DSF 10%. Presence of MSF showed a remarkable increase in WAC at both 10% and 5% levels resulting in about thrice the value of WAC for CS only. All the blends showed significant increase in the OAC. The 5% levels of the blends exhibited greater SI. While AF 5% blend gave the highest value (SI, 46.8±1.41%). The SI value observed for CS was 14.6±2.30%. None of the blends showed remarkable increase of the specific loaf volume of the bread samples. The blending of CS with suitable ESF rich in colloidal substances may be a better alternative to chemical modification.

Key words: Cassava, Starch, hydrocolloid, seed, functional properties.

Effect of planting dates and harvesting ages on the root and stem yields of three yellow cassava genotypes in three Agro-ecologies in Nigeria

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Abstract

Environmental factors such as temperature, rainfall, solar radiation, and soil conditions influence cassava plant growth and yield. A study was conducted in three locations (Ibadan, Ubiaja and Umudike) to evaluate the effect of three planting dates and three harvest ages on the productivity of three released proVitamin A biofortified cassava varieties (IITA TMS I011368, IITA TMS I011371 and IITA TMS I011412). The experimental design was a split-split plot laid in a randomized complete block with three replicates. Main plots were planting date, sub plots were harvest age and sub-sub plots were varieties. Planting dates were at two-month intervals while harvest ages were at three-month intervals of 9, 12 and 15 months after planting. No fertilizer was applied, with plots weeded as necessary. Characteristics evaluated include stem production, storage root yield, dry matter content and root total carotenoid content. Harvest results at nine months show no differences among varieties for number of plantable stakes per plant and root yield within the same location; however these parameters differed from one location to another. Umudike produced an average of 11 stakes per plant following by Ibadan with eight stakes per plant and lastly Ubiaja with four stakes per plant. The highest average root yield (t/ha) across varieties was obtained at Ibadan (15.1), following by Umudike (8.7) and Ubiaja (4.6). Dry matter content was 27.6 % at Umudike, 25.5 % at Ibadan and 26.5 % at Ubiaja. Based on these results, we conclude root and stem production is location specific and dry matter content is favourable for these varieties.

Key words: Planting dates, harvesting ages, root yield, stem yield, yellow cassava genotypes, Agro-ecologies.

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Evaluation of biological control agents (BCAs) for the control of tuber rot of yam (*Dioscorea* spp.)

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Abstract

The efficacy of four BCAs, *Trichoderma asperellum* strain NGT158, *T. longibrachiatum* strain NGTI67, *Bacillus subtilis* and *Pseudomonas fluorescens,* for the control of tuber rot caused by *Botryodiplodia theobromae, Aspergillus niger, Penicillium oxalicum, Rhizoctonia solani, Sclerotium rolfsii* and *Fusarium oxysporum* in four yam species, *Dioscorea rotundata, D. caynensis, D. alata and D. dumetorum,* was evaluated. The agar pairing method was used to test for antagonism between the test pathogens and BCAs using three inoculation regimes *in vitro.* Evaluation of rot development was done by the destructive sampling method and percentage rot reduction by the antagonists was estimated. The mycelial growth of the test pathogens were significantly inhibited by the BCAs ($P \leq 0.05$). Inhibitory zone measuring 1.5 cm was clearly established between the pathogens and *B. subtilis*. Inoculation of the BCAs 24 h ahead of the pathogens was most effective and was in the order *T. longibrachiatum* (88.1%) > *T. asperellum* (87.4%) > *B. subtilis* (77.5%) > *P. fluorescens* (64.8%) in the *in vitro* trials. Mean rot reduction values across the yam species ranged from 87.1-97%, 89.3-95.7%, 85.7-96.2% and 71.2-90.8% for *T. asperellum, T. longibrachiatum, B. subtilis* and *P. fluorescens,* respectively, when paired with the antagonists *in vivo* at 14 days after inoculation (DAI). The mechanism of control by *Trichoderma* spp. was mycoparasitism, Whie *B. subtilis* and *P. fluorescens* controlled by antibiosis. The potential of the four BCAs used in this study recommends their use in the integrated management strategy for the control of post-harvest fungal rot pathogens of yam.

Key words: Evaluation, biological control agents (BCAs), control, tuber rot of yam (*Dioscorea* spp.)

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Incidence and Epidemiology of three yam virus species in various plantings of yams (*Diosocrea* spp.) in Nigeria

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Abstract

This study was conducted to determine the effect of serial plantings of seed yams on virus incidence and performance of various yam cultivars in Guinea savanna agroecologies in Nigeria. Field trials were organized in RBCD design in 30 sq.m plot using five popular cultivars, TDa 05/00129, TDr 89/02665, Gbakunmo, Elemsu and Orin, in one location in Kwara State, and TDa 05/00129 and TDr 89/02665, Makakusa, Dan-anachia and Arme in one location in Federal Capital Territory (FCT) Abuja. First trial in 2010 was planted using seed yams procured from local markets. Seed yams harvested from this trial were used for second season planting in 2011. Seed yams and plants after emergence were tested for *Yam mosaic virus* (YMV), *Yam mild mosaic virus* (YMMV), *Dioscorea alata* bacilliform (DaBV)-like viruses and *Cucumber mosaic virus* (CMV). Virus incidence based on symptoms was assessed at weekly intervals for up to 10 weeks. Highest virus incidence was recorded in TDr 89/02665 in both locations (71% in Kwara state and 76.8% in FCT Abuja), while lowest incidence (56%) was recorded in TDa 05/00129 in Kwara state and Arme (50%) in FCT Abuja. Yields of yams were higher in FCT Abuja than in Kwara. Highest yield was recorded in TDa 05/00129 from Abuja (52,328 kg/ha); whilst TDr 89/02665 from Kwara recorded lowest yields (10,567 kg/ha). YMV, YMMV, and DaBV-like viruses were detected, but CMV was not detected in any sample. This study is providing useful information on increase in virus incidence due to replanting of virus infected seed yams.

Key words: Incidence, epidemiology, yam virus species, plantings of yams (*Diosocrea* spp.), Nigeria

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Incidence and diversity of postharvest tuber rot pathogens in *Dioscorea* yams in Nigeria

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Abstract

Incidence and diversity of pathogens associated with ware tuber rot in four yam species, *Dioscorea rotundata* (genotype TDr 95-18544), *D. alata* (TDa 05-00205), *D. caynensis* (TDc 98-136) and *D. dumetorum* (TDd 05-23) were assessed in this study**.** Tubers with rot symptoms were collected from 14 locations (15 tubers per species per location) in rainforest, derived and southern guinea savanna agroecologies in Nigeria. Altogether 840 rotted tubers were analyzed and 21 fungal species were isolated from them: 18 species in *D. cayenensis*, 17 in *D. rotundata*, 14 in *D. alata* and 12 in *D. dumetorum*. Incidence of ten fungi exceeded 1% they are, *Aspergillus niger* (48.7%), *Rhizopus stolonifer* (28.1%), *Botryodiplodia theobromae* (25.7%), *Penicillium oxalicum* (10.8%)*, Fusaium oxysporum* (3.6%)*, Aspergillus flavus* (3.5%)*, F. verticilloides* (2.8%), *Penicillium sclerotigenum* (1.7%), *Rhizoctonia solani* (1.4%), *Aspergillus tamarii* (1.2%) and incidence of other 12 fungi were detected in less than 1% of the samples. The incidence of fungi in various agroecologies differed significantly ($P \leq 0.05$) which was in the order *D. rotundata* (85.7%) > *D. cayenensis* (80.9%) > *D. alata* (66.7%) > *D. dumetorum* (57.1%). Severity of rot symptoms (estimated on 1 to 5 scale) was highest in rainforest agroecology (2.9), followed by derived savanna (2.0), and southern Guinea savanna (1.6), and in tubers it was in the order of *D. rotundata (2.4)* > *D. cayenensis* (2.3) > *D. alata* (2.2) = *D. dumetorum (2.2). Information on incidence and diversity of tuber rot pathogens reported in this study will be useful for establishment of preventive strategies*

.

Keywords: Incidence, diversity, postharvest tuber rot pathogens, *Dioscorea* yams, Nigeria

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Incidence and severity of Yam Internal Brown Spot Disease in Côte d'Ivoire

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Abstract

Yam internal brown spot disease (YIBSD) is a virus-like disease of unidentified etiology was first reported in 1960s in the Caribbean, and a similar disease was reported subsequently from Côte d'Ivoire. The prominent symptoms of YIBSD appear in tubes which includes small to large, dark brown, corky necrotic lesions. Such tubers are unsuitable for consumption or sale. Yam fields (N=18) in 4 locations in forest, transition and savannah in Toumodi (central) were surveyed in Côte d'Ivoire to determine the extent of YIBSD spread. In each field, ten tubers were harvested and examined for YIBSD symptoms by making five transfers sections. Symptom severity in each section was scored based on 1 to 5 rating scale (**1 = no symptoms; 2 = <25% necrotic area; 3 = 26-50% necrotic area; 4 = 51-75% necrotic area; 5 = >75% necrotic area).** YIBSD symptoms were observed in 105 (59%) of the 178 tubers examined. Incidence of symptomatic tubers in field varied from 20% to 90%. Symptoms were most common in Bètè-bètè (57%) and Sao (62%), the two predominant cultivars in the surveyed fields. Necrotic symptoms were observed in all portions of the tubers (from the apex to the base). Symptoms were more severe towards the apical end (mean score = 3) compared to base (mean score = 2.1). Tuber distortion or other abnormalities was not observed in symptomatic plants. This is the first detailed study on distribution and symptom of YIBSD. Further studies will focus on identification of pathogen and mode of spread.

Key words: Incidence, severity,yam internal brown spot disease, Côte d'Ivoire

Some physical properties and microbial safety of bread supplemented with sweet potato flour

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Abstract

The objective of this study was to compare the physical and microbial properties of breads supplemented with sweet potato flour (SPF) and 100% wheat flour. Five bread samples supplemented with SPF at varying proportions (5, 10, 15, 20 and 25%) were processed using the straight dough method for baking. Baking properties (loaf volume, oven spring and specific volume) were determined on the bread samples. The oven spring and specific loaf volume decreased steadily with increasing level of addition of SPF. Bread samples were stored at ambient (25 ± 2^{0}C) and samples were monitored for microbial growing patterns for up to 6 days. The results revealed the presence and increase in the incidence of bacteria and fungi. Spoilage micro organisms and food-borne pathogens identified during the storage include: *Staphylococcus aureus, S. Epidermis, Aspergillus niger, A. flavus, Rhizopus nigricans and Penicillium spp.*

Key words: Composite flour, sweet potato flour, bread, microbial properties

Mathematical modeling of some thermophysical and engineering properties of cassava starch

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Abstract

Cassava (*manihot esculenta*) is processed into various foods such as gari, fufu, starch, cassava flour, glucose syrup *etc*. in many parts of Nigeria. In this study, fresh cassava tubers were peeled, washed, grated/chipped and rasped. The rasped tubers were mixed with a lot of distilled water. The resultant slurry was filtered through a fine muslin cloth. The starch was stirred with distilled water, allowed to settle and the supernatant decanted off. The starch was put in a clean bag and pressed to dewater, spread thinly on a tray and allowed to dry at 45˚C in a cabinet dryer for 24 hours. The dried starch was then milled to a very fine particle size and kept in air tight container for analysis. The thermophysical properties and rheological properties, which include density, specific heat capacity, thermal conductivity, thermal diffusivity, pasting properties, amylose and amylopectin ratio of cassava starch were investigated using proximate composition based empirical models, Rapid Visco Analyzer and Juliano methods. From the data obtained, it was found that the density of cassava starch is (526±0.10) Kg/m^3, specific heat capacity (942±0.05)KJ/KgK, thermal conductivity (0.12±0.02) W/m˚K, thermal diffusivity (2.42x10^{-7}±0.01)m^2/s, Peak viscosity (290.58±0.01) Ns/m^2, setback viscosity (179.58±0.03) Ns/m^2, amylose and amylopectin ratio (0.36±0.01), swelling power (6.83±0.03)%, water absorption capacity (94.49±0.04)% and solubility index (6.83±0.03). The values obtained for both thermophysical and rheological properties were found to be useful in the design of starch extraction and refining process for cassava starch.

Key words: Mathematical modeling, thermophysical, engineering properties, cassava starch

Cassava Flour: a Suitable Resisting and Printing Paste for Textile patterning

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Abstract

The use of cassava flour as a suitable resisting and printing paste for textile patterning was investigated. Cassava flour, corn flour and cassava starch were prepared into paste as resisting agents. The fabric prepared with the paste samples in Adire model were subjected to consumer acceptability test using structured questionnaire with 180 respondents. Three groups of people were used for data collection: traders, patrons and producers. Data were analysed using analysis of variance and Chi-square test. The model preferred by patrons was the cassava flour paste applied with photographic screen template as indicated by 49 respondents (81.7%). This corresponds to an application time (ApT) 17 minutes, dye time (DyT) of 7 minutes and drying time (DrT) 30 minutes. The effectiveness of the model towards reduced production cost while retaining the overall quality of the finished cloths as related cottage and large scale "Adire" production was shown.

Keywords: Cassava flour, printing paste, adire, textile patterning

Nigeria Cassava - Yam Productivity and GARCH Approach.

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Abstract.

The fact that cassava and yam productivity fluctuates overtime has been known for a long time to be caused by vagaries of factors including climatic and market dynamics. However, a study of cassava and yam production distribution and dynamics without incorporation of climatic instability would be leptokurtic. This study was carried out with the objective of evaluating the volatility of cassava and yam productivity in Nigeria using data from the Statistics Unit of the Food and Agricultural Organization (FAOSTAT). The data were subjected to descriptive statistics, autocorrelation and GARCH model analysis. Jarque Bera Test for GARCH residual was also computed. Giving the condition of weather instability, GARCH model is found to be a useful approximation of short term forecasting to cassava and yam data generated within a conditional heteroskedastic period.

Key words: Cassava, yam, productivity, GARCH approach

Evaluation of Some Yam Cultivars from Yam Belt of Nigeria to Minisett Technology and Organic Fertilizer

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Abstract

Five yam cultivars (*Hambamkwase, Aloshi, Pepa, Eko* and *Udanyi*) were evaluated at three organic manure sources (Di-Grow, Boast Extra, Poultry Manure) for seed yam production using the minisett technique. The field trial was conducted in 2011 at the University of Uyo Teaching and Research Farm, Uyo, Akwa Ibom State. The aim of the trial was to evaluate complete production packages for yam minisett techniques through appropriate organic fertilizer, and high yielding varieties. The experiment was laid out in a randomized complete block design replicated three times with split plot arrangement. The results showed that yam varieties and organic fertilizers application had significant ($P<0.05$) effects on growth and tuber yield. *Hambamkwase*, *Aloshi* and *Pepa* performed better in minisett technique by producing tuber yield of 10.37, 8.42, 7.85 t/ha and Di-Grow, Boast extra and poultry manure application performed better than application of mineral fertilizer. The study suggests that farmers in Uyo should use three high yielding varieties with application of Di-Grow in their minisett production.

Key words: Yam cultivars, minisett, organic fertilizer.

Effect of Pretreatment Methods on the Functional, Pasting and Physicochemical Properties of Instant Water Yam Flour

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Abstract

One of the problems encountered during the processing of water yam into flour is enzymatic browning which results in a brown colouration of the flour. This adversely affects consumer acceptability and utilization of water yam flour. This study investigated the effects of combining three pretreatment methods (blanching (50-70 ºC), concentration of potassium metabisulphite and lime solution; 0-1.5 %), on the functional, pasting and physicochemical properties of water yam flour. Functional properties, pasting properties and physicochemical properties were determined and data obtained were subjected to statistical analysis. The result of functional properties, foam capacity, water absorption capacity, swelling capacity, solubility index, emulsion capacity, bulk density, dispersibility, least gelation capacity, oil absorption capacity and wettability ranged from 15.26 – 39%, 235.96 – 263.48%, 16.57 – 21.45%, 4.97 – 11.68%, 3.40 – 5.05g/ml, 0.82 - 0.94g/cm^3, 66.50 – 75.50%, 8.00 – 19.00%, 84 – 158% and 90.9 – 587seconds respectively. While the pasting properties: peak viscosity, trough, breakdown, setback, final viscosity, pasting temperature and peak time ranged between the values of 289.16 – 414.25RVU, 291.29 – 364.88RVU, 26.50 – 97.87RVU, 78.25 – 208.33RVU, 340.92 – 524.96RVU, 84.42 – 90.70^{0}C and 5.05 – 6.18 seconds respectively. Meanwhile values obtained for physicochemical properties: CIE Lab colour(L^*,$a^*$and b^*) parameters ranged from 80.32-87.93, 0.71-2.89, 14.92-19.35. Moisture content and pH ranged between 5.87 – 9.55% and 5.69 - 6.78 respectively. The Combination of pre-treatment had significant ($p< 0.05$) effect on the properties determined. Water yam tubers can be processed into brightened white edible flour using the combined pre-treatment with desired functional, pasting, and physicochemical properties as reported to broaden its application in industries.

Key words: Effect, pretreatment methods, functional, pasting and physicochemical properties, Instant water yam flour

Functional and pasting properties of whear-three-leaved yam composite flour blend.

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Abstract

Flour is the main ingredient for baked products and bread, which is a staple food for many cultures, making the availability of flour a major economic and political issue at various times. Dioscorea *dumetorum* (three- leaved yam) have been neglected in attempts to process roots and tubers into more durable and value added form. A greater part of these tubers are consumed fresh with oil, the rest if not boiled, harden and spoil. Therefore the purpose of this study was to determine the functional and pasting properties of wheat/three-leaved yam flour blends with the aim of improving the utilization of these blends in baking as well as adding value to the under-utilized trifoliate yam. Wheat flour was collected from Port-Harcourt Flour Mill, while flour from three-leaved yam was produced using standard procedures. The flour was blended into different proportions and their functional and pasting properties determined using standard analytical procedures. The pasting properties of flour blends were significantly different ($p<0.05$) from that of the 100% wheat flour. Peak viscosity, trough and break down values of blends decreased with an increase in substitution towards the 100% flour from three-leaved yam, and ranged from 84.67 -95.88 RVU, 48.17-59.86 RVU and 20.0-45.70 RVU respectively. Final viscosity and set back of flour blends increased with an increase in substitution with three leaved yam, more than the 100% wheat and TLY flour and ranged from 132.67 -173.92 RVU and 82.5 – 122.42 RVU respectively. Time and temperature to attain peak viscosity ranged from 5.8 -6.2min and 49.3 -49.7˚C. Functional properties showed an increase with substitution higher than the 100% wheat sample and ranged from 8.20 -10.90%, 71.30 -94.84% for swelling power and water absorption capacity respectively. Solubility and color indices showed no significant ($p>0.05$) difference between the 100% wheat and three –leaved yam flour. The present study have shown that compositing the popular wheat flour with locally available under-utilized root crop like three-leaved yam (*Dioscorea dumentorium*) flour is desirable up to the 60:40 inclusion level for wheat/three-leaved yam flour in terms of there functional and pasting characteristics and reduction in wheat importation.

Keyword: flour , three-leaved yam, Wheat, functional, properties.

Determinants of Food Security among Women Cassava Processors in Ogun State, Nigeria

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Abstract

The study examined the determinants of food security among women processing cassava in Ogun state Nigeria. A multi-stage random sampling technique was used to select 546 women cassava processors in Ogun State comprising 201 and 345 from rain forest and derived savannah agro ecological zones respectively. Data were collected through a structured interview schedule and analysed using frequency counts, percentages and multiple regression analysis.
Among the respondents, 91.8% are married, 51.8% have a household size of 1-5 members, and 73.4% are between 30 and 40 years. Also 45.2% have no formal education while 71.4% of the processors used MPTs. Of all the respondents, food items were available to 67.4% and accessible to 65.0% while 65.8% were moderately food secured. Significant relationships exist ($p<0.05$) between year of schooling ,marital status, attitude to the use of cassava processing techniques, constraints to the use of MPTs, use of MPTs and agro ecological zones to the women cassava processors' household food security level. In conclusion, there is need for increased use of modern cassava processing techniques through reduction of constraints faced by the processors in their use and enhanced availability to rural households in order to enhance food security.

Key words: Rural women, processing techniques, household food security, cassava

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Dough Characteristics and Quality of Bread from Cassava-Wheat Composites.

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Abstract

Composite flours from wheat and cassava flour blends were examined to determine the effect of substitution on bread making process indices, as well as post-baking time (12hrs. and 36hrs.) on overall quality. The wheat flour was substituted with cassava flour at 0%, 10%, 15% and 20%. Water absorption, dough development and stability were measured with a Farinograph while an Alveograph was used for dough resistance, extensibility and work function. The water absorption increased steadily with substitution from 64.6%(0% substitution) to 69.0% (20% substitution) . Cassava flour had significant effect on dough resistance, extensibility and work function at ($P \leq 0.05$). Resistance increased steadily while extensibility and work function decreased. Bread from non-substituted wheat flour had the highest positive rating of all the sensory attributes examined - appearance, crumb texture, taste, flavor and overall acceptability. For bread 12hrs. post- baking, no significant difference was observed in appearance and overall acceptability up to 15% substitution, while significant difference was observed for taste between the 0% substitution sample and all others. However for the 36hr. post-baking samples, 0% and 10% substitutionremained consistently higher than all others in all sensory attributes. Substitution had significant effect on process indices and overall quality of bread upon short storage.

Key words: Substitution, dough characteristics, time and sensory attributes

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The Biosafety Issues in Bio-Cassava Plus Transgenic Research in Nigeria

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Abstract

Cassava is a very important staple food crop in Nigeria and over 100million Nigerians eat it or it's food products at least once a day. It is also an established fact that micro-nutrient deficiency is common among children and reproductive women in most cassava growing regions in Nigeria. Genes for these micro-nutrient traits are lacking in the Nigerian cassava germplasm. This means that the genetic improvement of the Nigerian cassava for these traits cannot easily be done through conventional hybridisation and recombination. Therefore, to improve the nutritional value of the Nigerian cassava clones, these micro-nutrient traits have to be introduced. Genetic transformation techniques, a genetic engineering methodology has proved a useful tool for this purpose. However, genetic engineering as a breeding tool is relatively new in Nigeria and as in many West African countries, is faced with many biosafety challenges. This presentation therefore looks at the preparation of major stakeholders (regulators and practioners) of Bio-cassava Plus Nigeria in dealing with bio-safety challenges that may arise.

Key words: Biosafety, bio-Cassava, transgenic, clones

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Performance of Selected newly-released cassava varieties in unfertilized tropical soils

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Abstract

Although cassava is reputed to be suitable for farming systems with poor resource base and marginal soils, yield increase and profitability under good soil conditions are presently the goal of the enterprise producer who has invested in cash inputs and targeting specific yield level and identified markets. While there are reports confirming response of cassava to applied nutrients, fertilizer application to cassava has not gained prominence due to cost, availability and technical knowhow. Six (6) newly released varieties were sampled for yield at 9 months and 12 months after planting, using one local variety (*oko iyawo*) and the national check (TMS 30572) as controls. The six varieties were established on farmers' field in Ondo and Ekiti States of Nigeria using best practices, yield samples were obtained from farmers who did not adopt the use of fertilizers on soils generally low in organic matter, nitrogen, available phosphorus, CEC and exchangeable calcium. Newly released varieties produced yield figures that were 24 - 70% higher than the local variety and the national check on similar soil types and management. Within the new varieties, TMS 98/0581 and TMS 98/0505 produced root yield of 23% higher than other varieties. TMS 98/0510 and TMS 95/0289 were similar in root yield figures that were slightly higher than TME 419 and TMS 92/0067. In general, all the newly-released varieties exceeded 20tons/ha in near marginal unfertilized soil using recommended practices. This implies that the farmers are likely to adopt these materials if available.

Key words: Performance, cassava varieties, unfertilized, tropical soils

Influence of Training based short-term intervention projects on fresh cassava root supply to processing factories in Nigeria

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Abstract

In the period between 2006 and 2008, the cassava crop began the leap from being a household crop to the one being sought after by numerous processing enterprises involved in the production of high quality cassava flour (HQCF), starch, chips, syrup and others. Three donor intervention agencies, C:AVA (Cassava Adding Value for Africa); USAID MARKETS (United States Agency for International Development; Marketing Agricultural Revenue and Key Enterprises in Targeted Sites) and USAID BtM2 (United States Agency for International Development; Bridge to MARKETS 2), supported targeted processing factories and farmers in ensuring regular supply of roots through varied strategies of networking and training of farmers to support profitable cultivation and regular delivery of roots on a sustainable basis. On-farm yield of 90% of networked farmers increased by 20-70% within 12 - 24 months of training and knowledge sharing activities. Adopting the use of improved planting materials, integrated weed control involving herbicides and optimum plant population accounted mainly for the increased yield. Input, credit and market linkage efficiency did not follow the pattern observed in field support with resultant product swapping in favour of stable targeted starch market. While non-targeted products of fufu (dry and wet), lafun and gaari absorbed the roots initially targetted for flour, the large-scale starch market appeared to be nearing saturation after 2 years of expanded production and increased yield. The cassava industry has not enjoyed the much desired factory/farmers sustainable relationship needed for the industrialization of the cassava sector due to inn-stability of prices and policies.

Keywords: Influence, Training, Short-term intervention projects, Fresh cassava root supply, processing

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Evaluation of Sweetpotato (*Lpomoea Batatas)* Varieties under Maize (*Zea Mays*) Canopy.

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Abstract

Sweetpotato [*Ipomoea batatas* (L) Lam] is grown to produce roots for human consumption. The experiment was conducted at the Teaching and Research Farm of the Department of Agronomy, University of Ibadan, Ibadan Oyo State from April to November, 2011. It evaluated sweetpotato varieties under maize canopy, with the aim of determining the growth response of sweetpotato to competition arising from association with maize, and to compare the yield of sweetpotato using early and late-maturing maize varieties. Four maize varieties (Oloyin ART (75 days),ACR 91 Suwan-I-SRC1(90days), Suwan-ISR (75days) and TZL comp.3C4 (90days), and five sweetpotato varieties; 199062.1, 440034, Arrowtip, Benue, and Shaba were used. The growth parameters of sweetpotato measured included**:** germination percentage, vine length, number of leaves per plant and number of branches per plant. In vine length, 440034 intercropped with Oloyin ART had the highest mean value of 146767cm, followed by 199062.1 intercropped with Suwan-ISR with mean value of 66443cm, and also in number of leaves, with mean value of 92.82 and 92.00 at 12 weeks after planting.
The yield parameters of sweetpotato include; shoot weight per plant, shoot per plot, number of tuber per plant, tuber weight per plant, per plot and weight of marketable tubers. Arrowtip had the highest tuberous root yield of 8.80tha^{-1} when intercropped with Oloyin ART, followed by when intercropped with Suwan-ISR with 8.68tha^{-1} of yield, and was not significantly different from the sole sweetpotato with a yield of 8.0 tha^{-1}. Arrowtip had the best yield of 8.80tha^{-1} when intercropped with early maturing maize variety.

Key words: Sweetpotato, maize, intercrop, yield.

Hydrolysis of Sweet Potato Starch using Malted Rice under Different Experimental Conditions.

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Abstract

Hydrolysis of sweet potato ("shaba") starch with malted rice flour was investigated under different experimental conditions. Paddy rice ("boromo") was malted for 12 days at ambient temperature. The malting parameters measured were malting loss, malting yield, thousand kernel weight, starch conversion time, diastatic activity and reducing sugar yield after hydrolysis of sweet potato starch with malted rice. The combined effect of germination period (GP) (3, 4, 6, 8, 10, 12day), pH (4.5, 5.0, 5.5, 6.0, 6.5), saccharification time (ST) (30, 60, 120min) and saccharification temperature (TS) (60 and 80

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Response of Different Rates of Primextra and Two Sowing Densities of Pumpkin (*Curcubita Pepo*) on Weed Control, Growth and Yield of Cocoyam (*Xanthosoma sagitifolium*) in Uyo .

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Abstract

Experiments were conducted at the University of Uyo Teaching and Research Farm, during 2008 and 2009 seasons, to evaluate the effects of reduced rates of primextra and two sowing densities of pumpkin on the growth and yield of cocoyam. Six treatments, primextra 1.5 and 3.0 kg ai/ha, pumpkin 20,000 and 30,000 plants/ha; weed free and unweeded check were used in a randomised complete block design with four replications. Result showed that unweeded treatment consistently produced highest weed density (87.50 and 81.38 m^{-2}) and weed biomass (42.32 and 39.36 g/m^2), while weed free treatment had least weed density (5.00 and 4.65 m^{-2}) and weed biomass (11.58 and 10.77 g/m^2) at 8 WAP in 2008 and 2009 respectively. Treatments also had significant effect on plant height at 12 WAP, with unweeded producing shortest plants (31.62 and 28.77cm), while 3.0 kg ai/ha of primextra gave the tallest plants (48.75 and 44.36cm), which were comparable to those of weed free (41.88 and 38.11cm), primextra 1.5 kg ai/ha (40.08 and 36.47cm) and 20,000 plants/ha of pumpkin (38.90 and 35.39cm) treatments in 2008 and 2009 respectively. Primextra 1.5 kgai/ha resulted in significantly higher number of cormels (8.31 and 6.49), weight of corm per stand (1.03 and 0.08 kg) and total yield (22.06 and 17.23 t/ha) than the weed free. Pumpkin 30,000 plants/ha gave a significantly higher total yield (20.85 and 16.28 t/ha) than pumpkin 20,000 plants/ha and unweeded check. Therefore, application of primextra 1.5 kgai/ha and 30,000 plants/ha of pumpkin could be recommended for use in Uyo.

Key words: Primexta, pumpkin, weed control, cocoyam.

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Getting Round the Problem of Cassava Utilization by Livestock: A Case Study of Composite Cassava Meal

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Abstract

Cassava is ranked the sixth most important crop in the World in terms of area planted and production. Nigeria is one of the World's largest producers of cassava. Cassava therefore, is the best possibility for overcoming the chronic scarcity of feed in the livestock industry. However, use of cassava-based products in monogastic animals feeding is limited because of the many problems that bedevil cassava products. These include poor texture, microbial contamination, low protein level, dustiness and their content of cyanogenic glucoside (HCN), thereby depressing performance and causing crop impaction and irritation of respiratory tract. This article reviews a novel cassava product - composite cassava meal (CCM) that has been developed to circumvent the identified problems of cassava products. CCM made up of whole tuber, leaves and discarded stem (very old and tender parts) was assayed for its proximate composition and true metabolizable energy (TME). Its utilization by broilers, layers and rabbits were also assessed. CCM contained average of 10.40% crude protein, 23% crude fiber, and 2.20 kcal/g TME. 60% replacement of maize with CCM in broiler diet did not depress broiler performance. Supplementation with palm oil and/or methionine further improved performance. Inclusion of 20% CCM in layers diet did not depress average total egg/bird, feed conversion/dozen egg and average hen day production, while higher inclusion levels encouraged smaller yolk size. 30% partial replacement of maize and wheat offal with CCM in weaned rabbit diets did not depress performance. Composite cassava meal therefore, was adjudged potential feedstuff for monogastic animals.

Key words: Cassava utilization, composite cassava meal, broilers, layers, rabbits.

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Promoting Sustainable Cassava Value Chain Development in Sierra Leone

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Abstract

To adequately develop cassava enterprise and improve livelihood, CFC approved funding of a three year project proposal on the Cassava Value Chain Development, in which Sierra Leone was selected. As expected, the project facilitated farmers' access to improve cassava varieties, set up/upgraded six functioning, well laid-out and equipped micro processing centres, i*ncreased the commercial value of cassava, enhanced* processors, local fabricators and farmers 'capacities for increased productivity, raised incomes, reduced drudgery in processing, and also enhanced consumers' access to quality products. To address the challenge of low yield, which affected farmers' productivity and processors' access to roots, improved varieties, were given to the established CFC nucleus Farms and a total of 28.6 hectares of cassava fields were established across all centres for future expansion. On the project achievements, yield estimates of cassava production increased from 7-8 t/ha to 20-25 t/ha with an appreciable increase in the volume of cassava products produced and marketed. A local fabricator, whose skill was enhanced by the project, single-handedly produced a Brazilian prototype of mechanical *gari* roaster, which was installed in one of the sites, and has now become a leading fabricator in the country. Other development agencies and NGOs are now either considering or using the project models. Such include UPoCA Project and AfDB/FARA/CORAF/WECARD, PSTAD and DONATA. Conclusively, the project has led to the availability of commercially competitive cassava products in the country with potential for sustainability, especially on group dynamics, market linkages and information systems.

Keywords: Cassava, capacities, productivity, processing, value chain

Effect of Sweetpotato Propagule Size on Productivity of Sweetpotato/Soybean (*Glycine max*) Intercop.

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Abstract

Sweetpotato and soybean under intercrop situation are mixed crops that differ in maturity and as such their growth requirements are separated in time and competition is less. Therefore, under this system there would be an expected measure of yield advantage if these crops are grown in combination with each other rather than in sole cropping. In this experiment these advantages were harnessed to improve the productivity of various numbers of nodes of sweetpotato. Field trial was conducted in 2007 and 2008 to examine the effect of number of nodes (1, 2,3, and 4 node cuttings) of sweetpotato variety, TIS 87/0087 on the productivity of sweetpotato intercropped with soybean variety, TGX966-25E. The experiment was laid out in a randomized complete block design with three replications. The field experiment showed that percentage emergence at 2 and 4 weeks after planting (WAP) of sweetpotato in both years was not affected by intercrop situation but by number of node cuttings used. The sole crop yield, were higher in most cases than the intercrop yield. However, yield advantages accrued due to intercropping sweetpotato propagule sizes and soybean. On the basis of land equivalent ratio (LER) and net returns, the highest yield advantage and economic returns were obtained with 3 node cuttings of sweetpotato intercropped with soybean.

Keywords: Sweetpotato, soybean, intercrop, propagule sizes, productivity.

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Upgrading of a Nigeria Indigenous Product (*Fufu flour*): CFC-WA/IITA contribution

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Abstract

Cassava processing by traditional means is labour-intensive and not of high quality products; thus, the need for upgrading through the application of improved processing technologies. Cassava root is usually consumed in processed forms such as *gari, fufu*, starch, High Quality Cassava Flour (HQCF), etc. HQCF was of interest by the Nigeria government during the time of President Olusegun Obasanjo for 10% inclusion into wheat flour in the production of pastries. This brought about the establishment of cassava processing centres in Nigeria by farmers and other entrepreneurs. However, low demand for this HQCF by flour millers and poor implementation of the 10% inclusion policy lead to limited productivity and closure of some of the factory. CFC-WA/IITA came to the rescue of some of these factories through product diversification. Equipments used for the production of HQCF were diversified into *fufu* flour production. *Fufu* is traditionally produced in the wet form with its characteristic odour and short storage life. This was upgraded into high quality odourless *fufu* flour through the aerodynamic principle of the stainless steel flash dryer. The *fufu* flour was produced with strict adherence to standard operating procedures and Good Manufacturing Practices, packed in a hermetically sealed and branded High-density Polyethylene bag and stored in a well-arranged wooden platform inside a ventilated storage room ready for sale. The sales of the product from the store follow the First-in-First-out (FIFO) approach in line with their respective production date and batch numbers. The product was generally acceptable when rolled-out to the markets, restaurant and Hotels, conforms to the regulatory quality standard of the National Agency for Food and Drug Administration and Control (NAFDAC), and was given a NAFDAC registration number (B1-0816 L). The *fufu* flour is now constantly produced and sold in large quantities; leading to job creation, replication of pilot plant and provision of food security to Nigeria.

Key words: Cassava, processing, traditional, *fufu* flour, food security.

Chemical Composition and Sensory Properties of Potato starch – Wheat flour blend noodles.

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Abstract

Chemical composition and sensory properties of instant noodles from blend of wheat flour and potato starch were investigated. Potato starch was used to replace wheat flour at 30,40,50,60 and 70%, Proximate , vitamin A, mineral analysis and sensory evaluation were carried out by standard methods, Result showed that the formulated noodles had higher carbohydrate (63.34-70.53%), moisture (4,34-4-97%) and vitamin A (11.62-35.00 mg/100g) but lower protein (3.36-7.89%) fat (16.91-25.09%) calcium (0.73-0.89%) phosphorus(0.24-0.32%) Iron (0.10-0.27%) and ash content (1.17-3.17%) than the commercial noodles from wheat flour. The noodles containing 30% potato starch showed no significant difference ($p>0.05$) from commercial noodles (100% wheat flour) in terms of colour, crunchiness, taste and general acceptability.

Keywords: Chemical, sensory properties, wheat flour, potato starch blend, noodles.

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Yam innovation systems in southeastern Nigeria: Implications for strategic policy and extension actions

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Abstract

Yam enterprises in Nigeria have a great future and can significantly reduce hunger, un-employment, poverty and imperatively guarantee economic empowerment among farm households. Livelihoods of millions of households who grow, process, trade, and consume yams in Nigeria could be significantly improved through effective transfer and adoption of yam innovations. The farm households' benefits from yam-based enterprises in Nigeria are however severely constrained by a number of factors especially limited access to technological innovations such as the improved yam varieties, improved agronomic practices as well as research recommendations that address such critical issues like declining soil fertility, pests and diseases etc. Farmers are therefore left with little solutions to many of their problems in yam cultivation. This paper presents a case study of yam innovation system in Southeastern Nigeria with a view to examining the strengths, weaknesses, opportunities and threats to the system as well as highlights the implications for strategic actions regarding extension services delivery and policy. Results of the study showed that zero adoption rates for such yam innovations like improved varieties (0%) but "low" for others especially yam intercrop mixtures (39%), fertilizer application (44%) etc. Also, the results showed that the yam innovation system was 'very strong' in matters like increased yam productivity (3.26), income generation (3.21) but "very weak" in farmers' access to research finding (3.83) and farmers' acquisition of requisite technical skills to increase yam productivity (3.67). However, opportunities provided by the yam innovation system in the study area were quite revealing as the results shows that the system had "great opportunities for boosting household food security (3.87), Yam business enterprise (3.42), etc. On the other hand, low adoption of yam innovations (3.10), slow rate of innovation diffusion (2.44), lack of feedback from end users (2.66) etc posed 'much treats' to yam innovation system in the study area. Strategic arrangements aimed at strengthening the extension services delivery machinery to adequately address the twin issues of slow diffusion of research findings and lack of access to extension advice/improved technologies by farmers are proffered in the paper. Again, relevant policy actions that need be taken to stimulate active participation of the organized private sector and donor agencies in funding extension services to fast track yam innovation dissemination processes are highlighted. This will essentially make for availability of necessary facilities and logistics for extension to reach farm households with most approrpiate innovations for field constraints in the most efficient and timely manner.

Keywords: YamInnovations, strengths, weaknesses, opportunities, treats

Acceptability and proximate composition of snacks produced from cassava -fish flour

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Abstract

Acceptability and proximate composition of snacks produced from cassava-fish flour blend were investigated. Raw cassava tubers were harvested fresh and processed into flour while frozen fish was boiled, de-boned, de-oiled and processed into fish concentrate. Biscuits, pancake and rockbuns were prepared from cassava-fish flour (80:20) and 100% cassava flour to obtain a combination of six products. Thirty consumer taste panelists assessed the sensory attributes of the six products produced from cassava flour and cassava-fish flour. The samples were analysed for chemical composition using AOAC (1990) methods. Result shows that the overall mean acceptability score of all the products except rockbuns made from cassava-fish flour was above 3.0 out of 5 indicating acceptability based on the criteria of the American Society for Testing Materials (ASTM). However, preference test indicates that products from cassava flour were preferred compared to those from cassava-fish flour. Analysis of variance (ANOVA) indicates that the colour, taste, texture and flavor of pancake and rockbuns made from 100% cassava flour were significantly different ($p < 0.05$) from the same products made from cassava-fish flour while there was no significant difference ($p>0.05$) in these characteristics in biscuits made from both cassava and cassava-fish flour. Colour and taste acceptability scores (2.53 and 2.73 respectively) for rockbuns made from cassava-fish flour were significantly lower ($p < 0.05$) than the scores (4.47 and 4.20 respectively) for the same characteristics in rockbuns made from 100% cassava flour indicating non-acceptability of rockbuns made from cassava-fish flour. Pancake made from cassava-fish flour had the lowest acceptability scores in all the acceptable quality attributes compared to other products indicating low acceptability of fried products from cassava-fish flour. Proximate analysis indicates that the products made from cassava-fish flour have higher nutrient value especially for protein, energy and ash content compared to products from cassava flour. This study shows that cassava-fish flour has the potential to be used for production of nutritious and acceptable baked products.

Key words: Acceptability, proximate composition of snacks, cassava -fish flour

Nitrogen uptake efficiency and Tuber yield of white yam (*Dioscorea rotudata* Poir.) as influenced by compost rates in Abeokuta Southwestern Nigeria

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Abstract

Dearth of information exists on the nitrogen efficiency of white yam in response to composted Organic Fertilizer in Southwestern Nigeria. Field experiments were conducted at the Federal University of Agriculture Abeokuta, Nigeria in the rain seasons of 2010 to evaluate the N uptake efficiency and tuber yield of yam as influenced by sweet potato intercrop. Healthy yam setts (200-300g size) of three cultivars of white yam cv. Amula, Danacha and Ogoja were planted at 1m distance on ridges spaced 1m apart. Six weeks after planting, composted poultry manure at 0, 5.0t/ha were applied. The treatments were arranged as a split- plot in randomized complete block design with 4 replicates. Data on number of leaves, number of branches, leaf area, leaf area index and weight of tubers were collected. N uptake efficiency was estimated from the hervest indeces. Yam plots that received 0t/ha of compost produced significantly ($p<0.05$) higher N uptake efficiency as compared to plots that received other fertilizer treatments. Amula produced larger leaf area (45.6), more leaves (728) and higher tuber weight (11.9 t/ha) for the period of growth. These values are significantly ($P<0.05$) higher than those obtained from other yam cultivars. Cv.'Danacha' produced significantly longer vines with more branches than the other two cultivars.

Key words: N Uptake efficiency, white yam, sweetpotato, compost,

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Added Value Strategies for Cassava Products in Brazil: Applicability in Africa.

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Abstract

This paper describes several value added strategies for cassava products in Brazil that can be applied with certain modifications for cassava products in Africa. Data from secondary sources were collected and analyzed to describe the characteristics of cassava products developed by adding value to traditional cassava products in Brazil. Within the market of cheese-bread and despite some technical limitations that still exist in the production process of the sour starch, the cheese-bread is no longer a regional product to become a national product, present in many different outlets (cafes, restaurants, tea houses, supermarkets, bakeries, convenience stores and franchises) and marketed in different forms (Gingerbread cheese ready for consumption, chilled, frozen bread dough cheese- etc.) and flavors (garlic, onions, etc.). Tapioca (starch-based product), which also until recently was only in traditional markets, it is now more sophisticated and invaded the most exclusive restaurants and fast-food restaurants and buffets that serve up the dish at parties. Another alternative to change the projections of demand for cassava is the possibility of contribute to the reduction in wheat imports. It is estimated that, in the process of replacing 10% there may be an increase in demand for roots of 2.5 million tons, a savings of R$104 million in the trade balance, since 70% of wheat consumed is imported, generating 50 thousand new direct jobs only in the agricultural sector. With regard to the potential market for starch for the paper and pulp industry, Brazil presents a potential market of over 170 thousand tons.

Keywords: Tapioca, markets processing, added value, cassava

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Effects of Enzyme-supplemented Peeled and Unpeeled Cassava Root meal as replacement for Maize on the Performance, Blood parameters and Feed cost of Broiler chickens.

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Abstract

A 56-day study was conducted to investigate the effects of peeled cassava root meal (PCRM) and unpeeled cassava root meal (UCRM) supplemented with Allzyme SSF® enzyme as a replacement for maize on the performance, blood parameters and feed cost of broiler chickens. A total of 360 day-old Marshall broiler chicks were allotted to twelve dietary treatments with 3 replicates in a 2×3×2 factorial arrangement comprising of 2 products of cassava (PCRM and UCRM), 3 levels of inclusion of PCRM and UCRM (0,10,and 20%) and 2 levels of enzyme supplementation (0 and 200g/ton of feed).Data were collected on body weight gain, feed intake, blood parameters and feed cost. Final live weight and daily weight gain were significantly ($P<0.05$) higher for birds on UCRM than those on PCRM during the study. Feed cost/kg weight gain was also significantly ($P<0.05$) lower for those on UCRM than those on PCRM.Serum cholesterol and uric acid significantly ($P<0.05$) reduced in birds on UCRM than those on PCRM while white blood cell increased. Final weight, daily weight gain, total feed intake and total feed cost/bird decreased significantly ($P<0.05$) with increasing levels of cassava during the experiment while it also lowered the serum cholesterol at the finisher stage. Enzyme supplementation at 200g/ton resulted in significant ($P<0.05$) increase in the final weight throughout the study and reduced cholesterol and uric acid at the finisher phase. It is recommended that 10% level of UCRM and 200g/ton of Allzyme SSF® be included in broiler diets for increased performance and lower costs.

Key words: Allzyme SSF®,peeled Cassava root meal, unpeeled cassava root meal and broiler chicken

Population Dynamics, Damage and Control of Major Insect Pests of cocoyam (*Colocasia esculenta*) in Umudike, Abia State

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Abstract

The study assessed the population dynamics of major insect pests of cocoyam *(Colocasia esculenta)* and the effects of insecticidal treatments on the major insect pests of cocoyam in Umudike, South eastern Nigeria.
The population dynamics showed that during the stage 2 of cocoyam growth, Cotton Aphids, *Aphis gossypii* were most prevalent, sucking leaf sap. Increased numbers of *A.gossypii* were recorded during weeks of low rainfall and increased temperature particularly at their peaks.
Four insecticides, cypermethrim, dectamethrin, dimethoate and lambdacyhalothrin applied at the rates of 0.02kg, 0.01kg, 0.4kg and 0.01kg ai/ha, respectively, were evaluated for the control of *A. gossypii*. The results showed that the insecticides significantly ($P<0.05$) reduced the insect populations and increased the yield of the crop when compared with the control, with cypermethrin being the most effective. Tuber yield reduction of 43% was recorded when compared with the control. This study indicates that cypermethrin was effective in the control of *A. gossypii*.
Key words: Population dynamics, damage, control, major insect pests of cocoyam (*Colocasia esculenta*), Umudike

Nutrients Utilization and Haematological Parameters of Broiler chickens fed Diets based on Cassava Products supplemented with an exogenous enzyme.

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Abstract

This experiment was conducted to determine nutrients utilisation and some haematological indices of broiler chickens fed diets containing processed cassava root products (peels and leaves) with or without xylanase (EC 3.2.1.8) supplementation. Cassava peels were processed by sundrying (SCPM), retting (RCPM) and ensiling (ECPM) and then incorporated into practical diets of broilers replacing maize (control) at 500g/kg. All diets except the control contained uniform quantity (100g/kg) of sundried cassava leaves and all were supplemented with (0.1g/kg) or without xylanase (totalling 8 diets) in a 2 (with or without enzyme) by 4 {maize (control, SCPM, RCPM, and ECPM) factorial design.Thirty day old birds were assigned to 8 dietary treatments each having 3 replicates of 10 birds (240 birds in total) and fed respective diets for 57d. Nutrients utilisation coefficients (dry matter, crude protein, crude fibre, ether extract and ash), haematological (packed cell volume, haemoglobin, red blood cells and white blood cells.) and some serum biochemical indices (cholesterol, uric acid and creatinine) were measured. Data were analysed using ANOVA. Significant means were separated using Duncan's test. Birds on the processed cassava diets had similar digestibility values with control at starter (0-28d) and finisher (29 -57d) phases, while crude protein retention and fibre digestibility were increased ($P<0.05$) by xylanase supplementation in both phases above. Serum creatinine and uric acid values although significant did not follow any particular trend. Ensiled, xylanase diets elicited highest ($P< 0.05$) cholesterol concentration in serum of experimental birds.

Keywords: Broiler feeds, processed cassava peels and leaves, Xylanase, Haematological parameters

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Effect of Topping and reducing the number of Stems per plant on yield of Cassava Tuberous Roots.

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Abstract

The topping stops apical dominance and promote the emergence of the axillaries buds. It increases the biomass of leaves and therefore the chlorophyll activity. Thus, it influences metabolism which became most important and results in the formation of more carbohydrate reserves in the tuberous roots. In a study conducted in Yangambi and in Kisangani in Orientale Province of the Democratic Republic of Congo, four cassava varieties distinguished by the type of port (erect, branched, medium) were subjected to a single harvest of leaves, reducing the number of stems to allow a single stem per foot and a treatment combining the two practices (topping and thinning). They had occurred two months after planting and were compared with the control where no application was made. Different results were obtained and indicated that the harvest of leaves applied to the different varieties have encouraged an expansion of the canopy and thus, a large leaf biomass was observed where the operation was done. The variety Nsansi (with medium port) was developed more than regrowth after topping. Observations made on performance indicates that the practice of topping causes an increase of yield of 17.5% measured in tones of fresh cassava per hectare compared to the production obtained in the control plots. The combined effect of topping and thinning increase also the yield up to 11.53%. The practice of thinning applied alone is unfavorable because it decreases the production but not significantly compared to control (a decrease of 6.2% of yield). This is a justification by the fact that thinning causes a reduction of the crown. Furthermore, we observe that the responses of cassava varieties differ when they are subject to the topping and/or to the thinning. The Nsansi was more sensitive to the topping. In this variety, this operation causes yield increases of 37.3% compared to Butamu (26.5% of increase), to Zizila (11.5%) and to Mbongo, the local variety with 9.3 % of increase. Whatever the site, the practice of topping appears to be the most appropriate in substantial increases of yield of cassava. When done, it can produce cassava leaves as an important vegetable in the DRC and, if they are marketed, cause profits and give added value to cassava cultivation especially when production is for the roots. The topping causes a marginal cost of U.S. $ 8 per hectare but in the meantime, the marginal revenue obtained from this operation according to the following varieties of cassava are respectively U.S. $ 726.90 / ha (MRT = 0.95) with Nsansi, U.S. $ 463.26 / ha (MRT = 0.60) with Butamu, U.S. $ 239.29 / ha (MRT = 0.31) with Zizila and U.S. $ 99.23 / ha (MRT = 0.13) with Mbongo.

Key words: Topping, thinning, leaf biomass, MRT

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Stopping the rot: Nigerian Women adding value, processing their ways to wealth and food security at the Cassava markets

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Abstract

Empowering and creating wealth for cassava producing and processing smallholder farmers (of which women constitute the majority) through value addition and competitive market led opportunities for inclusive growth in agriculture, is one of the Cassava: Adding Value for Africa (C: AVA) objectives. This study attempts to examine the extent to which C: AVA project in Nigeria has created market led opportunities for women smallholder farmers of cassava roots in Southwest Nigeria. Stratified purposive sampling techniques were used to select 120 women farmers from Ogun and Ondo States of Nigeria. Data analyses were conducted using frequency distribution, percentages, t-test and chi-square. At the production level there was increase in yield of cassava roots on the farms surveyed from the average national range of 10-12 tonnes/ha in 2008 to average C: AVA range of 20-25 tonnes/ha in 2010. These improved varieties resulted in an average yield advantage of about 65% over local varieties. Owing to the observable increase in yield, farmers in the study areas increased the hectares under cassava from an average of 0.5-1.5 *ha* in 2008 to an average of 10.0-20.0 *ha* in 2010. The average annual national income of women farmers increased from $1000 in 2000 to an average C: AVA income of $1700 in 2010. Increased yield and new market entrants of high quality cassava flour (HQCF) for industrial uses and were cited for expansion of cassava fields. At the processing level, Chi-square analysis shows significant relationships at $p<0.05$ between the use of improved cassava technologies ($\chi^2= 79.25$), value addition ($\chi^2= 171.77$) and marketing of cassava products ($\chi^2= 105.35$). There were significant relationships between the yield of improved cassava varieties and marketing of cassava products ($\chi^2= 70.20$, $P<0.05$). The study concluded that C: AVA has provided systematic development of specialization in which women cassava roots producers/processors produce specifically for multiple markets to ensure wealth and household food security. This will ensure more market opportunities to generate wealth and ensure food security for women and their households.

Key word: Nigerian women, adding value, wealth, food security, cassava markets

Performance and cholesterol content of eggs and organs of laying hens fed Cassava root meal diets with or without enzyme (Allzyme SSF ®) supplementation

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Abstract

A study was conducted to investigate the effects of dietary enzyme (Allzyme SSF ®) supplementation in diets containing cassava root meal (CRM) on performance and egg qualities of laying hens. One hundred and eight, 19 weeks old Oba Black strain pullets were allotted to twelve dietary treatments in a 2x3x2 factorial arrangement, made up of processed cassava root meal (peeled and unpeeled), three levels of cassava inclusion (0, 10 and 20%) and two levels of enzyme supplementation (0 and 200g/tonne) for a period of five months. Data were collected on egg production and lipid fractions of egg, kidney and liver of laying hens. No significant differences were observed for hen-day production as a result of enzyme inclusion, processing method or inclusion levels. Inclusion of peeled and unpeeled CRM in diets of laying hens significantly ($P<0.05$) reduced cholesterol, low-density lipoprotein and increased high-density lipoprotein in the kidneys and liver. Egg cholesterol and low-density lipoproteins reduced significantly ($P<0.05$) as a result of unpeeled CRM inclusion. As the level of cassava increased there were significant ($P<0.05$) differences in the cholesterol and low-density lipoproteins at both 10 and 20 weeks of the experiment. It can be concluded that the performance of the laying hens was not influenced by enzyme supplementation whereas inclusion of unpeeled CRM in layers diet reduced cholesterol level and low-density lipoprotein in the eggs, kidney and liver of laying hens

Keywords: Peeled cassava root meal, unpeeled cassava root meal, Allzyme SSF ®, layers, cholesterol, eggs

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Evaluation of Cassava-Based Systems for Adaptation to Climatic Variations in Eastern Nigeria

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Abstract

Three cassava-based systems viz: solely cassava (SC), cassava + pigeon pea (C + P) and Cassava + pigeon pea + maize were evaluated using cassava root, shoot yields and their ratio as the index of adaptation. The study was carried out in two locations, one within the University of Nigeria, Nsukka (UNN) farm near the Metrological station and the other about one km off the Campus and in a newly cleared forestland. The experimental design was a randomized complete block design (RCBD) replicated three times in each location. Three climatic elements (rainfall, temperature and relative humidity) were obtained from the Meteorological station each year. The yields were significantly ($p \leq 0.05$) affected by location, year, and the cropping systems. Out of the three climatic variables the relative humidity accounted for about 60%variation in root yield and 56% in shoot yield. The highest average root yield (15 t ha^{-1}) came from C + P + M plots at forestland location and the least (2.2 t ha^{-1}) from C + P plots at the UNN location. Thus, C + P + M mixture is the most adapted in the area.

Key words: Cassava, climate, cropping systems, eastern Nigeria

Germplasm Evaluation of Yam (*Dioscoria rotundata*) genotypes in Ultisol of Nsukka Environment

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Abstract

Pre-release evaluation of different yam genotypes (*Dioscoria rotundata*) for high yield and disease tolerance (field tuber rot (%)) were studied for five consecutive years in the Department of Crop Science University of Nigeria , Nsukka farm. Each experiment was a randomized complete block design (RCBD) with three replications. Two hundred grams of mixed tuber portions were planted on ridges at 20 sets per plot of 4 m x 5 m. and were staked with approximately 2m stake. Fertilizer applied was NPK mixture at 400 kg/ha, weeding was done three times with local hoe and yam harvested six months after planting. The yield in year 2010 was the highest with the following: 16.377kg/plot fresh tuber, 47.3 tuber sett /plot, 352 g as the average sett, 811 g as the weight of sett per stand and the lowest field tuber rot of zero (0%).The least value of tuber fresh weight was produced in 2011 and the highest tuber rot was in the following order – 2009 > 2008> 2011. Similarly, the yield performance of the yam genotypes were in the order of 99/amo/058 > 2475 > 99/amo/001. It is evident in this study that the yam genotypes are adaptable in Nsukka environment.

Keywords: Yam, evaluation, yam yield, yam rot

Effects of Different Peeling Methods on the Proximate Composition of Sweet Potato (*Ipomea batatas*)

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Abstract

Effects of different peeling methods (abrasive, steam, lye, flame and hot oil) on the proximate composition (moisture, ash, fat&oil, protein and carbohydrate) of sweet potato were determined. The proximate composition of manually peeled sweet potato served as the control for the experiment. Steam peeled sweet potato had the highest value of moisture content among the other peeling methods when compared with the control at $p<0.05$. Flame peeled sweet potato had the least amount of ash content when compared with the control at $p<0.05$. Hot oil peeled sweet potato had the highest amount of fat and oil compared with the control at $p<0.05$. Lye peeled sweet potato had the least amount of protein compared with control at $p<0.05$. All the peeling methods except steam peeling had no significant ($p>0.05$) effect on the carbohydrate. The results obtained from this experiment would be useful in determining which peeling method is most suitable for industrial application of peeling of sweet potato.

Key words: Peeling methods, proximate composition of sweet potato (*Ipomea batatas*)

Comparative Evaluation of the Moisture Adsorption Characteristics of Some Dried Fermented Cassava Flours

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Abstract

This paper presents the moisture adsorption data of three dried fermented cassava products namely, *fufu*, *pupuru* and *lafun* at 27, 35, and 40°C. The equilibrium moisture content of the products at water activity values of 0.11- 0.89 ranged between 4.25 and 27.85% (db). Type II moisture adsorption isotherms were obtained for the products. The Peleg and GAB model similarly gave good fit of the experimental data. The average values of the monolayer moisture over the entire storage temperatures ranged between 6.1 and 12.0% (db). The moisture adsorption curves of *fufu*, *lafun* and *pupuru* are similar at the 27 and 35°C. However, at 40°C the sorption curve of *lafun* is different from *pupuru*.

Key words: *Pupuru*, *fufu*, *lafun*, adsorption isotherm, fermented cassava,

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Cassava Productivity among Farmers in the Rural Areas of Ogun and Ekiti States, Nigeria

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Abstract

This study analysed cassava productivity among farmers in the rural areas of Ogun and Ekiti States, Nigeria. Using multi-stage sampling technique, 200 farming households were sampled in the study area using interview guide. Data were analysed using descriptive statistics, chi-square and ordinary least square regression analyses. Results revealed that majority (74.4%) of the household heads were male; married (82.0%), had one wife (64.3%) and mostly Yoruba (90.4%) while more than half (56.8%) had no formal education. Mean age of respondents was 54 years. Mean farming experience was 30 years; the mean farm size was 1.9 hectares while average household size was 12 people. Percentage of land cultivated in relation to available land for cultivation was 34.0%. Results of productivity indicators showed that the mean labour, capital and land productivity values per household were N20, 736.13, N93.66 and N 311,860.18 respectively. Mean value of total productivity per household was N332, 689.97. Productivity was found to have increased progressively with increase in age up to economically viable group of 41-50 years and then started to decline. Chi square results showed significant association ($p<0.05$) between total productivity of respondents and age group ($\chi^2 = 28.03$; df =15). Regression analysis results showed that farmers' personal characteristics which significantly affected farm productivity were age ($p<0.01$), marital status ($p<0.05$), education ($p<0.01$), native status ($p<0.05$) and income ($p<0.01$). It was recommended that, government should enact a policy that will encourage young adults to take up farming as business venture in order to ensure successor generation of farmers.

Key words: Cassava productivity, farmers, rural areas, Ogun and Ekiti states

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Nutrient Content of Sweet potato (*Ipomoea batatas*) Storage Roots and Quality Assessment of their Food Products

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Abstract

In an effort to elucidate the nutritional potentials and possibly stimulate increased utilisation of the energy dense sweet potato the proximate compositions and water absorption capacity of storage roots of 21 local and exotic sweet potato varieties were determined by established methods. The storage roots were harvested, peeled, sliced, dried and milled for analysis and value-added products were also developed from the resultant flour and evaluated for degree of likeness. The mean dry matter content of the exotic and local varieties were (24.6±5.4) and (32.1± 4.0)% respectively, the mean ash content were (5.5±2.0) and (2.9±2.02) respectively, the mean protein contents were (3.7±1.3) and (2.3±1.6) respectively, crude fibre content were (6.7±2.4) and (4.2±1.3), respectively, free sugars were (12.5±4.5) and (13.6±1.9), respectively, the mean starch contents were (68.7±7.7) and (74.4±2.5) respectively, total carbohydrate content were (81.1±4.0) and (88.0±1.9) respectively, the mean crude lipid were (2.0±0.9) and (1.5±0.6) respectively. The mean of total carotenoids were (3.9±3.7)mg/100g and (0.62+0.1)mg/100g respectively.
Water absorption capacity (WAC) also had a mean of 2.2±0.7 g/g and 1.8±0.2 g/g for exotic and local varieties respectively. All the components were significantly different at $p<0.05$ between varieties. The composites of cakes, cookies, and bread were significantly different at $p<0.05$ suggesting differences in the quality. This study shows that a significant proportion of wheat flour can be substituted with sweet potato flour with little changes in the quality of the product.

Carotenoids profile, polyphenol content and antioxidant capacity of a tropical Cocoyam (*Xanthosoma Maffa* (Scoth)) from Nigeria.

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Abstract

Root and tuber crops are major stable foods in the tropical countries where they are the main source of calorie and essential micro and bioactive nutrients such as the carotenoids and polyphenol compounds. Carotenoids and polyphenols have great potential for improving human nutrition and health in these regions. The carotenoids and polyphenol content in Nigerian cassava and sweet potatoes may have been evaluated but not the aroids and Dioscorea spp. according to our knowledge. The carotenoid content of a typical under-utilized Nigerian cocoyam (Xanthosoma Maffa (Scoth)) was characterized, quantified and identified using an HPLC-DAD based OSU protocol (Aligent Technologies).The total polyphenol, flavonoid and antioxidant capacity using DPPH, ABTS and ORAC assays were determined. The result indicated the following carotenoids and antioxidant concentrations : alpha carotene (3.35µ g/g), beta carotene (3.9µ g/g), 9 cis-beta carotene (1.14µg/g),13 cis-beta carotene (0.9µg/g), lutein (1.7µg/g), zeazanthin (0.01µg/g), phytoene (15.8µg/g), phytofluene (15.8µg/g); total polyphenol (163.4mgGAE/100gFW), total flavonoid (155.4mgCE/100gFW), DPPH(729.4mgTE/100gFW), ABTS (756mgTE/100gFW), and ORAC (699.5mgTE/100gFW). The total carotenoid content from HPLC of about 15.0µg/g compared with the colorimetry value of 15.8µg/g suggesting a highly reliable data. The colorless phytoene and phytofluene are precursors of carotenoids in plants and are relevant in understanding the genetic and biosynthesis of carotenoids in Xanthosoma Maffa (Scoth). This data base have implication for nutrition and health in the Nigerian region and may be a useful tool for nutritionists, health workers and breeders working on biofortification of tropical root crops with carotenoids and antioxidants.

Keywords: Xanthosoma Maffa (Scoth), Carotenoids, Polyphenols, flavonoids, antioxidant capacity and biofortification.

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Preliminary Studies on the Development and Evaluation of Instant Poundo Yam From *Dioscorea Alata*

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Abstract

Yam is a very popular tuber crop in Nigeria. *D. alata* has more agronomical advantage than the other species because of its better storability, higher multiplication ratio, and less capital and labour intensive than the preferred specie, *D.rotundata.* Exploitation of its industrial potential by diversifying its utilisation through developing of novel products will expand its utilisation. This study investigated the potential of developing instant poundo yam flour from *D. alata*. Instant poundo yam flour was prepared from *D. alata* by peeling, dicing and immersing yam tubers in sodium metabisulphite solution (800 ppm for 20 min). The tubers were thereafter blanched at 70 ^{o}C for either 5 or 10 min, dried in a cabinet dryer at 60 ^{o}C for 72 hr, milled and sieved (600 μm). The proximate composition was determined using standard methods. Sensory evaluation was conducted to determine their sensory attributes (colour, flavour, taste, textural quality (strecthability, adhesiveness, cohesiveness, smoothness) and general acceptability. The instant poundo yam samples were compared with a commercial poundo yam in terms of its sensory attributes. There was no significant difference ($p \leq 0.05$) in the proximate composition of the two instant poundo yam samples. Textural quality of the two samples differed significantly ($p \leq 0.05$), instant poundo yam blanched for 10 min recorded higher scores in all the sensory attributes and was more accepted. An acceptable instant poundo yam has been developed from *D. alata*, thus providing a potential for increased utilisation of *D. alata*.

Key words: *D. alata*, instant poundo yam, proximate composition, sensory attributes

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Adaptability of Irrigated Orange-fleshed Sweet potato (*Ipomoea batatas* [L.] Lam) Genotypes in different Agro-ecological zones of Malawi

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Abstract

Storage root yield and beta-carotene adaptability of eight orange-fleshed sweetpotato (*Ipomoea batatas [*L.] Lam.) Genotypes were studied in three major agro-ecological zones of Malawi to evaluate their performance under furrow irrigation conditions. The sites were Maseya (<200masl), Bunda (750-1350masl) and Bembeke (>1350masl). Genotypes LU06/0527, LU06/0252, LU06/0428, LU06/0299, LU06/0258, BV/009, Kenya and Zondeni were used. A study was laid out in randomized complete block design with three replications per site. Beta-carotene was determined spectrophotometrically. Both beta carotene and storage root yield showed significant ($p<0.05$) differences within genotypes and across sites. Beta carotene was highest in LU06/0252 (6793.2µg/100g) followed by Zondeni (5620.9µg/100g). Beta carotene increased significantly with decreasing altitude. Beta carotene was highest at Maseya (4258.5µg/100g) followed by Bunda (3556.2µg/100g). This trend could be attributed to high temperatures at low altitude which promote carotenogenesis in tropical crops. Interestingly, the best genotype in beta carotene, LU06/0252, was also identified as relatively stable across sites according additive main effects and multiplicative interactions analysis (AMMI) and was considered for wider adaptation. LU06/0527 (20.8 t/ha) was the best yielding genotype followed by LU06/0252 (12.5t/ha) and LU06/0428 (11.7t/ha). Zondeni was the least with 6.4t/ha. Bunda produced highest yield (15.7t/ha) while Maseya was least (8.2t/ha). LU06/0252, BV/009 and LU06/0299 were stable genotypes according to AMMI biplots. Genotype by environment interactions greatly affected performance of sweetpotato genotypes consequently can slow down crop improvement programs. The study has also shown that sweetpotato can be produced under irrigated conditions as one way of adapting to effects of climate change.

Keywords: Agro-ecological zones, AMMI analysis, Beta-carotene, orange-fleshed sweetpotato, storage root yield

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Mineral composition and acceptability of cocoyam-based recipes enriched with cowpea flour.

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Abstract

The study was conducted to develop cocoyam-based recipes (*Ebiripo, Ikokore* and *Ojojo*) using different blends of cocoyam (*Colocasia esculenta*) and cowpea (*Vigna unguiculata*) flour in the ratio of 100:00, 80:20, 70:30, 60:40 and 50:50. The mineral composition and sensory acceptability of the developed products were determined using standard analytical procedures. The data obtained were subjected to analysis of variance and means were separated using Duncan's multiple range test. The results showed that the developed recipes had significantly ($p<0.05$) higher contents of iron, zinc, sodium and phosphorus compared to the control recipes (100 % cocoyam flour). The potassium content was higher in the control recipes than in the cowpea flour enriched recipes. However, 100 g *ikokore* had the highest iron (2.5 mg), phosphorus (92.5 mg) and zinc (1.92 mg) contents than *ebiripo* and *ojojo* at 50:50 cowpea flour inclusion levels. In terms of calcium content, *ebiripo* had the highest value (56.3 mg). The sensory evaluation showed that the control and 80:20 recipes for *ebiripo* had significantly ($p<0.05$) higher flavour and overall acceptability scores compared to 100:00, 70:30, 60:40 and 50:50 substitution levels. *Ikokore* substituted with cowpea flour at 20-40 % levels were scored higher in terms of colour, flavour, consistency, taste and overall acceptability among the blends. The samples of *ojojo* were not significantly different ($p>0.05$) from each other in terms of colour, flavour and taste. It is concluded that the enrichment of cocoyam-based recipes (*ojojo, ikokore* and *ebiripo)* with cowpea flour improved the mineral composition and the acceptability of the foods.

Key words: Mineral composition, acceptability, cocoyam-based recipes, enriched with Cowpea Flour

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Evidence of Gene-for-Gene Interaction in Yam Anthracnose Disease and Implication for Resistance Breeding

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Abstract

Differential interaction was evaluated in the resistance of 17 *Dioscorea alata* genotypes from French West Indies germplasm to 10 isolates of yam anthracnose pathogen (*Colletotrichum gloeosporioides*) using tissue culture-derived whole-plant assay. Resistance was generally quantitative, and could be isolate specific or non-specific. Isolate-specific resistance appears to be mostly partial, characterized by reduced rate of disease development despite infection. However, incompatible isolate-specific reactions resulting in no disease development were obtained in 14 of the 170 G × I combinations. These indicate the possibility of qualitative resistance that could fit the classical definition of gene-for-gene model in yam anthracnose. The implications of isolate specific reactions for resistance breeding and cultivar selection for sustainable management yam anthracnose disease were discussed. Seven genotypes (Pyramide, St Catherine, Plimbite, Oriental, Pacala cacao, Pacala station and AIA445) with differential resistance or susceptibility to various isolates were identified as candidate host differential for analysis of virulence variation in *C. gloeosporioides* populations.

Key word: Anthracnose, *Colletotrichum gloeosporioides*, isolate, specific-interaction, yam

Effect of Acetylation on some Physical and Functional Properties of Cassava Starch

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Abstract

The effects of acetylation on starch from new cassava cultivar (TMS30572) and industrial starch were investigated using graded levels of acetic anhydride (8.2-49.2ml) and 3% NaOH as catalyst. The resultant starches were evaluated for physical properties (bulk density, sedimentation and water and oil absorption capacities) and functional properties (swelling power, solubility, viscosity, paste clarity, freeze-thaw stability) and compared with commercial acetylated potato starch and native cassava starches. The industrial extracted starch showed higher acetyl (%) and degree of substitution under the same experimental condition. The yields after acetylation ranged between 96-98% and 80-93% for TMS30572 and industrial starches respectively. Acetylated cassava starches showed improved physical and functional properties over the native cassava starch and increased with increasing acetic anhydride concentration in the reaction medium. Swelling power at 50˚C and 70˚C were 3 and 24 times its original size respectively at 2.5% acetylation. Acetylated cassava starches (≥2.50%) at concentration of 5.5% w/v had the same hot paste viscosity (1500 cPa.s) with commercial acetylated potato starch at 5% w/v concentration. Acetylated cassava starch at 2.50% was stable until the third freeze-thaw cycles and exhibited better stability and lesser tendency toward retrogradation than commercial acetylated potato starch. Acetylated cassava starches (≥2.5 - 2.7%) could be a potential replacement to commercial acetylated potato starch as ingredient in food system especially frozen desserts.

Key words: Effect, acetylation, physical, functional Properties, cassava Starch

Factors influencing the inclusion of root and tuber crops in the cropping systems of farmers Oyo State, Nigeria

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Abstract

Root and Tuber Expansion Project was among several food security intervention programmes formulated to enhance national food sufficiency. However, root and tuber production relies on smallholders that have multiple practices to choose from while considering the inclusion of root and tuber crops in the cropping systems. This study examined factors influencing the inclusion of root and tubers crops in the cropping systems among farmers in Oyo state. Data were collected using structured interview schedule that was administered on 120 farmers randomly selected from two agricultural zones in the state. Frequency counts and percentages were used to describe the data while Tobit regression method was used as the main analytical tool. The study revealed that factors such as availability of planting material ($P<0.01$), suitability with cropping systems ($P<0.01$), low risk involvement ($P<0.01$) and low capital requirement ($P<0.01$) positively and significantly influenced the inclusion of root and tuber crops in the cropping systems by farmers in the study area. Root and tuber crops programmes will have effective impacts and increase efficiency of the target beneficiaries only, when farmers' input are considered in the design of such programmes. Policy makers and extension agencies should also intensify efforts at educating the farmers on the importance of root and tuber crops in the cropping systems.

Key words: Root and tuber, cropping system, tobit**,**

Seed transmission of viruses in *Dioscorea* yams

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Abstract

Experiments were conducted to assess transmission of viruses through true seed of *Dioscorea* yams. Seedlings from the F1 botanical seeds of yams of 42 populations and the 27 parental lines used for crossing were evaluated for incidence of virus, species and symptom severity. Plants were assessed for *Yam mosaic virus* (YMV), *Cucumber mosaic virus* (CMV) and *Dioscorea alata badna virus* (Badnavirus) by ELISA, PCR and RT-PCR assays. Symptoms on the plants were recorded based on the 1 to 3 severity scoring scale, where 1=no symptoms; 2=mild symptoms and 3=moderate to severe symptoms. Altogether, 532 F1 plants were tested, of which 95% of them tested for one or more viruses. Badnavirus was detected in 93% of the plants, YMV was detected in 24% of the plants and CMV was detected in 3% of the plants. Despite high incidence, only 3% of the plants showed moderate to severe symptoms (score 3); 23% had mild symptoms (score 2) and rest (74%) were asymptomatic. YMV was detected in 24 of 42 populations (57%); CMV was detected only in one population (2.3%). Badnavirus was detected in all the populations (100%). Detection of YMV and CMV in F1 seedling is the first ever report of true seed-transmission of YMV in *D. alata* and *D. rotundata*; and true seed transmission of CMV in *D. rotundata*.

Key words: Seed transmission, viruses, Dioscorea yams

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Cassava Brown Streak Disease: Breeding for Resistance in Mozambique

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Abstract

Cassava (Manihot esculenta Crantz) is the second most important crop in Mozambique and staple food for more than half of the rural population in the country. Northern provinces of Cabo Delgado, Nampula and Zambézia, contribute with more than 80% of the national production and this area is the more affected by cassava brown streak disease (CBSD). CBSD is considered the most important disease in the region and can cause loss of more than 71% of root yield. Breeding for CBSD resistance started with sourcing of breeding population, which was collected within the existing varieties in the country, based on the information sourced from farmers on the local variety performance. Cassava breeding scheme adjusted with farmers' participatory approach since early evaluation stages were followed to obtain the best results in five (5) crop seasons. Trial evaluations were conducted in the station, at farmers' fields and in some areas of the community in general which were mobilized to intervene in order to obtain the expected results. To date ten (10) improved varieties, namely, Comiwanya, Mokualana, Nulane, Varuiaya, Nomtjapela, Eyope, Orera, Calicanana, Okhumelela, N'ziva, were oficially released. Their fresh root yield and dry matter vary from 15 to 31ton/ha and 26 to 40%, respectively. The crop cycle of the new varieties ranges from 9 to 18 months. Commercial cassava seed multiplication is now at the stage of development with different segments of partners as the crop is moving from simply food security to income generation and industrial raw material.

Key words: Cassava, cassava brown streak disease, breeding population, root yield

Cassava as a vehicle for food security and nutritional status enhancement.

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Abstract

Cassava is one of the most important staple food crops grown in tropical Africa. It ranks second only to cereal grains as chief source of energy. The root is poisonous when eaten raw and it has to be fermented before use. Traditionally, cassava roots are processed by various methods into numerous products and utilized in various ways according to local customs and preferences. Various products are derivable from cassava *such as starch, cassava chips, f*ermented and unfermented dried cassava *meal, foo-foo, lafun, s***moked cassava balls ("pupuru") and gari.** Although cassava roots are rich in calories, they are grossly deficient in proteins, fat, and some of the minerals and vitamins. Various efforts have been made in the past to solve the problem of protein-calorie malnutrition, by enrichment with legume proteins. For cassava to maintain its role as a vehicle for poverty alleviation and high nutritional quality enhancement in Africa, there must be adequate production of cassava that will be able to meet the demands of the teeming population, development of improved processing technologies, development of improved products that can meet the changing needs of urban people, fortification of wheat flour with at least 10% cassava flour and availability of better genetically engineered low cyanide content and higher nutritional quality breed.

Key words: Cassava, food security, enrichment, legume protein, nutritional enhancement.

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Characterization of Sweetpotato *Alternaria* Blight Isolates in Uganda

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Abstract.

Alternaria blight disease of sweetpotato affects many cultivars in Uganda. However, little is known about the occurrence, species and race structure of *Alternaria*, yet this information is critical management of the disease. *Alternaria* affected sweetpotato samples were collected from 17 districts of Uganda. The samples were cultured on PDA media in the laboratory. Different species of Alternaria *were* isolated from the media and characterized morphologically. Morphological markers revealed two main species; *A. alternata* and *A. bataticola*. DNA fingerprinting of 50 representative isolates using Internal transcriber spacer1 (ITS1) and Internal transcriber spacer 4 (ITS4) primers confirmed these isolates to be of *Alternaria* species. Pathogenicity and virulence of different isolates of *A. alternata* and *A. bataticola* were investigated under laboratory and screenhouse conditions. Three cultivars; Ebwanateraka (resistant), Magabari (moderately resistant), and NASPOT 1 (susceptible) were used. Within 4-6 days after artificial inoculation, depending on cultivar, the fungus produced characteristic symptoms typical of *Alternaria* blight. Both *A. alternata* and *A. bataticola* isolates were pathogenic; differences in virulence depended on isolate source and conidial concentration. Furthermore, isolates of *A. bataticola* from Kamuli and Ntungamo were highly virulent (compared to those from elsewhere) and caused severe symptoms even on the most resistant cultivar, Ebwanateraka. This suggests a possibility of occurrence of different strains of *A. bataticola* species in Uganda. Isolates of A. a*lternata* spp caused only mild symptoms suggesting that the *species* is less virulent than *A. bataticola.* The existence of different races/strains of *A. bataticola* as revealed by both pathogenicity and molecular markers is a major threat to sweetpotato production.

Key words: *Alternaria bataticola*, *Alternaria alternata*, sweetpotato, ITS and Pathogenicity

In-vitro Plant Propagation and Post- flask Management: As an Effective Tool for Germplasm Introduction and Exchange for Cassava Improvement

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Abstract

More than 250 million Africans rely on the starchy root crop cassava *(Manihot esculenta)* as their staple source of calories. Cassava is vegetatively propagated, the planting materials are also source of spread of major cassava diseases and results from repeated use from season to season. In-vitro techniques can alliviate these problems. In-vitro techniques have been very useful in the transfer of exotic germplasm from latin America to Nigeria. Important advance have been obtained in research institutes for distribution and movement of germplasm especially for vegetatively propagated crops. However, the dissemination of these improved varieties is a huge challenge due to low multiplication in cassava. In-vitro technique is now being explored to disseminate these improved varieties to National Root Crops Research Institute (NRCRI), Umudike. One of the main limitations for a wider use of this technology is the hardening period during which the ex-plants have to be adapted to normal environmental conditions before transplanting to the field for proper evaluation as this cause high death percentages in the plants produced with the in-vitro multiplication system. Tissue culture technique and a proper post- flask management has been adopted as an effective means of germplasm transfer and dissemination of improved varieties in National Root Crops Research Institute (NRCRI), Umudike. We report the results obtained with the use of in-vitro method in germplasm transfer and improvement of cassava at National Root Crops Research Institute (NRCRI), Umudike Nigeria. The paper also described how this can be effectively utilized as a successful tool for germplasm development in crop improvement program.

Keyword: In-vitro propagation, post-flask management, germplasm, exchange, cassava improvement

Contribution of formal financial institutions to cassava processing in Benue State, Nigeria

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Abstract

The study was carried out to assess the contribution of Formal Financial Institutions (FFIs) to income of cassava processors. Multistage sampling technique was used to select 248 cassava processors from 18 communities in the Benue State, North Central, Nigeria. Data on credit sources and uses, processing activities and income were collected using structured questionnaire. The data were analyzed using descriptive and inferential statistics while the impact of the credit was assessed using the before-and-after comparison of processors' income. The results showed that only about a third of the cassava processors had access to credit from FFIs. Nigerian Agricultural Bank (NAB) was found to be the most (83%) preferred FFI by the processors in accessing credit. Commercial and microfinance banks lending to cassava processors represented about 12% and 5% respectively of the total credit received. Majority (70%) of the processors received less than N100, 000 per year; an average of N63,152 which was found to be about 12% of the total amount required. Credit financing from formal financial institutions was found to have significant effect on output of garri, fufu and cassava flour processed. The credit elasticity shows that output of garri, flour and fufu responds positively to FFIs credit support. The credit use structure showed that over 65% of the credit accessed was use to increase the scale of processing through increase in the quantity of raw tubers purchased and processing labour employment.

Key words: Benue State, cassava Processors, contribution, formal financial institutions.

Economic Analysis of Irish Potato production in Plateau State, Nigeria.

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Abstract

This study investigated the economics of irish potato in Bakin Ladin Local Government Area, Plataeu State, Nigeria. The primary data used in the study were obtained with a simple random sampling technique using structured questionnaires administered on 100 Irish potato farmers (respondents). Descriptive statistics, gross margin and regression analysis were used for the analysis of data. The result showed that 90% of the farmers were males, with 45% were between the age range of 41-50 years and 20% with secondary education. The period of sales of Irish potatoes was mostly after harvesting as a result of poor storage facilities. Estimated gross margin was N30, 056.00/ha with an output/input ratio of 1.50 which shows that sweet potato production is profitable in the study area. The regression result shows that labour, fertilizer seeds and agrochemicals were positive and significantly at 1% and 5% respectively related to output (Y). Also, all inputs employed by the farmer contributed positively to the output. It is recommended that Irish potato production should be increased. Efforts should be made by research on product and market development as well as measures to solve the short storage life and perishable nature of Irish-potatoes. Inputs such as fertilizer, agrochemicals should be subsidized in other to reduce the cost of production and increase the productivity.

Key words: Regression analysis, profitability, Irish potato,production.

Chemical and microbiological hazards associated with street-vended roasted yam in some parts of Lagos metropolis, Nigeria.

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Abstract

There is a general perception that street-vended foods are unsafe mainly because of the environment under which they are prepared and consumed. The physical, microbial and chemical potential hazards associated with the production of street-vended roasted yam in some parts of Lagos metropolis were identified. Samples were aseptically procured from eight vendors and the physical, microbial and chemical hazards were determined using standard laboratory procedures. A laboratory-prepared sample was used as a reference. Data obtained were subjected to statistical analysis by using Analysis of Variance of and means separated using DMRT at 5% level of significance. Physical hazard analyses showed that the street-vended samples were contaminated with mineral matters. With respect to chemical hazards, 0.016±0.003, 0.017±0.003, 0.387±0.003 and 0.034±002 mg/kg were determined for Ni, Cd, As and Lead, respectively with these values exceeding the permissible limits recommended by PTWI. A higher value of acrylamide (15.84±0.000 mg/kg) was obtained. The values of total aerobic microorganism plate, *fungi*, *Staphylococcal*, *E. coli*, *Salmonella* and *Shigella* counts ranged from 1.00×10^2 to9.85×10^4 cfu/g. Contaminations were generally characterized as hazards D, E and F; and grouped specifically with respect to risk under category III of the standard HACCP procedures. Roasting is the main unit operation identified as the critical control point to prevent these hazards in vended roasted yam. It was established in this study that chemical and microbiological hazards of street-vended roasted yam samples were at significant levels that could have health implications on the regular consumers.

Key words: Chemical, microbiological hazards, street-vended roasted yam, Lagos metropolis

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Quality traits of starches and total carotenoids retention from bio-fortified yellow Cassava (*Manihot esculenta* Crantz) roots

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ABSTRACT

Starches from fresh roots of six yellow cassava varieties namely 07/0576, 07/0824, 05/0024, 05/1814, 07/0099 and 07/0758 with different carotenoids contents were analysed for moisture/dry matter, starch, ash, amylose/amylopectin contents and the roots analysed for peel loss and peel thickness using TMS 30572 and TME 419 as controls. Moisture of the starches ranged from 5.54 to 8.48%, dry matter: 21.50 to 38.78%, starch: 5.77 to 30.43%, ash: 0.10 to 4.80%, amylose: 15.58 to 15.24%, amylopectin: 80.76 to 84.43%, peel loss: 18.70 to 30.47% and peel thickness: 1.92 to 3.5mm. The total carotenoids contents of the starches ranged from 2.56 to 10.92µg/g and the levels of this parameter in the processing effluent, dried starch and dried chaff ranged from 0.43 to 1.20µg/g, 0.51 to 0.99µg/g and 0.58 to 1.91µg/g, respectively. Some functional properties of the starches were determined; bulk density ranged from 0.55 to 0.79g/ml, water absorbed capacity: 1.40 to 1.55g/ml and oil absorption capacity: 0.85 to 1.75g/ml, respectively. The gelatinization temperatures of the starches ranged from 52.50 to 60.50°C. Starches from the six cassava varieties had functional properties which compared favorably with those of the controls. The amylose content of 07/0095 was comparatively low and this reflected in the low starch yield. Retention of carotenoids was higher in the chaff than the starch samples. The low carotenoids levels in the starches could be attributed to the extraction process which leads to leaching and the effect of drying using solar heat.To enhance the level of total carotenoids in foods prepared with starch from yellow cassava roots, the chaff may be incorporated, the chaff being a good source of fiber also.

Key words: Yellow cassava, starch, carotene, biochemical, functional properties

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Assessment of the utilization of improved health and sanitation practices by rural-based cassava processors in Ogun State, Nigeria

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Abstract

The study assessed the utilization of selected Improved Health and Sanitation Practices (IHSPs) by rural-based cassava processors in some locations in Ogun State, Nigeria. A multi-stage sampling technique was adopted in the selection of 240 processors from the Root and Tuber expansion locations in the four ones of Ogun State Agricultural Development Programme (OGADEP). Primary data were obtained through the use of structured interview guide which were analyzed using frequency counts, percentages, chi-square and t-test analysis. Findings revealed that the mean age of the processors was 44 years, 69.5% were females, 91.1% were married and 32.0% had no formal education. Results also revealed that 87.9% of the respondents always utilize the specialized ventilated processing centre while 79.2% have not used a nose-mask or protective eye-glass. Respondents were of the perception that using IHSPs improved the quality of their produce (

Training to validation population relatedness affects genomic prediction accuracy: a cassava case study

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Abstract

Prior to implementation of genomic selection, an evaluation of the potential accuracy of prediction can be obtained by cross validation. In this procedure, a population with both phenotypes and genotypes is split into training and validation sets. The prediction model is fitted using the training set, and its accuracy is calculated on the validation set. The degree of genetic relatedness between the training and validation sets, however, may strongly influence the expected accuracy. We developed a method to assess the importance of this effect and tested it in cassava. We used historical phenotypic data available from the International Institute of Tropical Agriculture Genetic Gain trial. DNA from clones in this trial was extracted and SNPs scored using genotyping by sequencing. A cross validation sampling scheme that prevented the training and validation sets from sharing close relatives was compared to one that forced this condition. Over 19 traits encompassing important agronomic, disease resistance, and morphological traits, plot basis heritabilities ranged from 0.04 to 0.66 and the correlation between predicted and observed phenotypes ranged from 0.15 to 0.47. Across traits, including close relatives in the training population increased accuracy between 0.00 and 0.07, a small but consistent effect over traits. We conclude that genomic selection has potential to accelerate gains in cassava and the existing training population should give a reasonable estimate of future prediction accuracies.

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Overview of root and tuber crops diversity using molecular genetic tools at CSIR- Crops Research Institute

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Abstract

Root and tuber crops are important staples in Ghana and across the Sub-Saharan African region. The Council for Scientific and Industrial Research–Crops Research Institute (CSIR-CRI), is mandated to work on all food crops and this paper focuses on diversity studies carried out on the major starchy staples, yam, cassava, cocoyam and sweetpotato, using molecular genetics tools. Twenty-five Single Sequence Repeat (SSR) markers were used to screen 115 and 284 accessions of sweetpotato and yam respectively. Thirty-six markers were used to evaluate 329 cassava accessions, whereas forty-one Random Amplified Polymorphic DNA (RAPDs) molecular markers were used to screen 50 cocoyam accessions. The study revealed duplicates in the various collections and also generated genetic clusters vital for fingerprinting and breeding activities in the CSIR-CRI.

Keywords: Single Sequence Repeat (SSR), Random Amplified Polymorphic DNA, molecular, marker.

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Physiochemical and pasting properties of starch extracted from improved varieties and landraces of yams (*D. rotundata* and *D. alata*)

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Abstract

Yam is a staple crop in many parts of Africa and Southeast Asia and second to cassava as the most important tropical root crop. Because of the importance of quality of the raw material and its impact in product development and quality, we conducted a study to characterize the physicochemical and pasting properties of starch from improved varieties and landraces of yams (*D. rotundata* and *D. alata*) grown in Nigeria. Five varieties each of *D. rotundata* and *D. alata* were obtained from the Yam Breeding Program. Starch was extracted from each of the varieties and evaluated for ash, water binding capacity, amylose, swelling power and solubility, pasting properties, color and granule morphology using standard laboratory methods. Results obtained indicate that the *Agbanwobe* variety had the highest water binding capacity (81%); lowest amylose content (17%) and swelling power among the landraces of *D.rotundata* varieties. Water binding capacity ranged from 54.2 to 84.2% and this was significant at $P \leq 0.05$. The water binding capacity of starches extracted from improved varieties of *D. alata* ranged from 66.3 to 87.4% and was higher compared to the landraces. TDa291 and TDr 06-3 had higher amylose content 31.1% and 32.1% respectively. The solubility index value of *D. alata* ranged from 0.8 to 1.5% and *D. rotundata* from 1.1 to 6.7%. Significant differences ($P \leq 0.05$) were observed for pasting properties for the investigated varieties. TDa95-310 had the highest peak viscosity value (738RVU). **The L* values of the yam varieties ranged from 74.1 to 87.6.** The *D. rotundata* starch granules are large (33.25-45.00µm) except for TDa00/00194 which was 22.8µm. In conclusion, significant differences were observed among the studied parameters for both *D. rotundata* and *D. alata* and among the improved varieties and landraces and these differences may have impact on the final processing characteristics and product quality.

Keywords: Physiochemical, pasting properties, starch, improved varieties, landraces of yam