Komoditas : Singkong
Tahun 2004-2008 (213 judul)

Eliangela de M. Teixeira, Daniel Pasquini, Antonio A.S. Curvelo, Elisangela Corradini, Mohamed N. Belgacem, Alain Dufresne, Cassava bagasse cellulose nanofibrils reinforced thermoplastic cassava starch, Carbohydrate Polymers, Volume 78, Issue 3, 15 October 2009, Pages 422-431, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2009.04.034.
(http://www.sciencedirect.com/science/article/B6TFD-4W8VW38-4/2/fa888423deb861f5b648402a49e203c8)
Abstract:
Cellulose cassava bagasse nanofibrils (CBN) were directly extracted from a by-product of the cassava starch (CS) industry, viz. the cassava bagasse (CB). The morphological structure of the ensuing nanoparticles was investigated by scanning electron microscopy (SEM), transmission electron microscopy (TEM), atomic force microscopy (AFM), presence of other components such as sugars by high performance liquid chromatography (HPLC), thermogravimetric analysis (TGA), and X-ray diffraction (XRD) experiments. The resulting nanofibrils display a relatively low crystallinity and were found to be around 2-11 nm thick and 360-1700 nm long. These nanofibrils were used as reinforcing nanoparticles in a thermoplastic cassava starch matrix plasticized using either glycerol or a mixture of glycerol/sorbitol (1:1) as plasticizer. Nanocomposite films were prepared by a melting process. The reinforcing effect of the filler evaluated by dynamical mechanical tests (DMA) and tensile tests was found to depend on the nature of the plasticizer employed. Thus, for the glycerol-plasticized matrix-based composites, it was limited especially due to additional plasticization by sugars originating from starch hydrolysis during the acid extraction. This effect was evidenced by the reduction of glass vitreous temperature of starch after the incorporation of nanofibrils in TPSG and by the increase of elongation at break in tensile test. On the other hand, for glycerol/sorbitol plasticized nanocomposites the transcrystallization of amylopectin in nanofibrils surface hindered good performances of CBN as reinforcing agent for thermoplastic cassava starch. The incorporation of cassava bagasse cellulose nanofibrils in the thermoplastic starch matrices has resulted in a decrease of its hydrophilic character especially for glycerol plasticized sample.
Keywords: Cassava bagasse; Thermoplastic starch; Cellulose nanofibrils; Nanocomposites

Calvin Onyango, Gunter Unbehend, Meinolf G. Lindhauer, Effect of cellulose-derivatives and emulsifiers on creep-recovery and crumb properties of gluten-free bread prepared from sorghum and gelatinised cassava starch, Food Research International, Volume 42, Issue 8, October 2009, Pages 949-955, ISSN 0963-9969, DOI: 10.1016/j.foodres.2009.04.011.
(http://www.sciencedirect.com/science/article/B6T6V-4W741X6-2/2/5d8e7c279d90f959c9f0b882ac9cfb92)
Abstract:
The effect of cellulose-derivatives and emulsifiers on the creep-recovery behaviour of gluten-free dough prepared from gelatinised cassava starch and sorghum was studied. Cellulose treated doughs, except the treatment with 2.4% w/w fwb CMC, had lower resistances to deformation (range 10-33%) than emulsifier-treated doughs (range 3-13%). The higher elastic recovery of emulsifier-treated doughs corresponded to lower compliances and higher zero shear viscosities than for doughs treated with cellulose-derivatives. Addition of egg white powder (6.7% w/w fwb) eliminated several textural defects associated with gluten-free bread. Cellulose-derivatives did not decrease crumb firmness or staling rate when compared to the control. Though increasing emulsifier concentration (from 0.4% to 2.4% w/w fwb) decreased crumb firmness, crumbs treated with 2.4% w/w fwb emulsifiers, except diacetyl tartaric acid esters of mono- and diglycerides, were

weak and difficult to handle after slicing. Nevertheless, all gluten-free breads treated with 2.4% w/w fwb emulsifiers staled at a slower rate than the control.
Keywords: Cassava; Cellulose-derivatives; Creep-recovery; Emulsifiers; Gluten-free bread; Sorghum

Nancy L. Garcia, Lucia Fama, Alain Dufresne, Mirta Aranguren, Silvia Goyanes, A comparison between the physico-chemical properties of tuber and cereal starches, Food Research International, Volume 42, Issue 8, October 2009, Pages 976-982, ISSN 0963-9969, DOI: 10.1016/j.foodres.2009.05.004.
(http://www.sciencedirect.com/science/article/B6T6V-4WBC1N7-1/2/4bbb9903cec46ce4354ca3acca833ea6)
Abstract:
Biofilms based on waxy maize and cassava starches (cereal and tuber starch, respectively), plasticized with glycerol were characterized through their crystallinity, dynamic-mechanical behavior (DMA), thermal degradation (TGA), moisture content and water vapor permeability (WVP). X-ray diffraction experiments show that both materials were mainly amorphous, with the waxy starch presenting a discreetly A-type X-ray pattern. Microscopic investigation of the cryo-fractured surfaces supported this observation. The glass transition of the glycerol-rich phase (measured by DMA) occurs at higher temperatures for cassava than for waxy maize starch, suggesting that the dispersion level of glycerol is higher in the former. TGA showed that maize starch has a slightly higher thermal stability than cassava starch, while glycerol interacts more strongly with the last one. The WVP was 18% higher in the case of the cassava starch film.
Keywords: Biofilms; Starch; Mechanical properties; TGA; X-ray; FTIR; SEM

Regy Johnson, G. Padmaja, S.N. Moorthy, Comparative production of glucose and high fructose syrup from cassava and sweet potato roots by direct conversion techniques, Innovative Food Science & Emerging Technologies, Volume 10, Issue 4, October 2009, Pages 616-620, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.04.001.
(http://www.sciencedirect.com/science/article/B6W6D-4W1BV85-2/2/bc54690e22c482658ed1e08be7b4ac84)
Abstract:
High fructose syrup (HFS) is a highly valued liquid sweetener for beverage, confectionery and processed food industry, owing to its special attributes like high solubility and non-crystalline nature. Even though 85% HFS production is from corn, increased food demand has necessitated the search for alternative substrates and starchy root crops like cassava and sweet potato are potential raw materials. However, the economic production needs direct use of the roots and simplification of the cost-intensive steps. This study aims at the direct enzymatic conversion of roots for HFS production. Glucose yield was compared from six treatment systems viz., liquezyme-dextrozyme (T1), Stargen (T2), Stargen in two split doses (T3), Spezyme-Stargen (T4), Stargen (60 [degree sign]C;T5) and Spezyme-Stargen (60 [degree sign]C; T6). Glucose was higher (22-25%) from cassava than sweet potato (14.0-15.7%), owing to the high starch content in cassava. Conversion to glucose was higher in T1-T4 (95-98%) compared to 88-92% for T5 and T6. Although the fructose yield was more from cassava (8.36-9.78%) than sweet potato (5.2-6.0%), percentage conversion was similar (37-38%) for both the roots. The cost of production of HFS could be reduced by the direct hydrolysis of root slurry using Stargen.Industrial relevance
The conventional process for HFS production involved three cost-intensive enzyme steps such as liquefaction, saccharification and isomerization and the major raw material is starch. Economic production using cheaper raw materials and simplification of the process are the decisive factors for the widespread use of HFS in the developing and less developed countries. The present study aimed at the direct conversion of cassava and sweet potato root slurry (without conversion to starch) through the use of improved enzymes like Spezyme and Stargen and mild operating

conditions of pH and temperature. The cost of production of HFS could be reduced by using the wet root slurry and performing the Stargen aided saccharification at room temperature, followed by isomerization at 60 [degree sign]C using Sweetzyme T.
Keywords: Glucose; High fructose syrup; Cassava; Sweet potato; Direct root hydrolysis

Daniela De Grandi Castro Freitas, Shirley Aparecida Garcia Berbari, Patricia Prati, Farayde Matta Fakhouri, Fernanda Paula Collares Queiroz, Eduardo Vicente, Reducing fat uptake in cassava product during deep-fat frying, Journal of Food Engineering, Volume 94, Issues 3-4, October 2009, Pages 390-394, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2009.04.005.
(http://www.sciencedirect.com/science/article/B6T8J-4W32KG7-2/2/72221006bd7264ded74ec5501f5fbda0)
Abstract:
The present study aimed at investigating the influence of the use of edible coatings from three different hydrocolloids during the deep-frying of a pre-fried, frozen product preformed from cassava. Three hydrocolloids (pectin, whey protein and soy protein isolate) were used as coatings in the deep-fat frying of preformed products made from cassava flour and from cassava puree. The water vapor permeability, water solubility and film thickness were measured. The cassava products were characterized with respect to their moisture and lipid contents. The water vapor permeability, water solubility and film thickness were directly proportional to the concentration of the films. Whey protein showed the best results with respect to fat absorption, presenting a reduction of 27% for the cassava puree product. The coating treatments were not efficient for the fingers preformed from cassava flour, indicating that different products can show different responses with the same type of coating material.
Keywords: Edible coatings; Deep-fat frying; Fat reduction; Cassava

Guillaume Leotard, Anne Duputie, Finn Kjellberg, Emmanuel J.P. Douzery, Chantal Debain, Jean-Jacques de Granville, Doyle McKey, Phylogeography and the origin of cassava: New insights from the northern rim of the Amazonian basin, Molecular Phylogenetics and Evolution, Volume 53, Issue 1, October 2009, Pages 329-334, ISSN 1055-7903, DOI: 10.1016/j.ympev.2009.05.003.
(http://www.sciencedirect.com/science/article/B6WNH-4W85MCD-5/2/b00f8c489f0382302b981aafa58afa71)
Keywords: Domestication; G3pdh; Guianas; Hybridization; Introgression

C.C. Opara, Soil microaggregates stability under different land use types in southeastern Nigeria, CATENA, In Press, Corrected Proof, Available online 13 August 2009, ISSN 0341-8162, DOI: 10.1016/j.catena.2009.06.001.
(http://www.sciencedirect.com/science/article/B6VCG-4X0F6R9-1/2/dca0c27811dc50df6eed2abf811200f5)
Abstract:
Low water stability of soil microaggregates accentuated by increased intensity of cultivation, high soil erodibility and climatic erosivity has become a major cause of increased water erosion process on agricultural lands in Imo State, southeastern Nigeria. Consequently; it has remained one of the most serious soil physical constraints to increased and sustained high level crop production in the area. Thus, this study was conducted in 2006 to quantify the effects of different land use types (LUTs) on the water stability of their various soil microaggregates in the area. Six LUTs [natural forest (NF); oil palm plantation (OPP); plantain plantation (PP); rubber plantation (RP); bush fallow (BF) and continuous cassava cropping (CCC)] were chosen for the study. Under each LUT, traverses were cut at equal intervals to obtain three plots per LUT that served as replications. From each plot, bulk samples were collected from 15 sampling points at 0-20 cm soil depth for determination of aggregate stability and other soil properties. The soil microaggregate stability was measured by clay dispersion ratio (CDR) and aggregated silt and clay, ASC (%) indices. Results

showed that the CDR obtained from soil under NF LUT was significantly (P <= 0.05) lower (implying higher microaggregate stability) than what were obtained from other LUT soils. Conversely, the CDR of soils under CCC was significantly higher (indicating lower microaggregate stability) than what were obtained under other LUT soils. The relative increase (%) in CDR or decrease in microaggregate stability over the control (NF soil) were 16.67, 54.76, 57.14 and 78.57 for soils under OP, PP, RP, BF and CCC LUTs respectively. Similarly, the ASC (%) under NF soil was significantly (P <= 0.05) higher (indicating higher microaggregate stability) than those of other LUT soils. Contrarily, the ASC (%) of CCC, soil was significantly lower (lower microaggregate stability) than other LUT soils. The relative reduction (%) in ASC or microaggregate stability of the soils over the control (NF soil) stood at 25.37, 44.03, 44.03, 44.03 and 62.69 for soils under OPP, PP, RP, BF and CCC LUTs respectively.
Correlation of each of the microaggregate stability indices (CDR and ASC) with some soil properties suggested that organic matter (OM), calcium (Ca2+) and magnesium (Mg2+) might be the most important variables related to each of the indices. By running multiple regression analysis, using linear, exponential, semi logarithmic and double logarithmic functional forms, whereas the semi logarithmic form was indicated as the best fit equation relating CDR to clay, OM and Ca; the linear form was the best fit model relating ASC to clay, OM and Ca. Thus, they could be used for prediction purposes.
Keywords: Land use type; Microaggregate stability; Clay dispersion ratio; Aggregated silt and clay; Ultisol; Degradation management

Lee Tin Sin, W.A.W.A. Rahman, A.R. Rahmat, M.I. Khan, Detection of synergistic interactions of polyvinyl alcohol-cassava starch blends through DSC, Carbohydrate Polymers, In Press, Corrected Proof, Available online 9 August 2009, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2009.08.003.
(http://www.sciencedirect.com/science/article/B6TFD-4WYJSMW-1/2/aabb9e72759a35c1c340feba255f8a88)
Abstract:
The synergistic interaction of polyvinyl alcohol (PVOH) and cassava starch was studied by differential scanning calorimetry (DSC) method. Film of the PVOH-cassava starch blends were prepared by solution cast method. Originally, cassava starch film did not show presence of any endothermic peaks in DSC thermogram. However, after adding PVOH to cassava starch, the PVOH-cassava starch blend films showed obvious endothermic peaks with onset and end-point temperatures higher than neat PVOH film. In addition, the PVOH-cassava starch blends have experimental enthalpy of melting higher than theoretical values. This evidence shows that the interactions between PVOH and cassava starch molecules are extensively strong. Due to the synergistic interactions of PVOH and cassava starch, it is postulated that incorporation of 65-75 wt.% of PVOH in cassava starch blend has physical bonding equivalent to neat PVOH.
Keywords: Polyvinyl alcohol; Cassava starch; Thermal properties; DSC; Synergistic interactions

Lewis H. Ziska, G. Brett Runion, Martha Tomecek, Stephen A. Prior, H. Allen Torbet, Richard Sicher, An evaluation of cassava, sweet potato and field corn as potential carbohydrate sources for bioethanol production in Alabama and Maryland, Biomass and Bioenergy, In Press, Corrected Proof, Available online 6 August 2009, ISSN 0961-9534, DOI: 10.1016/j.biombioe.2009.07.014.
(http://www.sciencedirect.com/science/article/B6V22-4WXXV59-1/2/389ce351c88050e213c6bdfbf904aee7)
Abstract:
The recent emphasis on corn production to meet the increasing demand for bioethanol has resulted in trepidation regarding the sustainability of the global food supply. To assess the potential of alternative crops as sources of bioethanol production, we grew sweet potato (Ipomoea batatas) and cassava (Manihot esculentum) at locations near Auburn, Alabama and Beltsville,

Maryland in order to measure root carbohydrate (starch, sucrose, glucose) and root biomass. Averaged for both locations, sweet potato yielded the highest concentration of root carbohydrate (ca 80%), primarily in the form of starch (ca 50%) and sucrose (ca 30%); whereas cassava had root carbohydrate concentrations of (ca 55%), almost entirely as starch. For sweet potato, overall carbohydrate production was 9.4 and 12.7 Mg ha-1 for the Alabama and Maryland sites, respectively. For cassava, carbohydrate production in Maryland was poor, yielding only 2.9 Mg ha-1. However, in Alabama, carbohydrate production from cassava averaged ~10 Mg ha-1. Relative to carbohydrate production from corn in each location, sweet potato and cassava yielded approximately 1.5x and 1.6x as much carbohydrate as corn in Alabama; 2.3x and 0.5x for the Maryland site. If economical harvesting and processing techniques could be developed, these data suggest that sweet potato in Maryland, and sweet potato and cassava in Alabama, have greater potential as ethanol sources than existing corn systems, and as such, could be used to replace or offset corn as a source of biofuels.
Keywords: Biofuels; Carbohydrate; Cassava (Manihot esculenta); Corn (Zea mays); Ethanol potential; Sweet potato (Ipomoea batatas); Yield

Asgar Farahnaky, Imad A. Farhat, John R. Mitchell, Sandra E. Hill, The effect of sodium chloride on the glass transition of potato and cassava starches at low moisture contents, Food Hydrocolloids, Volume 23, Issue 6, 9th International Hydrocolloids Conference, August 2009, Pages 1483-1487, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2008.08.007.
(http://www.sciencedirect.com/science/article/B6VP9-4T84K5M-2/2/5700a60a3b46184f0cf9acd8e4a9a755)
Abstract:
The effect of NaCl on the glass transition of cassava and potato starches at low water levels (<20% dwb) was investigated. Sodium chloride (up to 6% of the starch dry weight) was mixed thoroughly with cassava and potato starches using a twin-screw extruder. The samples were equilibrated over saturated salt solutions (LiCl, CH3COOK, MgCl2, NaBr, CuCl2 and NaCl) to give a range of moisture contents. The addition of sodium chloride caused a considerable reduction in the DSC measured glass transition temperature for both starches. For example, the Tg of cassava starch without and with 6% NaCl equilibrated at relative humidity of 11% was 166 and 136 [degree sign]C, respectively. Similar reductions were found for potato starch. Although the starch sorption isotherms are affected by the addition of salt when Tg is plotted against water content as opposed to relative humidity a Tg reduction on salt addition is still observed. The possible reasons for the plasticization of starch by salt are discussed.
Keywords: Sodium chloride; Potato starch; Cassava starch; Glass transition temperature; Sorption isotherm

Albert Linton Charles, Tzou-Chi Huang, Sweet cassava polysaccharide extracts protects against CCl4 liver injury in Wistar rats, Food Hydrocolloids, Volume 23, Issue 6, 9th International Hydrocolloids Conference, August 2009, Pages 1494-1500, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2008.08.011.
(http://www.sciencedirect.com/science/article/B6VP9-4T9CCYH-2/2/5e428b8649d305f35f749eee3ae76917)
Abstract:
The expression levels of phase I (CYP1A1 and CYP1A2) and phase II (GST and UGT) enzyme-coded genes were measured in liver microsomes of 50 Wistar rats fed sweet cassava polysaccharides (SCP), an arabinogalactan type root mucilage. Quantitative and qualitative analyses of the detoxifying enzymes were investigated using reverse transcription polymerase reaction (RT-PCR) and real-time polymerase reaction (Real-time PCR) techniques. The antioxidant properties of the SCP were investigated in vitro and screened and investigated for its hepatoprotective activity in rat. There was significant induction of GSTYa1 and inhibition of

CYP1A2. Moreover, an SCP diet was found to significantly increase UGT1A6 mRNA levels and to decrease CYP1A1 mRNA levels in chemically-injured rat liver. SCP ethanol extracts exhibited hydroxyl radical and superoxide scavenging activities in a dose-dependent manner. In vitro and intracellular antioxidative enzyme activity assays demonstrated and confirmed the potential of cassava root extracts as a natural source of mucopolysaccharide substances with potential use in chemoprevention medicine.
Keywords: Manihot esculenta; Polysaccharide; Antioxidative activities; Detoxifying enzymes

Paul A. Dorosh, Simon Dradri, Steven Haggblade, Regional trade, government policy and food security: Recent evidence from Zambia, Food Policy, Volume 34, Issue 4, August 2009, Pages 350-366, ISSN 0306-9192, DOI: 10.1016/j.foodpol.2009.02.001.
(http://www.sciencedirect.com/science/article/B6VCB-4W0R3JN-1/2/282134b13a3d13c7abb74e6b751cc8a7)
Abstract:
Given heavy dependence on rainfed maize production, countries in East and Southern Africa must routinely cope with pronounced production and consumption volatility in their primary food staple. Typical policy responses include increased food aid flows, government commercial imports and stock releases, and tight controls on private sector trade. This paper examines recent evidence from Zambia, using a simple economic model to assess the likely impact of maize production shocks on the domestic maize price and on staple food consumption under alternative policy regimes. In addition to an array of public policy instruments, the analysis evaluates the impact of two key private sector responses in moderating food consumption volatility - private cross-border maize trade and consumer substitution of an alternate food staple (cassava) for maize. The analysis suggests that, given a favorable policy environment, private imports and increased cassava consumption together could fill roughly two-thirds of the maize consumption shortfall facing vulnerable households during drought years.
Keywords: Trade policy; Sub-Saharan Africa; Food aid; Food security

Segla Wilfrid Padonou, Dennis S. Nielsen, Joseph D. Hounhouigan, Line Thorsen, Mathurin C. Nago, Mogens Jakobsen, The microbiota of Lafun, an African traditional cassava food product, International Journal of Food Microbiology, Volume 133, Issues 1-2, 31 July 2009, Pages 22-30, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2009.04.019.
(http://www.sciencedirect.com/science/article/B6T7K-4W4TXTB-2/2/dc1529eba23ee207e9b7330d76a484ab)
Abstract:
Lafun is a fermented cassava food product consumed in parts of West Africa. In the present work the microorganisms (aerobic bacteria (AB), lactic acid bacteria (LAB) and yeasts) associated with the fermentation of Lafun under traditional conditions have for the first time been studied using a combination of pheno- and genotypic methods. During Lafun fermentation the AB count ranged from 6-7 log10 CFU/g at the beginning to 9 log10 CFU/g at the end. Similarly, the number of LAB increased from 5 log10 CFU/g to 9 log10 CFU/g during the process while the yeast load increased from 3 log10 CFU/g at the onset of the fermentation to 5-6 log10 CFU/g at the end of the fermentation. A total of 168 isolates (31 AB, 88 LAB, and 49 yeasts) were isolated and identified by means of phenotypic tests, PCR-based methods and 16S rRNA gene sequencing. The aerobic bacteria were mostly identified as belonging to the Bacillus cereus group (71%). The B. cereus isolates lacked the genetic determinant specific for cereulide producers but harboured several genes encoding the heat-labile toxins hemolysin BL and nonhemolytic enterotoxin as detected by PCR. The other aerobic bacteria isolated were Gram negative and identified as Klebsiella pneumoniae and Pantoea agglomerans. The dominant LAB were identified as Lactobacillus fermentum (42% of LAB isolates) followed by Lactobacillus plantarum (30%) and Weissella confusa (18%). Seven isolates remained unidentified and constitute probably a novel LAB species.

The predominant yeast species associated with Lafun fermentation were Saccharomyces cerevisiae (22% of yeast isolates), Pichia scutulata (20%), Kluyveromyces marxianus (18%), Hanseniaspora guilliermondii (12%), Pichia rhodanensis (8%) and Candida glabrata (8%) as well as Pichia kudriavzevii, Candida tropicalis and Trichosporon asahii at lower incidence (< 5% each).
Keywords: Cassava; Fermentation; Lafun; Lactic acid bacteria; Bacillus; Yeast

Guang-yue Ren, Dong Li, Li-jun Wang, Necati Ozkan, Zhi-huai Mao, Morphological properties and thermoanalysis of micronized cassava starch, Carbohydrate Polymers, In Press, Corrected Proof, Available online 24 July 2009, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2009.07.031.
(http://www.sciencedirect.com/science/article/B6TFD-4WV77WX-4/2/e729c4dd9c30d4534e71f2df802a7ecb)
Abstract:
The granule morphology, microstructure, and thermal properties of micronized cassava starch prepared by a vacuum ball-grinding machine were investigated. Scanning electron microscopy (SEM) analysis indicated that the morphology of starch granule changes during the ball-grinding treatment. Differential scanning calorimetry (DSC) analysis indicated that the maximum peak temperature (Tp) of the gelatinization process, the glass transition (Tg), and peak height index (PHI) for the starch granules decreased when the size of micronized starch granules was reduced. When the size of starch granules was reduced beyond 9.11 [mu]m, they have a tendency to agglomerate and their [Delta]H were increased. The granule size has a significant effect on the gelatinization properties of cassava starch. This study will provide useful information of the micronized starch for its potential industrial application.
Keywords: Ball-grinding treatment; Micronization; Cassava starch; Thermoanalysis; DSC; SEM

Stefan Siebert, Petra Doll, Quantifying blue and green virtual water contents in global crop production as well as potential production losses without irrigation, Journal of Hydrology, In Press, Corrected Proof, Available online 11 July 2009, ISSN 0022-1694, DOI: 10.1016/j.jhydrol.2009.07.031.
(http://www.sciencedirect.com/science/article/B6V6C-4WRD3RW-G/2/492b43a91debc4600734249a19691549)
Abstract: Summary
Crop production requires large amounts of green and blue water. We developed the new global crop water model GCWM to compute consumptive water use (evapotranspiration) and virtual water content (evapotranspiration per harvested biomass) of crops at a spatial resolution of 5' by 5', distinguishing 26 crop classes, and blue versus green water. GCWM is based on the global land use data set MIRCA2000 that provides monthly growing areas for 26 crop classes under rainfed and irrigated conditions for the period 1998-2002 and represents multi-cropping. By computing daily soil water balances, GCWM determines evapotranspiration of blue and green water for each crop and grid cell. Cell-specific crop production under both rainfed and irrigated conditions is computed by downscaling average crop yields reported for 402 national and sub-national statistical units, relating rainfed and irrigated crop yields reported in census statistics to simulated ratios of actual to potential crop evapotranspiration for rainfed crops. By restricting water use of irrigated crops to green water only, the potential production loss without any irrigation was computed. For the period 1998-2002, the global value of total crop water use was 6685 km3 yr-1, of which blue water use was 1180 km3 yr-1, green water use of irrigated crops was 919 km3 yr-1 and green water use of rainfed crops was 4586 km3 yr-1. Total crop water use was largest for rice (941 km3 yr-1), wheat (858 km3 yr-1) and maize (722 km3 yr-1). The largest amounts of blue water were used for rice (307 km3 yr-1) and wheat (208 km3 yr-1). Blue water use as percentage of total crop water use was highest for date palms (85%), cotton (39%), citrus fruits (33%), rice (33%) and sugar beets (32%), while for cassava, oil palm and cocoa, almost no blue water was used. Average crop yield of irrigated cereals was 442 Mg km-2 while average yield of rainfed

cereals was only 266 Mg km-2. Average virtual water content of cereal crops was 1109 m3 Mg-1 of green water and 291 m3 Mg-1 of blue water, while average crop water productivity of cereal crops was 714 g m-3. If currently irrigated crops were not irrigated, global production of dates, rice, cotton, citrus and sugar cane would decrease by 60%, 39%, 38%, 32% and 31%, respectively. Forty-three per cent of cereal production was on irrigated land, and without irrigation, cereal production on irrigated land would decrease by 47%, corresponding to a 20% loss of total cereal production. The largest cereal production losses would occur in Northern Africa (66%) and Southern Asia (45%) while losses would be very low for Northern Europe (0.001%), Western Europe (1.2%), Eastern Europe (1.5%) and Middle Africa (1.6%). Uncertainties and limitations are discussed in the manuscript, and a comparison of GCWM results to statistics or results of other studies shows good agreement at the regional scale, but larger differences for specific countries.
Keywords: Crop water requirement; Global crop water model; Virtual water content; Irrigation water use; Crop production; Crop yield

Wenming Zong, Ruisong Yu, Peng Zhang, Meizhen Fan, Zhihua Zhou, Efficient hydrogen gas production from cassava and food waste by a two-step process of dark fermentation and photo-fermentation, Biomass and Bioenergy, In Press, Corrected Proof, Available online 8 July 2009, ISSN 0961-9534, DOI: 10.1016/j.biombioe.2009.06.008.
(http://www.sciencedirect.com/science/article/B6V22-4WPS9GT-3/2/2c65903c042ee1123863e3fba4fea459)
Abstract:
A two-step process of sequential anaerobic (dark) and photo-heterotrophic fermentation was employed to produce hydrogen from cassava and food waste. In dark fermentation, the average yield of hydrogen was approximately 199 ml H2 g-1 cassava and 220 ml H2 g-1 food waste. In subsequent photo-fermentation, the average yield of hydrogen from the effluent of dark fermentation was approximately 611 ml H2 g-1 cassava and 451 ml H2 g-1 food waste. The total hydrogen yield in the two-step process was estimated as 810 ml H2 g-1 cassava and 671 ml H2 g-1 food waste. Meanwhile, the COD decreased greatly with a removal efficiency of 84.3% in cassava batch and 80.2% in food waste batch. These results demonstrate that cassava and food waste could be ideal substrates for bio-hydrogen production. And a two-step process combining dark fermentation and photo-fermentation was highly improving both bio-hydrogen production and removal of substrates and fatty acids.
Keywords: Bio-hydrogen production; Biomass; Manihot esculenta Crantz; Food waste; Anaerobic consortia; Rhodobacter sphaeroides

Jacques H.C. Delabie, Regis Cereghino, Sarah Groc, Andrea Dejean, Marc Gibernau, Bruno Corbara, Alain Dejean, Ants as biological indicators of Wayana Amerindian land use in French Guiana, Comptes Rendus Biologies, Volume 332, Issue 7, July 2009, Pages 673-684, ISSN 1631-0691, DOI: 10.1016/j.crvi.2009.01.006.
(http://www.sciencedirect.com/science/article/B6X1F-4VR1T8D-3/2/963a11acd7bbd6f1d1decd25255d95ea)
Abstract:
We examined the ecological impact of traditional land use by Wayana Amerindians in French Guiana using ants as bio-indicators. Ants were sampled through a rapid assessment method and the core results analyzed using Kohonen's self-organizing maps (SOM). Our sample sites included: (1) a Wayana village; (2) a cassava plantation; (3) an abandoned cassava plantation; (4) a forest fragment near the village; (5) a riparian forest; and (6) a primary terra firma forest. The ant diversity decreases according to the degree to which the habitat is disturbed. The SOM allowed us to compare the ecological succession between the six habitats. The protocol used is robust since the same conclusions were drawn using partial data. To cite this article: J.H.C. Delabie et al., C. R. Biologies 332 (2009).

Keywords: Landscape ecology; Traditional land use; Formicidae; Rapid assessment; Pit-fall traps; Self-Organizing Maps; Ecologie du paysage; Utilisation traditionnelle de la terre; Formicidae; Echantillonnage rapide; Pieges pifall; Self-Organizing Maps

G. Essono, M. Ayodele, A. Akoa, J. Foko, O. Filtenborg, S. Olembo, Aflatoxin-producing Aspergillus spp. and aflatoxin levels in stored cassava chips as affected by processing practices, Food Control, Volume 20, Issue 7, July 2009, Pages 648-654, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.09.018.
(http://www.sciencedirect.com/science/article/B6T6S-4TMBPRS-7/2/70d52c0899522329b00d9b9d08b96060)
Abstract:
Cassava chips (cassava balls, and cassava pellets) are derived cassava products traditionally produced by farmers in sub-Saharan Africa following fermentation, and drying of fresh roots of cassava, and are widely consumed in Cameroon. Once produced, this food commodity can be stored for more than two months and contaminated by a wide array of harmful microbes. In order to assess persistence of toxigenic fungi in cassava chips, aflatoxin-producing fungi (Aspergillus flavus, Aspergillus nomius, and Aspergillus parasiticus) and aflatoxins were contrasted at regular intervals in home-stored cassava chips collected in two locations of southern Cameroon throughout a two-month monitoring period. Three hundred and forty-six isolates of aflatoxin-producing fungi were found to be associated with all samples. A. flavus contaminated more samples in both types of chips (267 isolates in 53 samples), followed by A. nomius (58 isolates in 15 samples), whereas A. parasiticus was rarest. A direct competitive Enzyme-linked immunosorbent assay (ELISA)-based method was implemented to quantify the content in aflatoxins. Eighteen of the samples contained some aflatoxins at detectable levels whereas 54 did not. The levels of aflatoxin ranged between 5.2 and 14.5 ppb. The distribution of aflatoxin in positive samples depended on 8 parameters including pH, moisture content, storage duration, types of chips, level of contamination by aflatoxin-producing fungi, processing practices and storage facilities. From analysis of variance results, only pH ($p < 0.01$), duration of storage ($p < 0.01$), population of aflatoxin-producing species (0.0001) and the chip type ($p < 0.05$) were significantly related to aflatoxin in positive samples. A stepwise regression analysis (forward selection procedure) indicated that aflatoxin levels were significantly ($p < 0.01$) correlated with processing practices, storage facilities, and storage duration of the chips.
Keywords: ELISA; Aflatoxin-producing fungi; Cassava chips; Cameroon; Storage facilities

Carmen M.O. Muller, Joao Borges Laurindo, Fabio Yamashita, Effect of cellulose fibers addition on the mechanical properties and water vapor barrier of starch-based films, Food Hydrocolloids, Volume 23, Issue 5, July 2009, Pages 1328-1333, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2008.09.002.
(http://www.sciencedirect.com/science/article/B6VP9-4THJGPX-4/2/fc3643644bf12252017a3be16e0f5ba7)
Abstract:
Starch-based films have promising application on food packaging, because of their environmental appeal, low cost, flexibility and transparency. Nevertheless, their mechanical and moisture barrier properties should be improved. The aim of this work was to enhance these properties by reinforcing the films with cellulose fibers. Besides, the influences of both the solubility coefficient of water in the films ([beta]) and the diffusion coefficient of water vapor through the films (Dw) on the films' water vapor permeability (Kw) were investigated. Films were prepared by the so-called casting technique, from film-forming suspensions of cassava starch, cellulose fibers (1.2 mm long and 0.1 mm of diameter), glycerol and water. The influence of fibers addition on Kw was determined at three relative humidity gradient ranges, [Delta]RH (2-33%, 33-64% and 64-90%). Films reinforced with cellulose fibers showed higher tensile strength and lower deformation

capacity, and presented lower Kw than films without fibers. Kw showed strong dependency of [beta] and Dw, presenting values up to 2-3 times greater at [Delta]RH = 64-90% than at [Delta]RH = 33-64%, depending on the film formulation. Therefore, adding cellulose fibers to starch-based films is a viable alternative to improve their mechanical and water barrier properties. Besides, this work showed the importance of determining film's water vapor permeability simulating the real environmental conditions the film will be used.
Keywords: Starch films; Cellulose; Fibers; Mechanical; Water; Permeability

Ninh Thi Len, Tran Bich Ngoc, Brian Ogle, Jan Erik Lindberg, Ileal and total tract digestibility in local (Mong Cai) and exotic (Landrace x Yorkshire) piglets fed low and high-fibre diets, with or without enzyme supplementation, Livestock Science, In Press, Corrected Proof, Available online 30 June 2009, ISSN 1871-1413, DOI: 10.1016/j.livsci.2009.06.002.
(http://www.sciencedirect.com/science/article/B7XNX-4WN1YM9-1/2/f96688bfe946b857761199f645c48e39)
Abstract:
Ileal and total tract digestibility of low and high-fibre diets (100 and 200 g/kg neutral detergent fibre), with or without enzyme supplementation (mixture of cellulase, [beta]-glucanase, [alpha]-amylase and protease) was determined in piglets of two breeds weaned at 30 days of age. The breeds were local (pure-breed Mong Cai, MC) and exotic (Landrace x Yorkshire, LY). The experimental diets were based on maize meal, soybean meal, fish meal, cassava residue meal, and rice bran. Cassava residue meal and rice bran were the main fibrous feeds in the high-fibre diet. The experiment was arranged according to a 2 x 2 x 2 factorial, completely randomized design with 4 replications, and lasted for 30 days. The coefficient of ileal apparent digestibility (CIAD) was measured by analyzing ileal digesta collected from piglets killed at 60 days of age. The coefficient of total tract apparent digestibility (CTTAD) was measured by analyzing faecal samples collected for 5 consecutive days immediately before the experiment finished. The CIAD and CTTAD of organic matter, crude protein, crude fibre, neutral detergent fibre, acid detergent fibre and amino acids in the high-fibre diet were lower than in the low-fibre diet ($P < 0.01$). The CIAD of nutrients and amino acids was similar ($P > 0.05$) between MC and LY, while the CTTAD of nutrients was higher for the MC than for LY ($P < 0.05$). Enzyme supplementation of the high-fibre diet improved daily gain and the digestibility of all dietary components at the ileum and in the total tract ($P < 0.05$), but there was no effect of enzyme supplementation of the low-fibre diet ($P > 0.05$).
Keywords: Breed; Piglets; Digestibility; Enzyme supplementation; Fibre

Taofik A. Shittu, Rashidat A. Aminu, Evelyn O. Abulude, Functional effects of xanthan gum on composite cassava-wheat dough and bread, Food Hydrocolloids, In Press, Corrected Proof, Available online 21 June 2009, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2009.05.016.
(http://www.sciencedirect.com/science/article/B6VP9-4WK43WX-1/2/887592067dc7f322fd65ed3cd7b18a61)
Abstract:
The use of composite flour for bread making is gradually gaining prominence worldwide due to some economic and nutritional reasons. However, studies on the application of functional ingredients purposely to improve composite bread quality are very few. This paper examines the functional role of xanthan gum (XG) on the properties of dough and bread from composite cassava-wheat flour. The viscoelastic properties of dough and gas retention characteristics of batter as well as the fresh and storage properties of bread from the composite flour (90% wheat plus 10% cassava) were studied. The crumb cell structure was also studied using digital image analysis technique. Inclusion of XG had significant effects on the dough tenacity and extensibility and sensory acceptability of fresh composite bread. The oven spring, specific volumes of bread loaf and crumb softness were higher at 1% XG content. Also, addition of XG made the composite

bread samples had more open crumb structure and better sensory acceptability. However, moisture loss and crumb firming during bread storage were best reduced when 1% XG was added to bread formulation.
Keywords: xanthan gum; Dough rheology; Cassava flour; Wheat flour; Composite bread quality

Folarin A. Oguntoyinbo, Christine E.R. Dodd, Bacterial dynamics during the spontaneous fermentation of cassava dough in gari production, Food Control, In Press, Corrected Proof, Available online 18 June 2009, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2009.06.010.
(http://www.sciencedirect.com/science/article/B6T6S-4WJHB32-1/2/65360fca1e6c3e43e0b9ca4c369bc64b)
Abstract:
The microbial dynamics and diversity during solid substrate fermentation of cassava, a case study of gari production in West Africa, was investigated. The 16S rDNA gene sequence analysis of the PCR-Denaturing Gradient Gel Electrophoresis (PCR-DGGE) analysis of microbial community DNA and Pulsed Field Gel Electrophoresis (PFGE) of selected isolates as well as culturing techniques using different selective media were used to monitor the bacterial dynamics during cassava fermentation. The V3 variable region of the 16S gene was analyzed and the closest relatives of Lactobacillus plantarum, Lactobacillus fermentum, Lactobacillus pentosus, Lactobacillus acidophilus and Lactobacillus casei were identified by sequencing of the DGGE band amplimers. The DGGE amplimers also revealed the succession and dynamics of LAB; there was a progressive increase in their population proportional to the fermentation period. The analysis of the PFGE band patterns showed that five diverse species of LAB were involved in the fermentation. The representative isolate of each of the PFGE clusters was phenotypicaly identified as L. plantarum, L. fermentum and Leuconostoc mesenteroides by the API 50 CHL sugar fermentation profile. These combinations of parameters identified heterofermentative LAB as bacteria that initiated the fermentation, reduced the pH below four and increased the acidity of the fermentation mash. Information such as this is relevant for the development of starter cultures and predictability of the process for traditional fermented foods and to aid their intermediate and large scale production.
Keywords: Fermentation; Cassava; Starch; Bacteria; Lactobacillus; Dynamics

Carmen M.O. Muller, Joao Borges Laurindo, Fabio Yamashita, Effect of cellulose fibers on the crystallinity and mechanical properties of starch-based films at different relative humidity values, Carbohydrate Polymers, Volume 77, Issue 2, 10 June 2009, Pages 293-299, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.12.030.
(http://www.sciencedirect.com/science/article/B6TFD-4VCH6X3-J/2/0f6934b1cf6e1acefe81118ab0402b12)
Abstract:
The objective of this study was to investigate the effect of the addition of cellulose fibers on the mechanical and physicochemical properties of starch-based films plasticized with glycerol. Film samples were prepared from solutions with 3% of cassava starch, with the addition of 0, 0.10, 0.30 and 0.50 g of fibers/g of starch. The mechanical properties of samples conditioned at different relative humidity (RH) values were determined through tensile and stress relaxation tests. SEM micrographs of the films showed a homogeneous and random distribution of the cellulose fibers, without pores or cracks. Films with fibers were more crystalline and had higher tensile strength and rigidity, but lower elongation capacity. On the other hand, addition of cellulose fibers increased the stability of starch-based films subjected to RH variations, solving a classical problem encountered with this kind of film. Thus, the addition of cellulose fibers to starch-based films is an effective way to prepare stronger and more stable films.
Keywords: Starch films; Cellulose; Fibers; Crystallinity; Viscoelasticity

David J. Biddinger, Donald C. Weber, Larry A. Hull, Coccinellidae as predators of mites: Stethorini in biological control, Biological Control, In Press, Corrected Proof, Available online 2 June 2009, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2009.05.014.
(http://www.sciencedirect.com/science/article/B6WBP-4WF4J3K-3/2/078992c727c63d994b13609f5db7273c)
Abstract:
The Stethorini are unique among the Coccinellidae in specializing on mites (principally Tetranychidae) as prey. Consisting of 90 species in two genera, Stethorus and Parasthethorus, the tribe is practically cosmopolitan. The Stethorini are found in a diverse range of habitats, including many agricultural systems such as pome and stone fruits, brambles, tree nuts, citrus, avocadoes, bananas, papaya, palms, tea, cassava, maize, strawberries, vegetables, and cotton, as well as ornamental plantings, grasslands, forests, and heathlands. Tetranychid mite outbreaks became common in many agricultural systems only after World War II, when widespread use of broad-spectrum insecticides increased. Stethorini were initially appreciated only for their ability to suppress severe outbreaks of tetranychid populations. However, research on their prey searching behaviors reveals that Stethorini use visual and olfactory stimuli to locate small mite colonies in patchy distributions, and can be very effective in regulating their prey at low densities. Moreover, acariphagous coccinellids colonize mite outbreaks earlier, and consume more pest mites, than many other mite predators. Key to the use of coccinellids in conservation biological control programs is the provision of overwintering habitats and refuges from pesticides in and near cropland. When these conditions are fulfilled, Stethorini often play important roles in maintaining suppression of tetranychid populations. Examples of successful biological mite control with Stethorini include apple orchards in Pennsylvania, USA, and citrus in Asia, and the unintended disruption of a tetranychid-based biological control program for the invasive woody weed, gorse, in Australia and New Zealand. The systematics and taxonomy of this group is challenging with many cryptic species, and molecular diagnostic tools are sorely needed. How best to utilize their mite-suppressive potential in diverse settings requires better knowledge of their requirements including utilization of alternative foods, refuges for dormancy and from nonselective pesticides, and host-finding mechanisms.
Keywords: Coccinellidae; Stethorus; Acari; Acariphagous; Tetranychid; Spider mites

Nzigamasabo Aloys, Nimpagaritse Angeline, Traditional fermented foods and beverages in Burundi, Food Research International, Volume 42, Issues 5-6, June-July 2009, Pages 588-594, ISSN 0963-9969, DOI: 10.1016/j.foodres.2009.02.021.
(http://www.sciencedirect.com/science/article/B6T6V-4VR9FFN-1/2/45db7d30977b85dc0aa864fb5026b6ac)
Abstract:
Several traditional fermented foods and beverages are produced at the household level in Burundi. These include milk products (urubu, amateregua and amavuta), cereal and banana-based beverages (Urwarwa, Isongo, Impeke and Kanyanga) and cassava-based fermented foods (Ikivunde, Inyange, Imikembe and Ubswage). Literature on Burundian fermented foods and beverages is non-existent. Therefore, the objective of this review is to document the methods by which these Burundian foods and beverages are produced and to devise scientific means to improve their quality and optimize their production methods.
Keywords: Traditional fermented foods and beverages; Milk products; Cereal and banana-based beverages and cassava-based foods

Valfredo Azevedo Lemos, Cleber Galvao Novaes, Marcos Almeida Bezerra, An automated preconcentration system for the determination of manganese in food samples, Journal of Food Composition and Analysis, Volume 22, Issue 4, June 2009, Pages 337-342, ISSN 0889-1575, DOI: 10.1016/j.jfca.2008.11.019.

(http://www.sciencedirect.com/science/article/B6WJH-4VS405D-5/2/733141ce174297e69e7d2d9f847d1251)
Abstract:
In this work, an on-line automated system for the preconcentration and evaluation of manganese in food samples is proposed. The preconcentration of manganese ions is carried out using two mini-columns packed with 4-(5'-bromo-2'-thiazolylazo)orcinol (Br-TAO) loaded polyurethane foam. After a preconcentration step, a stream of hydrochloric acid is passed through the mini-column in order to transport the manganese directly to the flame atomic absorption spectrometer. The sample frequency was 60 h-1 for a 60 s preconcentration time. The limit of detection and enrichment factor were 0.70 [mu]g L-1 and 17, respectively. The accuracy of the procedure was evaluated by analysis of biological reference materials (spinach leaves, tomato leaves and pine needles). The procedure was successfully applied for the evaluation of manganese in several food samples, such as corn, rice and cassava flour.
Keywords: Food; Preconcentration; On-line system; Polyurethane foam; Br-TAO; Manganese; Trace metals in food; Food analysis; Food composition; Determination

T.A. Shittu, M.O. Edema, O. Dada, A.O. Atayese, Microorganisms associated with the spoilage of Pupuru, Food Control, In Press, Corrected Proof, Available online 27 May 2009, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2009.05.012.
(http://www.sciencedirect.com/science/article/B6T6S-4WCSR6C-1/2/2b2d4ea2775a05524956d239b2237426)
Abstract:
This study involved evaluation of physicochemical and microbiological changes in dried Pupuru (fermented, smoke dried cassava) balls under storage conditions simulating those currently used by the traditional processors. The aim was to understand the process of spoilage with a view to reducing the rate. pH ranged from 3 to 4, reducing significantly in cabinet-dried samples from 4.24 to 3.27 after 6 days of storage. Viable counts were in the range of 6-8 log cfu/g. Spoilage microorganisms included aerobic spore-forming and non-sporing bacteria as well as potentially toxigenic moulds like Aspergillus flavus and Penicillium species, which could constitute a health hazard to consumers.
Keywords: Pupuru; Spoilage; Viable counts

M. Wanapat, R. Pilajun, P. Kongmun, Ruminal ecology of swamp buffalo as influenced by dietary sources, Animal Feed Science and Technology, Volume 151, Issues 3-4, 26 May 2009, Pages 205-214, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2009.01.017.
(http://www.sciencedirect.com/science/article/B6T42-4VPKPXB-2/2/8b08cda28d520e510bb57e71b78a28f5)
Abstract:
Four, 3-year old, rumen fistulated swamp buffalo bulls were randomly assigned in a 2 x 2 factorial arrangement in a 4 x 4 Latin square design to received four dietary treatments; factor A = 2 sources of energy (cassava chip and corn cobs), factor B = 2 levels of urea in concentrate mixture (15 and 30 g/kg). During the experiment, concentrate was offered at 5 g/kg BW while 50 g/kg urea-treated rice straw was given on ad libitum basis. Feeds, rumen fluid and rectal feces were collected for chemical analyses during each experimental period (21 days). In addition, rumen fluid was analyzed for, pH, temperature and NH3-N concentration and microbial population and diversity by using direct count technique, roll-tube technique and molecular techniques including PCR-DGGE and real-time PCR technique. It was found that energy sources and urea levels had no effects on rumen pH, temperature, NH3-N and total VFA concentrations as well as proportion of individual VFA. Energy sources especially cassava chip had a higher protozoal population than those of corn cob while urea had no effect. The two factors, energy sources and urea levels resulted in similar rumen bacterial and fungal zoospore population. Similarly with nutrient digestion

coefficients, there were no differences among treatments, while cassava chip gave a slightly higher intake of urea-treated rice straw than corn cob fed group. Methanogenic and cellulolytic bacteria were variable among treatments and were highest in corn cob with 15 g/kg urea fed group which were higher than those in other groups. In addition, the use of PCR-DGGE has found diversity of rumen microorganisms particularly methanogenic and cellulolytic bacteria. Moreover, using of real-time PCR technique provided that population of Fibrobacter succinogenes had relatively higher than those Ruminococus flavefacieus and Ruminococus albus. Based on this study, corn cob and urea at 15 g/kg could be efficiently utilized in the rumen and thus, could provide good fermentation end-products and improve rumen ecology for the host swamp buffaloes.
Keywords: Swamp buffalo; Rumen ecology; Diets; Microorganisms; Molecular techniques

D. Phan The, F. Debeaufort, A. Voilley, D. Luu, Influence of hydrocolloid nature on the structure and functional properties of emulsified edible films, Food Hydrocolloids, Volume 23, Issue 3, May 2009, Pages 691-699, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2008.05.006.
(http://www.sciencedirect.com/science/article/B6VP9-4SMWFJN-2/2/a3fe6094741fc8e3773d56a03e940640)
Abstract:
To investigate the influence of polymer behaviors on the structure and the functional properties of emulsified films, agar (AG) and cassava starch (CAS) were used as hydrocolloid continuous phases in which hydrogenated vegetable oil (VGB81) was dispersed. Different ratios of hydrophilic/hydrophobic materials (HB/HL) were also used in film formulations to study the evolution of film-emulsion structure. Microscopically observed, VGB-CAS emulsified films exhibit a similar bilayer structure. However, there was just a migration and an aggregation of lipid particles. There was no coalescence which could form a continuous 'lipid layer' necessary for an effective barrier. Moreover, they could not be made with a HB/HL ratio greater than 0.7:1. Conversely, AG chains set into gel, which solidifies film-forming emulsion before drying, leading to a fixed macronetwork structure. Films made with a high HB/HL ratios lead to a film structure becoming like a multilayer system. The water vapor permeability of emulsified films is better found when HB/HL >= 1:1 when films are formed only with gelling polysaccharide (AG). In addition, there is no relationship between the moisture sorption and the moisture permeability of emulsified films. In contact with liquid water, brief sorption and swelling surface are observed for VGB-AG film surface and rapid absorption following a temporary hydrophobicity is found in the case of VGB-CAS films. While the mechanical properties of VGB-CAS films are strongly altered, those of VGB-AG films are considered to be sufficient for most of applications.
Keywords: Emulsified edible film; Agar-based film; Cassava starch-based film; Moisture permeability; Wetting behavior; Mechanical properties

A.M. Fermont, P.J.A. van Asten, P. Tittonell, M.T. van Wijk, K.E. Giller, Closing the cassava yield gap: An analysis from smallholder farms in East Africa, Field Crops Research, Volume 112, Issue 1, 30 April 2009, Pages 24-36, ISSN 0378-4290, DOI: 10.1016/j.fcr.2009.01.009.
(http://www.sciencedirect.com/science/article/B6T6M-4VRNNMB-1/2/4a52e7010a499c2dff52cf190a652660)
Abstract:
Cassava yields in Africa are small and it remains unclear which factors most limit yields. Using a series of farm surveys and on-farm and on-station trials in Uganda and western Kenya, we evaluated the importance of abiotic, biotic and associated crop management constraints for cassava production in a range of socio-economic settings as found in smallholder farms in the region. Average yields under farmer management were 8.6 t ha-1, but these were more than doubled to 20.8 t ha-1 by using improved crop establishment, improved genotypes and 100-22-83 kg ha-1 of single-nutrient N-P-K fertilizers. A farm survey revealed large yield differences between

farms. Less endowed farmers harvested less cassava per unit area than better endowed farmers (difference of 5.9 and 9.7 t ha-1 in Kenya and Uganda, respectively); differences were associated with less access to labour, poorer soils, and premature harvesting by less endowed farmers. Analysis of 99 on-farm and 6 on-station trials showed that constraints for cassava production varied strongly between sites and years. Poor soil fertility, early water stress and sub-optimal weed management limited cassava production by 6.7, 5.4 and 5.0 t ha-1, respectively, when improved crop establishment and genotypes were used. Pests and diseases were relatively unimportant, while weed management was particularly important in farmer fields during a dry year in Kenya (yield gap of 11.6 t ha-1). The use of complementary analytical tools such as multiple regression and boundary line analysis revealed that many fields were affected by multiple and interacting production constraints. These should be addressed simultaneously if significant productivity improvements are to be achieved. This will be more difficult for less endowed than for better endowed farm households, since the former lack social and financial capital to improve management.
Keywords: Agriculture; Boundary line analysis; Drought; Nutrient management; Production constraints; Soil fertility; Weed management

J. Howard Bradbury, Development of a sensitive picrate method to determine total cyanide and acetone cyanohydrin contents of gari from cassava, Food Chemistry, Volume 113, Issue 4, 15 April 2009, Pages 1329-1333, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.08.081.
(http://www.sciencedirect.com/science/article/B6T6R-4TC3521-1/2/5303b79a6f76a306a0c12b4ad5284fc4)
Abstract:
The sensitivity of the normal picrate method for determination of total cyanide in cassava was increased tenfold using a small 1 cm2 picrate paper, eluted using 0.5 mL instead of 5 mL of water as in the normal method. The absorbance was measured in a 2 mm cuvette in the spectrophotometer. The sensitive method was calibrated against the normal picrate method. The total cyanide content in mg HCN equivalents/kg sample = ppm, is calculated from the absorbance (A) by the equation ppm = A x 45.7 which is applicable from 0.1 to 50 ppm. A new method to determine acetone cyanohydrin was developed based on irreversible denaturation of linamarase in 0.1 M HCl at 30 [degree sign]C for 1 h. Five gari samples from Mozambique gave a mean total cyanide content of 12 ppm (range 6-15 ppm) and mean acetone cyanohydrin content of 11 ppm (range 5-14 ppm). Acetone cyanohydrin liberates cyanide quantitatively in the human intestine.
Keywords: Total cyanide; Acetone cyanohydrin; Sensitive picrate method; Cassava; Gari

Stephanie A. Vogelmann, Michael Seitter, Ulrike Singer, Markus J. Brandt, Christian Hertel, Adaptability of lactic acid bacteria and yeasts to sourdoughs prepared from cereals, pseudocereals and cassava and use of competitive strains as starters, International Journal of Food Microbiology, Volume 130, Issue 3, 15 April 2009, Pages 205-212, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2009.01.020.
(http://www.sciencedirect.com/science/article/B6T7K-4VGPGS6-1/2/8255e3e8a1d8d0df8de6699616c89be6)
Abstract:
The adaptability of lactic acid bacteria (LAB) and yeasts to sourdoughs prepared from cereals, pseudocereals and cassava was investigated using PCR-DGGE and bacteriological culture combined with rRNA gene sequence analysis. Sourdoughs were prepared either from flours of the cereals wheat, rye, oat, barley, rice, maize, and millet, or from the pseudocereals amaranth, quinoa, and buckwheat, or from cassava, using a starter consisting of various species of LAB and yeasts. Doughs were propagated until a stable microbiota was established. The dominant LAB and yeast species were Lactobacillus fermentum, Lactobacillus helveticus, Lactobacillus paralimentarius, Lactobacillus plantarum, Lactobacillus pontis, Lactobacillus spicheri, Issatchenkia

orientalis and Saccharomyces cerevisiae. The proportion of the species within the microbiota varied. L. paralimentarius dominated in the pseudocereal sourdoughs, L. fermentum, L. plantarum and L. spicheri in the cassava sourdough, and L. fermentum, L. helveticus and L. pontis in the cereal sourdoughs. S. cerevisiae constituted the dominating yeast, except for quinoa sourdough, where I. orientalis also reached similar counts, and buckwheat and oat sourdoughs, where no yeasts could be detected. To assess the usefulness of competitive LAB and yeasts as starters, the fermentations were repeated using flours from rice, maize, millet and the pseudocereals, and by starting the dough fermentation with selected dominant strains. At the end of fermentation, most of starter strains belonged to the dominating microbiota. For the rice, millet and quinoa sourdoughs the species composition was similar to that of the prior fermentation, whereas in the other sourdoughs, the composition differed.
Keywords: Sourdough; Cereals; Pseudocereals; Cassava; Lactic acid bacteria; Yeasts

Louis M. Nwokocha, Ndubisi A. Aviara, Chandra Senan, Peter A. Williams, A comparative study of some properties of cassava (Manihot esculenta, Crantz) and cocoyam (Colocasia esculenta, Linn) starches, Carbohydrate Polymers, Volume 76, Issue 3, 9 April 2009, Pages 362-367, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.10.034.
(http://www.sciencedirect.com/science/article/B6TFD-4TX794M-1/2/f5722d5e453f10a3b1f717366f63201c)
Abstract:
Some properties of cassava and cocoyam starches were studied and compared with a view to determining the functional applications in food systems for which they are suitable. The starches were compared in terms of their microscopic, thermal, physicochemical and rheological properties. Microscopy revealed smaller granule sizes of cocoyam starch compared with cassava. The amylose content was higher in cocoyam starch (33.3%) than in cassava starch (29.3%). Gelatinization in cassava starch occurred at a lower temperature range (60.11-72.67 [degree sign]C) compared with cocoyam (72.96-80.25 [degree sign]C) with the endothermic gelatinization enthalpy higher in cocoyam. The swelling power and solubility patterns indicated lower relaxation temperature, higher swelling and solubilization rates in cassava starch compared with cocoyam starch. The pasting characteristics of 8% (db, dry basis) starch slurry showed that cassava had higher peak viscosity but lower stability and setback ratios compared with cocoyam. This indicates that cocoyam starch paste is better in withstanding processing conditions and would present a superior thickening characteristic than cassava starch paste. The flow properties of both starch pastes showed non-Newtonian behaviour and could be best described by the Herschel-Bulkley model. The rate index and yield stress of cocoyam starch paste was higher than that of cassava. The storage modulus of cocoyam starch paste was higher than that of cassava indicating that cocoyam starch paste was more rigid than cassava starch paste. Cassava starch paste exhibited higher paste clarity and freeze-thaw stability than cocoyam starch paste. The properties of cassava and cocoyam starches dictate their food applications.
Keywords: Cassava; Cocoyam; Starch; Pasting properties; Rheological properties; Paste clarity; Freeze-thaw stability

J.A. Hernandez, Optimum operating conditions for heat and mass transfer in foodstuffs drying by means of neural network inverse, Food Control, Volume 20, Issue 4, April 2009, Pages 435-438, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.07.005.
(http://www.sciencedirect.com/science/article/B6T6S-4T0MMFV-4/2/3194c23d59374acac1f5d3dcf42e4be8)
Abstract:
Artificial neural network inverse (ANNi) is applied to optimize the operating conditions on heat and mass transfer during foodstuffs drying. This proposed method (ANNi) inverts the artificial neural network (ANN) and uses the Nelder-Mead simplex method of optimization to find the optimum

parameter value (or unknown parameter) for given required conditions. In the aim to demonstrate this ANNi method, two separate feedforward networks (ANN) with one hidden layer reported by Hernandez-Perez, Garcia-Alvarado, Trystram, and Heyd [Hernandez-Perez, J.A., Garcia-Alvarado, M.A., Trystram, G., & Heyd, B. (2004). Neural networks for the heat and mass transfer prediction during drying of cassava and mango. Innovative Food Science and Emerging Technologies, 5, 56-64], were used in order to obtain temperature and moisture kinetics simulations during the drying of mango and cassava. These reported models take into account air temperature, air velocity, shrinkage as a function of moisture content, time and air humidity as well-known input parameters. Levenberg-Marquardt learning algorithm, hyperbolic tangent sigmoid transfer-function, linear transfer-function and three neurons in the hidden layer were considered in both reported models. Results of the ANNi showed a good agreement with the experimental and simulated data . Then ANNi could be applied to determine the optimal parameters during mango and cassava drying with elapsed time minor to 0.3 s. In addition, this methodology can be used to controlling the drying process.
Keywords: Neural network inverse; Heat and mass transfer; Drying; Cassava; Mango; Optimal parameters

A. Stewart-Jones, T.J. Stirrup, R.J. Hodges, D.I. Farman, D.R. Hall, Analysis of free fatty acids in food substrates and in the dust and frass of stored-product pests: Potential for species discrimination?, Journal of Stored Products Research, Volume 45, Issue 2, April 2009, Pages 119-124, ISSN 0022-474X, DOI: 10.1016/j.jspr.2008.10.003.
(http://www.sciencedirect.com/science/article/B6T8Y-4VKMW7H-3/2/5f275262168df80e8c30a020d110eb11)
Abstract:
The larger grain borer, Prostephanus truncatus, is a serious beetle pest that tunnels extensively to produce large quantities of dust and frass. The natural enemy Teretrius nigrescens is an important biological control beetle which is known to exploit at close-range solvent-extractable chemical cues in the dust and frass. The objective of the current study was to analyse quantitatively and qualitatively, the free fatty acid mixtures in different food-substrate materials both before and after insect attack by a range of stored-product pests in order to ascertain whether differences in these mixtures could explain the T. nigrescens selectivity to P. truncatus dust/frass over that of other species irrespective of food substrate. By TLC, GC and GC-MS we found triglyceride and five free fatty acids were the most abundant chemicals in dust/frass (palmitic acid (C16:0), stearic acid (C18:0), oleic acid (C18:1), linoleic acid (C18:2) and linolenic acid (C18:3)). In maize flour, Sitophilus species did not significantly change free fatty acid concentrations whereas with P. truncatus, Rhyzopertha dominica and Dinoderus minutus there were 4-6-fold increases, and, for Tribolium species there were over 20-fold increases. These differences provide interesting insights to tunnelling/feeding habits and are correlated with known feeding preferences within grain. Principal component analysis (PCA) demonstrated that free fatty acid ratios in dust/frass of different species are most linked to the food substrate and confer little discriminatory information that could be used to distinguish between the different species. Although increases in free fatty acid concentrations are good indicators of pest infestation and this may contribute behaviourally in an additive or synergistic way, we conclude that other chemical(s) are present and are key to T. nigrescens recognition of P. truncatus on different substrates.
Keywords: Arrestant; Cassava; Kairomone; Maize; Predator; Prostephanus truncatus; Teretrius nigrescens; Triglyceride

J. Perdomo, A. Cova, A.J. Sandoval, L. Garcia, E. Laredo, A.J. Muller, Glass transition temperatures and water sorption isotherms of cassava starch, Carbohydrate Polymers, Volume 76, Issue 2, 17 March 2009, Pages 305-313, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.10.023.

(http://www.sciencedirect.com/science/article/B6TFD-4TVJ3MC-1/2/5fbc4c757a5057914a1bb02b9182522e)
Abstract:
The effect of water content on the glass transition temperatures of cassava starch was determined by differential scanning calorimetry (DSC) and dynamic mechanical thermal analysis (DMTA). Samples were transformed to the amorphous state by compression molding at high temperature (as demonstrated by wide angle X-ray diffraction, WAXS), and then the samples were moisture conditioned. Both DSC and DMTA showed that water anti-plasticized cassava starch at lower moisture contents, and plasticized it at higher water contents. Samples with higher moisture contents stored at room temperature, 45 [degree sign]C and 80 [degree sign]C underwent retrogradation as indicated by WAXS. Sorption isotherms of cassava starch showed that for aw values lower than around 0.85, the sorption capacity decreased with increasing temperature; while the opposite behavior was observed at aw > 0.85. This inversion point (aw = 0.85) was attributed to the fact that more active sites were exposed to the adsorption processes, due to the enhanced molecular mobility promoted in the amorphous regions by starch crystallization.
Keywords: Cassava starch; Plasticizing and anti-plasticizing effects; WAXS; DSC and DMTA; Glass transition; Sorption isotherm; Retrogradation

E. Dongmeza, S. Steinbronn, G. Francis, U. Focken, K. Becker, Investigations on the nutrient and antinutrient content of typical plants used as fish feed in small scale aquaculture in the mountainous regions of Northern Vietnam, Animal Feed Science and Technology, Volume 149, Issues 1-2, 2 March 2009, Pages 162-178, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2008.04.012.
(http://www.sciencedirect.com/science/article/B6T42-4ST45VD-1/2/7e4578269f10d7d18b0127f7d09f3552)
Abstract:
The aquaculture system of the Black Thai farmers in the upland of Northern Vietnam mostly depends on green leaves which they use as major feed input to the ponds. A study was conducted to assess the quality of two groups of plant residues used as fish feed (principally for grass carp) in Northern Vietnam. The first group was constituted of residues commonly fed to fish, such as cassava (Manihot esculenta), banana (Musa nana), and bamboo (Bambusa vulgaris) leaves, and the second group included residues occasionally fed to fish by farmers, such as barnyard grass (Echinochloa erusgalli), mixed weeds from paddy fields, Elephant grass (Pennisetum purpureum), mulberry (Morus), maize (Zea mays), sweet potato (Ipomoea batatas), peanut (Arachis hypogaea); cassava tubercles and crop residues such as rice bran, cassava peels. In the first group of plant material analysed any possible temporal changes in their nutrient, energy and antinutrient contents during the course of the year were evaluated, whereas in the second group the nutrient, energy and antinutrient content were determined, without any evaluation of their temporal changes. No significant temporal changes were observed in the proximate composition, energy and antinutrient contents of banana leaves during the course of the year. Significant ($P<0.05$) temporal changes were observed in the proximate composition of cassava and bamboo leaves as well as in the content of some antinutrient of cassava leaves. Results of proximate analysis indicated the high potential of some of these plant materials such as cassava and mulberry leaves as fish feed because of their higher protein and energy content. However, the protein and energy content of these leaves were generally very low when compared to that of the common standard fish feed. Thus, these plant feedstuffs alone may not be sufficient to cover the requirements for rapid growth in cultured grass carp. The data presented here could be used for formulating cost-effective and balanced animal feeds for the use of small-scale farmers in rural areas in Northern Vietnam.
Keywords: Plant nutrients; Potential; Fish feed; Animal feed; Grass carp; Antinutrients; Seasonal changes

Liangzhi You, Stanley Wood, Ulrike Wood-Sichra, Generating plausible crop distribution maps for Sub-Saharan Africa using a spatially disaggregated data fusion and optimization approach, Agricultural Systems, Volume 99, Issues 2-3, February 2009, Pages 126-140, ISSN 0308-521X, DOI: 10.1016/j.agsy.2008.11.003.
(http://www.sciencedirect.com/science/article/B6T3W-4VC7452-1/2/6c285626ef38df9bd9978aeb3048f592)
Abstract:
Large gaps exist in our knowledge of the current geographic distribution and spatial patterns of performance of crops, and these gaps are unlikely to be filled. In addition, even the spatial scale of many sub-national statistical reporting units remains too coarse to capture patterns of spatial heterogeneity in crop production and performance that are likely important from a policy and investment planning perspective. To fill these spatial data gaps we have developed and applied a meso-scale model for the spatial disaggregation of crop production. Using a cross-entropy approach, our model makes plausible pixel-scale assessments of the spatial distribution of crop production within geopolitical units (e.g. countries or sub-national provinces and districts). The pixel-scale allocations are performed through the compilation and judicious fusion of relevant spatially-explicit data, including: production statistics, land use data, satellite imagery, biophysical crop 'suitability' assessments, population density, and distance to urban centers, as wells as any prior knowledge about the spatial distribution of individual crops. The development, application and validation of a prior version of the model in Brazil strongly suggested that our spatial allocation approach shows considerable promise. This paper describes efforts to generate crop distribution maps for Sub-Saharan Africa for the year 2000 using this approach. Apart from the empirical challenge of applying the approach across many countries, the application includes three significant model improvements: (1) the ability to cope with production data sources that provided different degrees of spatial disaggregation for different crops within a single country; (2) the inclusion of a digital map of irrigation intensity as a new input layer; and (3) increased disaggregation of rainfed production systems. Applying the modified spatial allocation model we generated 5 min (approximately 10 km) resolution grid maps for the following 20 major crops across Sub-Saharan Africa: barley, dry beans, cassava, cocoa, coffee, cotton, cow peas, groundnuts, maize, millet, oil palm, plantain, potato, rice, sorghum, soybeans, sugar cane, sweet potato, wheat, and yam. The approach provides plausible results but also highlights the need for much more reliable input data for the region, especially with regard to sub-national production statistics and satellite-based estimates of cropland extent and intensity.
Keywords: Sub-Sahara Africa; Cross entropy; Satellite image; Spatial allocation; Agricultural production; Crop suitability

Guillaume Gruere, Latha Nagarajan, E.D.I. Oliver King, The role of collective action in the marketing of underutilized plant species: Lessons from a case study on minor millets in South India, Food Policy, Volume 34, Issue 1, Collective Action for Smallholder Market Access, February 2009, Pages 39-45, ISSN 0306-9192, DOI: 10.1016/j.foodpol.2008.10.006.
(http://www.sciencedirect.com/science/article/B6VCB-4TX6W8Y-1/2/7190106ae11b5340df93acf92c3978a7)
Abstract:
Underutilized plant species are generally defined by their unexploited economic potential, making them an appropriate focus for market development. This paper analyses the role of collective action in the process of market development for minor millets, an underutilized plant species, in the Kolli Hills of Tamil Nadu, India. Based on a series of focus group discussions, we analyze the role and involvement of self-help groups in the minor millet marketing chain recently set up by the M.S. Swaminathan Research Foundation. We then compare the role of collective action in this new market with the cases of marketing chains for cassava and organic pineapples, two cash crops with expanding production in the same area. Our analysis shows the critical role of collective

action as a necessary but not sufficient condition for the successful commercialization of underutilized plant species for the benefit of the poor and the conservation of agro-biodiversity.
Keywords: Underutilized species; Agricultural marketing; Collective action; Agro-biodiversity

D. Phan The, F. Debeaufort, A. Voilley, D. Luu, Biopolymer interactions affect the functional properties of edible films based on agar, cassava starch and arabinoxylan blends, Journal of Food Engineering, Volume 90, Issue 4, February 2009, Pages 548-558, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.07.023.
(http://www.sciencedirect.com/science/article/B6T8J-4T4Y5NV-1/2/30750a67a59764b479bda137f4d0e2f9)
Abstract:
Edible films based on the binary combination of agar (AG), cassava starch (CAS) and arabinoxylan (AX) were studied with regard to their microstructure, moisture barrier and mechanical properties. Though the films appear macroscopically homogeneous, electron microscopy observations reveal a phase separation and dispersion, respectively, in AG-CAS and AG-AX blend film structures, whereas the structure of CAS-AX blend films seems homogeneous. In case high moisture (84% and 99% RH), neither the combination of AG and CAS nor the addition of AX into CAS can improve film moisture barrier properties, except at a lower RH (57%). Conversely, water vapor permeability (WVP) of AG based film is significantly reduced when AX is used as an 'additive'. On the other hand, blending AG with CAS increases the surface wettability of AG films but not that of CAS films. Adding AG into CAS induces an improvement in elongation and tensile strength of CAS based films. Mechanical properties of agar based films are degraded when CAS or AX was added. The results suggest that AG is able to provide a very good cohesive matrix, which contributes to enhance the mechanical properties of other polysaccharide based films.
Keywords: Water vapor permeability; Surface hydrophobicity; Film microstructure; Binary polymeric edible film; Agar; Cassava starch; Arabinoxylan

G.V. Kozloski, R.L. Cadorin Jr., C.J. Harter, L. Oliveira, T.P. Alves, F.R. Mesquita, D.S. Castagnino, Effect of suplemental nitrogen source and feeding frequency on nutrient supply to lambs fed a kikuyu grass (Pennisetum clandestinum) hay-based diet, Small Ruminant Research, Volume 81, Issues 2-3, February 2009, Pages 112-118, ISSN 0921-4488, DOI: 10.1016/j.smallrumres.2008.12.005.
(http://www.sciencedirect.com/science/article/B6TC5-4VD81N0-1/2/565d59d4c9dc667791309b5bbd657dd2)
Abstract:
Eight castrated male lambs (35 +/- 4 kg live weight), fed a basal diet of kikuyu grass hay, were used in a replicated 4 x 4 Latin Square experiment with a 2 x 2 factorial arrangement of treatments to evaluate the effect of supplemental feeding frequency and source of rumen degradable N on intake, digestibility, ruminal fermentation, and microbial protein yield. Treatments were supplementation with cassava meal plus calcium caseinate or cassava meal plus urea offered at a rate of 7 g/kg live weight daily in one or two meals per day. Lambs were fed twice daily in such manner to allow ad libitum comsumption of forage. There was significant feeding frequency by N source interaction on variables of intake. In general, intake of feed components was higher ($P <= 0.05$) by lambs offered the caseinate-supplement twice daily over intake observed in lambs given the others diet treatments. Digestibility of feed components was neither affected by supplemental N source (DM, $P = 0.541$; OM, $P = 0.585$; NDF, $P = 0.828$) nor by feeding frequency (DM, $P = 0.122$; OM, $P = 0.175$; NDF, $P = 0.591$). Urinary excretion of N increased ($P <= 0.05$) in lambs supplemented twice daily whereas N retention was similar for all treatments (N source, $P = 0.748$; feeding frequency, $P = 0.418$). Microbial protein entering into the small intestine was affected by the interaction between feeding frequency and N source such as an increasing ($P < 0.10$) in this

variable was observed when lambs received the caseinate but not the urea supplement twice daily. Efficiency of microbial protein synthesis, however, was not affected by treatments (N source, P = 0.588; feeding frequency, P = 0.334). Rumen pH averaged 6.70 and it was neither affected by N source (P = 0.827) nor by feeding frequency (P = 0.740). Ruminal concentration of ammonia N was not affected by feeding frequency (P = 0.144) while it increased (P < 0.05) when urea rather than caseinate was the supplemental N source (mean of 7.61 mg/dl vs. 6.00 mg/dl). Concentration of sugars in rumen fluid was higher (P <= 0.05) in lambs supplemented once a day compared to twice daily (mean of 49.4 mg/dl vs. 34.4 mg/dl) for both N sources. A significant (P <= 0.05) N source by feeding frequency interaction effect was observed for ruminal concentrations of [alpha]-amino N compounds. In urea treatment [alpha]-amino N concentration increased (P <= 0.05) in lambs receiving the supplement twice daily compared to once a day (mean of 4.59 mg/dl vs. 3.70 mg/dl) while in caseinate treatment it was higher (P <= 0.05) in lambs offered the supplement in one meal per day compared to twice daily (mean of 5.29 mg/dl vs. 4.07 mg/dl). In conclusion, for ruminants fed a tropical grass-based diet, starch-rich supplement containing non-protein N as N source may be offered only once a day whereas the supply of nutrients may be improved if degradable true protein is included as N source and supplement is offered in two meals per day.
Keywords: Calcium caseinate; Degradable N; Digestibility; Intake; Rumen microbial protein synthesis; Ruminal fermentation; Urea

Lucia Fama, Lia Gerschenson, Silvia Goyanes, Starch-vegetable fibre composites to protect food products, Carbohydrate Polymers, Volume 75, Issue 2, 22 January 2009, Pages 230-235, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.06.018.
(http://www.sciencedirect.com/science/article/B6TFD-4T0WJW3-1/2/a9387aa21cb1a0f8fc1c6374bdefed87)
Abstract:
The influence of wheat bran content in biodegradable composites based on cassava starch and containing glycerol and potassium sorbate were studied. Films were produced by casting and three different fractions of wheat bran fibre were used: 1.5 mg, 13.5 mg and 27.1 mg/g of matrix.
It was observed that the addition of wheat bran, which contains 40 g of water insoluble fibre per 100 g of bran, shifted the glycerol-rich phase glass transition temperature toward higher temperatures, broadening and diminishing in intensity the peak associated with this relaxation. This effect suggests that the presence of fibre led to an enhancement in the glycerol dispersion.
At room temperature, an increase in fibre content did not affect density of the matrix but caused the increase of the storage modulus and the decrease of loss tangent, moisture content and water vapor permeability. Besides, the addition of fibres led to the increase of the yellow index.
The improvement in water vapor barrier properties jointly with the enhancement of mechanical properties when fibre was present, lead to the idea that the composite developed can be used to protect food and extend its shelf life.
Keywords: Composites; Starch-wheat bran; Physicochemical characterization

Ismael E. Rivero, Vittoria Balsamo, Alejandro J. Muller, Microwave-assisted modification of starch for compatibilizing LLDPE/starch blends, Carbohydrate Polymers, Volume 75, Issue 2, 22 January 2009, Pages 343-350, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.08.012.
(http://www.sciencedirect.com/science/article/B6TFD-4T9CCV7-1/2/43bcede9d40abedb9ef882cc28af0aeb)
Abstract:
Modification of activated cassava starch (S) was performed by using octenyl succinic anhydride (OSA) at different starch/OSA ratios under microwave radiation. FTIR and titration results indicated that, within a reaction time of 7 min, degrees of substitution (DS) of about 0.045 may be achieved with 20% OSA. Subsequently, linear low density polyethylene/starch (LLDPE/S) blends were prepared employing succinylated starches (S-g-OSA) as compatibilizers. The morphology

and mechanical properties of LLDPE/S blends with and without compatibilizer were compared. It was observed that the addition of 10% of compatibilizer with respect to the dispersed phase content led to a reduction of the starch phase size and to an improvement of the blends mechanical properties.
Keywords: Cassava starch; Octenyl succinic anhydride; LLDPE blends; Mechanical properties

Li-Ming Che, Li-Jun Wang, Dong Li, Bhesh Bhandari, Necati Ozkan, Xiao Dong Chen, Zhi-Huai Mao, Starch pastes thinning during high-pressure homogenization, Carbohydrate Polymers, Volume 75, Issue 1, 5 January 2009, Pages 32-38, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.06.004.
(http://www.sciencedirect.com/science/article/B6TFD-4SPJ1TY-4/2/6152ce194c6e9a82bed000b3e8de9e7b)
Abstract:
High-pressure homogenization induced thinning of potato and cassava starch paste was investigated. The starch slurries at a concentration of 2.0 wt.% were heated at 90 [degree sign]C for 1 h and then rapidly cooled in tap water. The cooled starch pastes were homogenized at various pressures ranging from 0 to 100 MPa using a lab-scale high-pressure homogenizer. The influence of homogenizing pressure on the temperature, apparent viscosity, electrical conductivity, and percent light transmittance of homogenized starch pastes were determined. Temperatures of homogenized starch pastes increased linearly with the increase of the applied pressure, and the rate was 0.177 [degree sign]C/MPa and 0.186 [degree sign]C/MPa for potato and cassava starch pastes, respectively. After high-pressure homogenization, the apparent viscosities of the starch pastes decreased, while the percent light transmittances of them increased. However, the electrical conductivities of starch pastes were not affected by homogenization.
Keywords: Starch paste; Homogenization; Thinning

Nurul Absar, I.S.M. Zaidul, Shigenobu Takigawa, Naoto Hashimoto, Chie Matsuura-Endo, Hiroaki Yamauchi, Takahiro Noda, Enzymatic hydrolysis of potato starches containing different amounts of phosphorus, Food Chemistry, Volume 112, Issue 1, 1 January 2009, Pages 57-62, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.05.045.
(http://www.sciencedirect.com/science/article/B6T6R-4SJP7M4-1/2/9b68cf5be4d6d9ca36661ab60d021fa9)
Abstract:
The rapid hydrolysis of potato starches differing in phosphorus content, as well as sweet potato, cassava and yam starches, was accomplished by treatment of gelatinised starches with bacterial liquefying [alpha]-amylase at 50 [degree sign]C for 1 h, followed by Bacillus licheniformis [alpha]-amylase at 55 [degree sign]C up to 24 h, and then by glucoamylase at 40 [degree sign]C for a further 24 h. Among the potato starches, the high-phosphorus starches showed higher starch resistant capacity than the medium-phosphorus starches, as well as other tuber and root starches. The hydrolysis rate of tuber and root starches was not greatly influenced by their amylose content and median granule size. Only glucose was detected in the almost completely hydrolysed tuber and root starch samples, indicating that the concomitant enzymes treatment could hydrolyse both the [alpha]-1,4 and [alpha]-1,6 linkages of the starches examined.
Keywords: Gelatinised potato starches; Phosphorus content; [alpha]-Amylase; Glucoamylase

Hetti Arachchige Mangalika Wickramasinghe, Shigenobu Takigawa, Chie Matsuura-Endo, Hiroaki Yamauchi, Takahiro Noda, Comparative analysis of starch properties of different root and tuber crops of Sri Lanka, Food Chemistry, Volume 112, Issue 1, 1 January 2009, Pages 98-103, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.05.046.
(http://www.sciencedirect.com/science/article/B6T6R-4SJP7M4-3/2/5766b9946b77229db6812ac2fb2040b5)

Abstract:
The physicochemical properties of starches of six different root and tuber crop species grown mainly in Sri Lanka showed significant differences among the tested crop species and varieties. The median granule size of starch of tested root and tuber crop species varied from 33.5 to 10.2 [mu]m. The largest granule size and the highest blue value were given by the canna, Buthsarana, and yam species, in that order. The amylose content of cassava was higher than those of sweet potato and many yams. High peak viscosities, high breakdown, and high final viscosities were observed in yams, and, generally, such starch showed a high swelling power. According to the correlation analysis, these pasting properties would mainly be due to their larger starch granule size. Based on the thermal properties, cassava starch showed less energy requirement for gelatinization and thus gelatinized at lower temperatures. Furthermore, a higher susceptibility of raw cassava starch toward fungal glucoamylase was observed. The low enzyme digestibility of raw yam starch would be due to its large granules. Correlation analysis showed that the blue value and starch granule size were important in determining the pasting, thermal, and other properties of starch.
Keywords: Starch; Cassava; Sweet potato; Digestibility; Granule size

Eduardo Rodriguez-Sandoval, Alejandro Fernandez-Quintero, Gerard Cuvelier, Stress relaxation of reconstituted cassava dough, LWT - Food Science and Technology, Volume 42, Issue 1, 2009, Pages 202-206, ISSN 0023-6438, DOI: 10.1016/j.lwt.2008.03.007.
(http://www.sciencedirect.com/science/article/B6WMV-4S2MJ2S-1/2/00563ac63580f25e95a5457f460d9488)
Abstract:
The viscoelastic characteristics of reconstituted cassava dough were evaluated using a stress-relaxation test. Cassava parenchyma (peeled root) processed under different cooking conditions and left at either -5 or -20 [degree sign]C for 24 h was used to obtain flour, which was reconstituted into dough. Two stress-relaxation models (Maxwell two-termed and Peleg) were fitted to experimental data. Both models were valid for quantifying the relaxation behaviour; but the Maxwell model was better to predict experimental data. Most dough rheological attributes depend on the cooking method and the storage temperature. Dough samples made with flour from parenchyma boiled and left at -20 [degree sign]C for 24 h had higher values of elasticity moduli, higher viscosity values and lower values of Peleg constants.
Keywords: Cassava; Dough; Cooked flour; Stress relaxation

Dionne N. Shepherd, Darren P. Martin, Jennifer A. Thomson, Transgenic strategies for developing crops resistant to geminiviruses, Plant Science, Volume 176, Issue 1, January 2009, Pages 1-11, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2008.08.011.
(http://www.sciencedirect.com/science/article/B6TBH-4TF7C5C-1/2/dd295e38cab85c9453597cba7fac8502)
Abstract:
Geminiviruses infect a wide range of economically important crop plants. This review covers genetic engineering approaches currently being evaluated for the development of crops resistant to geminiviruses. In the past, most of these have involved pathogen-derived resistance strategies such as the expression of mutant or truncated viral proteins that interfere with virus infection, or transcription of viral RNA sequences that silence the expression of virus genes. Recently, however, alternatives to pathogen-derived resistance have been investigated. These include the use of geminivirus-inducible toxic proteins to kill infected cells, and the expression of DNA binding proteins, peptide aptamers or GroEL homologues that either disrupt geminivirus infections or lessen their harmful effects. Despite moderate successes in the engineering of geminivirus resistance using many of these strategies, no comparative data are available either on the relative merits of different approaches, or on how well the various resistant transgenic plants that have

been produced will fare in the field. We anticipate that high geminivirus mutation and recombination rates could seriously undermine the durability of most currently available resistance transgenes. It should, however, be possible to achieve robust transgenic geminivirus resistance either by using mixtures of genes targeting multiple virus processes via multiple mechanisms, or by using 'tolerance' genes that alleviate symptoms but do not selectively favour resistance-breaking virus mutants.
Keywords: Virus resistance; Geminivirus; Mastrevirus; Begomovirus; Maize; Cassava

Melanie Huch (nee Kostinek), Alexander Hanak, Ingrid Specht, Carine M. Dortu, Philippe Thonart, Samuel Mbugua, Wilhelm H. Holzapfel, Christian Hertel, Charles M.A.P. Franz, Use of Lactobacillus strains to start cassava fermentations for Gari production, International Journal of Food Microbiology, Volume 128, Issue 2, 10 December 2008, Pages 258-267, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.08.017.
(http://www.sciencedirect.com/science/article/B6T7K-4TCHKDV-1/2/0f7c6aa5a4ddaf580a2dfefc1fe45db3)
Abstract:
Two Lactobacillus strains, Lactobacillus plantarum BFE 6710 and Lactobacillus fermentum BFE 6620, were used to start cassava fermentations in a pilot study under field production conditions in Kenya, to determine their potential to establish themselves as predominant lactobacilli during the fermentation. Predominant strains from three fermentations were isolated throughout the 48 h fermentation period. The use of these strains in high numbers clearly resulted in 1 to 2 log higher lactic acid bacteria (LAB) counts over the course of the fermentation when compared to the uninoculated control. 178 predominant LAB isolates were grouped based on their phenotypic characteristics, and were characterised to strain level by RAPD-PCR, followed by PFGE strain typing. Overall, L. plantarum strains represented the majority of the isolates, followed by Weissella confusa and Lactococcus garvieae strains. The results of RAPD-PCR and PFGE strain typing techniques indicated that L. plantarum BFE 6710 was successful in asserting itself as a predominant strain. In contrast, L. fermentum BFE 6620 failed to establish itself as a predominant organism in the fermentation. The success of the L. plantarum strains to predominate in the cassava fermentation demonstrates the potential for development of Lactobacillus starter cultures to industrialise the Gari production process.
Keywords: Lactic acid bacteria; Starter cultures; Cassava; Gari; Fermentation

C. Valentin, F. Agus, R. Alamban, A. Boosaner, J.P. Bricquet, V. Chaplot, T. de Guzman, A. de Rouw, J.L. Janeau, D. Orange, K. Phachomphonh, Do Duy Phai, P. Podwojewski, O. Ribolzi, N. Silvera, K. Subagyono, J.P. Thiebaux, Tran Duc Toan, T. Vadari, Runoff and sediment losses from 27 upland catchments in Southeast Asia: Impact of rapid land use changes and conservation practices, Agriculture, Ecosystems & Environment, Volume 128, Issue 4, December 2008, Pages 225-238, ISSN 0167-8809, DOI: 10.1016/j.agee.2008.06.004.
(http://www.sciencedirect.com/science/article/B6T3Y-4SYKKRT-2/2/6e714d2c58ef952933e63b48abaac5b9)
Abstract:
Rapid changes in upland farming systems in Southeast Asia generated predominantly by increased population pressure and `market forces' have resulted in widespread land degradation that has been well documented at the plot scale. Yet, the links between agricultural activities in the uplands and downstream off-site effects remain largely unknown because of the difficulties in transferring results from plots to a larger scale. Many authors have thus pointed out the need for long-term catchment studies. The objective of this paper is to summarize the results obtained by the Management of Soil Erosion Consortium (MSEC) over the last 5 years from 27 catchments in five countries (Indonesia, Laos, Philippines, Thailand, and Vietnam). The purpose of the study was to assess the impacts of cultivation practices on annual runoff and erosion rates. Initial surveys in

each catchment included topography, soils and land use. Monitoring included climatic, hydrologic and erosion (total sediment yield including bed load and suspended sediment load) data, land use and crop yields, and farmers' income. In addition, new land management options were introduced through consultations with farmers and evaluated in terms of runoff and erosion. These included tree plantations, fruit trees, improved fallow with legumes, maize intercropped with legumes, planted fodder, native grass strips and agro-ecological practices (direct sowing and mulch-based conservation agriculture). Regressions analyses showed that runoff during the rainy season, and normalized runoff flow coefficient based on erosive rainfall during the rainy season (rainfall with intensity exceeding 25 mm h-1) increase with the percentage of the catchment covered by maize. Both variables decrease with increasing soil depth, standard deviation of catchment slope (that reflects terrain roughness), and the percentages of the catchment covered by fallow (regular and improved), tree plantations and planted fodder. The best predictors of sediment yield were the surface percentages of maize, Job's tears, cassava and footpaths. The main conclusions generated from this study were: (i) soil erosion is predominantly influenced by land use rather than environmental characteristics not only at the plot scale but also at the catchment scale; (ii) slash-and-burn shifting cultivation with sufficiently long rotations (1 year of cultivation, 8 years of fallow) is too often unjustly blamed for degradation; (iii) in its place, continuous cropping of maize and cassava promotes high rates of soil erosion at the catchment scale; (iv) conservation technologies are efficient in reducing runoff and total sediment yield at the catchment scale; (v) the adoption of improved soil management technologies by upland farmers is not a function of the degree of intensification of their farming system and/or of their incomes. The results suggest that if expansion of maize and cassava into already degraded upland systems were to occur due to increased demand for biofuels, there is a risk of higher runoff and sediment generation. A failure to adopt appropriate land use management strategies will result in further rapid resource degradation with negative impacts to downstream communities.
Keywords: Soil erosion; Upland rice; Maize; Cassava; Shifting cultivation; Steep slopes

A.M. Fermont, P.J.A. van Asten, K.E. Giller, Increasing land pressure in East Africa: The changing role of cassava and consequences for sustainability of farming systems, Agriculture, Ecosystems & Environment, Volume 128, Issue 4, December 2008, Pages 239-250, ISSN 0167-8809, DOI: 10.1016/j.agee.2008.06.009.
(http://www.sciencedirect.com/science/article/B6T3Y-4T3CPX4-1/2/8887f7a71a9c44d4cb1248e60f2fd524)
Abstract:
Increasing land pressure during the past three to four decades has transformed farming systems in the mid-altitude zone of East Africa. Traditional millet-, cotton-, sugarcane- and/or banana-based farming systems with an important fallow and/or grazing component have evolved into continuously cultivated cassava or cassava/maize-based systems. Within three to four decades, cassava cultivation increased from 1-11 to 16-55% of cropped fields in our six study sites. Declining soil fertility, and not labour or food shortage, was apparently the primary trigger for this transformation. The land use changes have increased nutrient offtakes and reduced nutrient recycling rates. Cassava and maize now account for 50-90% of nutrient removal. Whereas single-season fallows were the most important source of nutrient recycling on cropped fields in the past, currently cassava litterfall and maize stover contribute roughly 70% of nutrient recycling, with 50-70% of N, P and K recycled in cassava litterfall. This may explain why many farmers reason that cassava `rests' the soil. With increasing land use pressure farmers progressively use cassava as an `imitation fallow' throughout their farm. Farmers increasingly target cassava to poor fertility fields characterized by low pH and available P. High cassava intensities are nonetheless maintained on more fertile fields, probably to guarantee regeneration of soil fertility on all fields. Once cassava is targeted to poor fertility soils, farmers have run out of low-input management options and need to intensify management to maintain system productivity. As cassava is now

used by more farmers and on a larger acreage than fallowing in the studied farming systems, cassava cropping could perhaps serve as an excellent entry point to strengthen system sustainability.
Keywords: Cassava; East Africa; Soil fertility; Nutrient removal; System sustainability

Soad A.L. Bayoumi, Michael G. Rowan, Ian S. Blagbrough, John R. Beeching, Biosynthesis of scopoletin and scopolin in cassava roots during post-harvest physiological deterioration: The E-Z-isomerisation stage, Phytochemistry, Volume 69, Issue 17, December 2008, Pages 2928-2936, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2008.09.023.
(http://www.sciencedirect.com/science/article/B6TH7-4TWSB5W-1/2/30a731410c27541ba062a235e1fd05e9)
Abstract:
Two to three days after harvesting, cassava (Manihot esculenta Crantz) roots suffer from post-harvest physiological deterioration (PPD) when secondary metabolites are accumulated. Amongst these are hydroxycoumarins (e.g. scopoletin and its glucoside scopolin) which play roles in plant defence and have pharmacological activities. Some steps in the biosynthesis of these molecules are still unknown in cassava and in other plants. We exploit the accumulation of these coumarins during PPD to investigate the E-Z-isomerisation step in their biosynthesis. Feeding cubed cassava roots with E-cinnamic-3,2',3',4',5',6'-d5 acid gave scopoletin-d2. However, feeding with E-cinnamic-3,2',3',4',5',6'-d6 and E-cinnamic-2,3,2',3',4',5',6'-d7 acids, both gave scopoletin-d3, the latter not affording the expected scopoletin-d4. We therefore synthesised and fed with E-cinnamic-2-d1 when unlabelled scopoletin was biosynthesised. Solely the hydrogen (or deuterium) at C2 of cinnamic acid is exchanged in the biosynthesis of hydroxycoumarins. If the mechanism of E-Z-cinnamic acid isomerisation were photochemical, we would not expect to see the loss of deuterium which we observed. Therefore, a possible mechanism is an enzyme catalysed 1,4-Michael addition, followed by [sigma]-bond rotation and hydrogen (or deuterium) elimination to yield the Z-isomer. Feeding the roots under light and dark conditions with E-cinnamic-2,3,2',3',4',5',6'-d7 acid gave scopoletin-d3 with no significant difference in the yields. We conclude that the E-Z-isomerisation stage in the biosynthesis of scopoletin and scopolin, in cassava roots during PPD, is not photochemical, but could be catalysed by an isomerase which is independent of light.
Keywords: Manihot esculenta Crantz Family Euphorbiaceae; Cassava; Biosynthesis; Deuterium; Hydroxycoumarin; Isotopic labelling; Scopoletin; Scopolin; Spectroscopy; Post-harvest physiological deterioration

Li-ming Che, Dong Li, Li-jun Wang, Necati Ozkan, Xiao Dong Chen, Zhi-huai Mao, Rheological properties of dilute aqueous solutions of cassava starch, Carbohydrate Polymers, Volume 74, Issue 3, 4 November 2008, Pages 385-389, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.03.007.
(http://www.sciencedirect.com/science/article/B6TFD-4S2MHXF-3/2/3e1c438c34274df2a740a829ab8e77ba)
Abstract:
The effects of starch concentration on the rheological properties of dilute aqueous solutions of cassava starch were investigated. Cassava starch suspensions at different starch concentrations (0.2, 0.4, 0.6, 0.8, and 1.0 wt. %) were heated at 90 [degree sign]C for 1 h and then rapidly cooled to 25 [degree sign]C. The apparent viscosities of starch solutions were measured as a function of starch concentration. The cassava starch solution with a concentration of 0.2% showed Newtonian behavior, and as the concentration was increased beyond 0.4%, the solutions showed shear-thinning behavior. The flow behavior (apparent viscosity against shear rate) of the solutions was well described using a power law model. The consistency indices increased and the flow behavior indices decreased with the increasing of starch concentration. After storing the solutions at 25

[degree sign]C for 24 h, precipitation of starch took place instead of gelation. The volume of precipitation bed increased linearly with starch concentration.
Keywords: Rheological properties; Cassava starch; Solution

Rojan P. John, Dhanya Gangadharan, K. Madhavan Nampoothiri, Genome shuffling of Lactobacillus delbrueckii mutant and Bacillus amyloliquefaciens through protoplasmic fusion for l-lactic acid production from starchy wastes, Bioresource Technology, Volume 99, Issue 17, November 2008, Pages 8008-8015, ISSN 0960-8524, DOI: 10.1016/j.biortech.2008.03.058.
(http://www.sciencedirect.com/science/article/B6V24-4SH7DRD-2/2/14e94c8a01653d56ce34c32258114de9)
Abstract:
Current study was focused on the development of a non-fastidious lactic acid producing strain having better growth rate, low pH tolerance and good productivity by genome shuffling of a mutant strain of Lactobacillus delbrueckii NCIM 2025 and an amylase producing non-fastidious Bacillus amyloliquefaciens ATCC 23842. After the third cycle of the protoplast fusion, lactic acid production by few fusants was monitored and the best fusant was selected for further studies. Optimization of the important process parameters for lactic acid production was conducted using Plackett-Burman design and response surface methodology. Selected fusant could utilize the liquefied cassava bagasse starch directly with minimum nutrient supplementation for lactic acid production. During validation, 40 g/L of lactic acid was obtained (~96% conversion of starch to lactic acid) by using fusant inoculum (3%, v/v) from 83 g/L cassava bagasse (starch content 50% w/w) supplemented with yeast extract and peptone (0.2% each, w/v) and the buffering agent (2% CaCO3, w/v).
Keywords: Genome shuffling; Lactic acid production; Lactobacillus delbrueckii; Bacillus amyloliquefaciens; Strain improvement

S. Lertworasirikul, Drying kinetics of semi-finished cassava crackers: A comparative study, LWT - Food Science and Technology, Volume 41, Issue 8, November 2008, Pages 1360-1371, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.09.009.
(http://www.sciencedirect.com/science/article/B6WMV-4PTMY2N-2/2/8e6d9da8733b9f28fd2bff489c2ef49e)
Abstract:
Drying kinetics of semi-finished cassava crackers was investigated in this paper using a hot air dryer at seven levels of drying air temperatures in the rage of 50-80 [degree sign]C, a fixed air flow velocity using a fan speed of 0.18 kW, and a fixed level of thickness at 1.5 mm. A comparative study was performed among mechanistic and empirical models: the diffusion model, Newton model, Page model, Modified Page model, Henderson and Pabis model, MFNN (Multilayer Feedforward Neural Network), and ANFIS (Adaptive-Network-based Fuzzy Inference System), to estimate dynamic drying behaviors of semi-finished cassava crackers. Among these models, MFNN was found to be the most suitable for predicting moisture ratio of the product based on r2 (regression coefficient), and MSE (mean squared errors between the experimental data and predicted values).
Keywords: Cassava cracker; Drying process; Diffusion model; Artificial Neural Network; Fuzzy Inference System

P. Veiga-Santos, C.K. Suzuki, K.F. Nery, M.P. Cereda, A.R.P. Scamparini, Evaluation of optical microscopy efficacy in evaluating cassava starch biofilms microstructure, LWT - Food Science and Technology, Volume 41, Issue 8, November 2008, Pages 1506-1513, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.09.011.
(http://www.sciencedirect.com/science/article/B6WMV-4PV94M1-1/2/f37ec78af344508f44c2dfc296523467)
Abstract:

With the aim to evaluate optical microscopy efficacy as an imaging tool for evaluating bio-based films microstructure, plasticizing sugars (sucrose and inverted sugar), other additives (gelatin, soybean oil, sodium phosphate, and propylene glycol), and pH variation effect on cassava starch biofilms crystallization and phase separation during storage were investigated. Material crystallization, when using sucrose as additive, was observed through non-polarized and confirmed with polarized light microscopy. Scanning electron microscopy (SEM) and X-ray diffraction analysis have reinforced the observed results. Light microscopy also has indicated phase separation when soybean oil was added. Light microscopy analysis may be a fast and simple image tool to indicate crystallization and phase separation during bio-based materials storage.
Keywords: Biofilms; Microstructure; Optical microscopy; X-ray; SEM

Abdulrazak I. Baba, Fabio C.S. Nogueira, Camila B. Pinheiro, Juliana N. Brasil, Emmanuel S. Jereissati, Thiago L. Juca, Arlete A. Soares, Marise F. Santos, Gilberto B. Domont, Francisco A.P. Campos, Proteome analysis of secondary somatic embryogenesis in cassava (Manihot esculenta), Plant Science, Volume 175, Issue 5, November 2008, Pages 717-723, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2008.07.014.
(http://www.sciencedirect.com/science/article/B6TBH-4T5TPFR-1/2/1066a12b64e17f1f4d2c0e610e134028)
Abstract:
Using histological analysis of the induction of secondary somatic embryogenesis (SSE) in cassava (Manihot esculenta Crantz) as a guide, we performed 2-DE for protein separation and matrix-assisted laser desorption ionization-time of flight-tandem mass spectrometry (MALDI-TOF-TOF-MS) for protein identification in cotyledons of cassava somatic embryos undergoing SSE. Reference map obtained by 2-DE within a pH range of 3-10 and a size range of 6-97 kDa revealed approximately 410 eletrophoretically resolved spots populated primarily by acidic (pI < 7) proteins with molecular masses between 30 and 75 kDa. Tryptic digestion of 163 of the most abundant spots led to the identification of 86 proteins with a protein identification success rate of 53%. In total, 43% of the identified proteins were involved in metabolism and energy and 11.6% in protein destination and storage. Others are, disease/defense (11.6%), transcription and protein synthesis (7%), signal transduction (5.8%), cell growth/division (3.5%), transporters (3.5%), cell structure (2.3%), secondary metabolism (1.2%) and other functional classes (10.5%). Our studies demonstrate that 2-DE-based proteomic approaches combined with histological studies can serve as tools for identifying protein markers for the developmental stages of cassava SE while providing clues on the underlying causes of the low rate of conversion of cassava somatic embryos into mature plants.
Keywords: Manihot esculenta; Proteome analysis; Mass spectrometry; Somatic embryogenesis; Secondary somatic embryogenesis

Nguyen Van Dung, Tran Duc Vien, Nguyen Thanh Lam, Tran Manh Tuong, Georg Cadisch, Analysis of the sustainability within the composite swidden agroecosystem in northern Vietnam: 1. Partial nutrient balances and recovery times of upland fields, Agriculture, Ecosystems & Environment, Volume 128, Issues 1-2, October 2008, Pages 37-51, ISSN 0167-8809, DOI: 10.1016/j.agee.2008.05.004.
(http://www.sciencedirect.com/science/article/B6T3Y-4SWG0B5-1/2/2035afcd61479a625ade9b332eea034e)
Abstract:
Composite swiddening is defined as an agroecosystem that integrates upland rotating crop/fallow plots and downstream permanent wet rice fields into a single household resource system. Analyses of partial N, P, K nutrient balances in upland fields were followed over a 5-year period in northern Vietnam comparing two shifting cultivation intensities (4-year rice (Oryza sativa)-rice-

cassava-cassava (Manihot esculenta Crantz), and 2-year rice-cassava cropping cycles) and a secondary forest. Nutrient inputs by forest burning, seeds, atmospheric deposition and output by erosion, runoff, leaching, rice straw burning and off-take in crop produce were determined. Burning of a 12-year fallow plot resulted in only moderate nutrient recycling via ashes and unburned plant materials (12.5, 2.8 and 29.8 kg ha-1 of N, P, and K, respectively) but losses (off-take and atmospheric) from the field of 91, 82 and 70% of N, P, and K, respectively of nutrients contained in plant biomass. Economic yields of rice and cassava declined rapidly with successive cropping cycles. Average yearly atmospheric depositions amounted to 29, 7, and 37 kg ha-1 of total N, P, and K, respectively. Yearly runoff and erosion (7-23 Mg ha-1 year-1) were significantly higher from cropping systems than from secondary forest plots (0-3 Mg ha-1 year-1). Yearly nutrient balances in the experimental upland fields were negative for total N, P, and K during the cropping period but on average positive for N (7 kg ha-1 year-1) and P (4.1 kg ha-1 year-1) in the secondary forest. In the more intensively managed upland fields about 139, 11, and 1600 kg ha-1 of N, P, K, respectively were lost during 4 years of cropping, with less losses occurring in the 2-year cropping cycle. If nutrient losses from forest burning were also taken into account, the cumulative nutrient losses over 5 years were 247 N ha-1 and 23 kg P ha-1 in the 4-year cropping system. The main pathway of total nutrient losses was erosion during cropping cycles but runoff during fallow periods. Soil analysis confirmed declining organic matter and N contents with increasing cropping cycles and partial recovery during fallow phases. It was estimated that fallows lasting up to 37 (incl. recovery of N losses from burning) years would be needed to restore N, and up to 6 years to restore P balances. With current fallow periods being mostly substantially shorter (about 4-6 years) the negative nutrient balances and soil erosion pose a serious threat to long-term sustainability of these upland fields.
Keywords: Slash and burn; Shifting cultivation; Erosion; Run-off; Deposition; Nutrient losses; Vietnam

S. Jisha, G. Padmaja, S.N. Moorthy, K. Rajeshkumar, Pre-treatment effect on the nutritional and functional properties of selected cassava-based composite flours, Innovative Food Science & Emerging Technologies, Volume 9, Issue 4, October 2008, Pages 587-592, ISSN 1466-8564, DOI: 10.1016/j.ifset.2008.06.003.
(http://www.sciencedirect.com/science/article/B6W6D-4STGRW7-1/2/b32d10f8ebf498b8de295a8ad40c082e)
Abstract:
The low protein and lack of gluten in cassava (Manihot esculenta Crantz) are disadvantageous for its use for product development and is overcome through the use of composite flours incorporating cereal and/or legume flours. The functionality and nutritional attributes of cassava flour were altered in the present study by pre-treatment with termamyl and green gram amylase, pre-gelatinization and subsequent blending with cereals, legumes, bran sources etc. Malting of cassava flour with termamyl followed by pre-gelatinization reduced the starch and increased the sugar content of the mixes. Pre-gelatinization had little effect on the crude protein of the mixes; nevertheless, the fat content was higher by 0.15-1.0 units. Energy content was around 1176 and 1217 KJ/100 g for the rice bran added mixes from malted cassava, which slightly increased in the respective pre-gelatinized cassava mixes. The peak viscosity of termamyl treated cassava-based flour mixes was much lower than the respective gram amylase based mixes, indicating that the latter had much less amylolytic activity than termamyl and pre-gelatinization further reduced the viscosity. The very low viscosity for the enzyme treated cassava-based mixes was due to the inability for retrogradation of the hydrolyzed starch. Significant improvement in in vitro starch digestibility (IVSD) (enhancement by 5.0-16.0 units in termamyl treatment vs 5.0-9.0 units in gram amylase treatment) was observed for the pre-gelatinized mixes. Lowest IVSD (25-29 units) was for the two bran based mixes, suggesting its use in the nutrition therapy for controlling obesity linked diseases.Industrial relevance

With the development in human society, the incidence of chronic diseases like diabetes, cancer, cardiovascular problems and conditions like obesity contributing to several diseases is on the increase. This has led to an increasing awareness and research efforts on the development of functional foods, pharmafoods etc, which have wide potential application in medical nutrition therapy. The present work aims at improving the nutritional and functional attributes of cassava through fortification with cereal and/ or legume flours, bran sources etc. and through pre- treatment with enzymes to improve the functionality and reduce the energy content. The study led to the development of cassava based composite flours with low starch digestibility, high protein content and low energy content which could be effectively utilized for developing designer foods for obese and diabetic people. Enhanced digestibility of pre- gelatinized malted flours from cassava finds potential application for the development of foods for geriatric and convalescent people.
Keywords: Cassava; Composite flour; Cereals; Legumes; Bran Sources; Pre-Treatment; Nutritional and functional properties

Juliana Chacon, Santiago Madrinan, Daniel Debouck, Fausto Rodriguez, Joe Tohme, Phylogenetic patterns in the genus Manihot (Euphorbiaceae) inferred from analyses of nuclear and chloroplast DNA regions, Molecular Phylogenetics and Evolution, Volume 49, Issue 1, October 2008, Pages 260-267, ISSN 1055-7903, DOI: 10.1016/j.ympev.2008.07.015.
(http://www.sciencedirect.com/science/article/B6WNH-4T3VR68-1/2/a857254e2f04aa6cd10d293eb921c5d2)
Abstract:
From a phylogenetic perspective, the genus Manihot can be considered as an orphan group of plants, and the scientific knowledge acquired has been mainly related to cassava, one of the most important crops in poor tropical countries. The goal of the majority of evolutionary studies in the genus has been to decipher the domestication process and identify the closest relatives of cassava. Few investigations have focused on wild Manihot species, and the phylogeny of the genus is still unclear. In this study the DNA sequence variation from two chloroplast regions, the nuclear DNA gene G3pdh and two nuclear sequences derived from the 3'-end of two cassava ESTs, were used in order to infer the phylogenetic relationships among a subset of wild Manihot species, including two species from Cnidoscolus as out-groups. Maximum parsimony and Bayesian analyses were conducted for each data set and for a combined matrix due to the low variation of each region when analyzed independently. A penalized likelihood analysis of the chloroplast region trnL-trnF, calibrated with various age estimates for genera in the Euphorbiaceae extracted from the literature was used to determine the ages of origin and diversification of the genus. The two Mesoamerican species sampled form a well-defined clade. The South American species can be grouped into clades of varying size, but the relationships amongst them cannot be established with the data available. The age of the crown node of Manihot was estimated at 6.6 million years ago. Manihot esculenta varieties do not form a monophyletic group that is consistent with the possibility of multiple introgressions of genes from other wild species. The low levels of variation observed in the DNA regions sampled suggest a recent and explosive diversification of the genus, which is confirmed by our age estimates.
Keywords: Wild Manihot species; Cassava; Cnidoscolus; Euphorbiaceae; Bayesian and maximum parsimony methods; Molecular phylogenetics; Molecular dating; Cerrado

A. Saidou, D. Kossou, L. Brussaard, P. Richards, T.W. Kuyper, Earthworm activities in cassava and egusi melon fields in the transitional zone of Benin: linking farmers' perceptions with field studies, NJAS - Wageningen Journal of Life Sciences, Volume 56, Issues 1-2, October 2008, Pages 123-135, ISSN 1573-5214, DOI: 10.1016/S1573-5214(08)80020-6.
(http://www.sciencedirect.com/science/article/B94T2-4WJRNXP-9/2/dfe6382dc658af8a8983bb061e0c766a)
Abstract:

Farmers' perceptions of earthworm activities were studied in the transitional zone of Benin and linked to scientific explanations of earthworm casting activities. Earthworm activity was assessed in farmers' fields with three different cassava cultivars and in a field experiment with three different egusi melon species. The experiment included plots with cowpea and maize. The study also comprised group discussions and a survey with 91 individual farmers. All farmers were aware of earthworms, but there were significant gender differences in terms of perception of earthworms. The presence of earthworm casts is used by farmers as an indicator of soil fertility and of good conditions for crop growth. Cast production over a period of two months was highest in fields with maize, followed by cowpea, cassava and egusi melon. Farmers' ranking of earthworm abundance showed a pattern almost the opposite of our assessment, with cassava and egusi melon fields being ranked highest and those with maize and cowpea lowest. We suggest that farmer's criteria are context-dependent, with earthworm casting activity being relevant when judging whether a field can be intensively cropped again. Casts showed significantly higher plant nutrient contents than the topsoil. Nevertheless, the amount of nutrients recycled in casts is relatively low. Farmer involvement in the research activity increased their interest in earthworms.
Keywords: cast enrichment; local ideas; science-based explanation; soil fertility; surface cast

T. Noda, S. Takigawa, C. Matsuura-Endo, T. Suzuki, N. Hashimoto, N.S. Kottearachchi, H. Yamauchi, I.S.M. Zaidul, Factors affecting the digestibility of raw and gelatinized potato starches, Food Chemistry, Volume 110, Issue 2, 15 September 2008, Pages 465-470, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.02.027.
(http://www.sciencedirect.com/science/article/B6T6R-4RW43CN-4/2/a0629c045a9f7a355ef5a739b9043765)
Abstract:
The enzymatic digestibilities of raw and gelatinized starches in various potato starches, as well as sweet potato, cassava, and yam starches, were estimated, along with other starch properties, such as the phosphorus content, median granule size, and rapid visco analyzer (RVA) pasting properties. Furthermore, correlation coefficients were calculated between the hydrolysis rates (HR) by amylase and other starch quality parameters. A larger granule size was closely associated with a lower HR in raw starch, while the HR in gelatinized starch did not correlate with the median granule size. An increase in phosphorus content resulted in a definitely lower HR in raw starch and tended to decrease the HR in gelatinized starch for the composite of potato and other starches. In contrast, no correlation coefficients of the phosphorus content with the HRs in raw and gelatinized starches were observed within potato starches. Starches with higher peak viscosity and breakdown showed a lower HR in raw starch, while few or no effects of these RVA parameters on the HR in gelatinized starch were observed for the composite of potato and other starches or among potato starches, respectively.
Keywords: Potato starch; Digestibility; Phosphorus content; Granule size; Pasting properties

Kaewta Kaewtatip, Varaporn Tanrattanakul, Preparation of cassava starch grafted with polystyrene by suspension polymerization, Carbohydrate Polymers, Volume 73, Issue 4, 5 September 2008, Pages 647-655, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.01.006.
(http://www.sciencedirect.com/science/article/B6TFD-4RKTNC6-3/2/618a61e9ae72091acfdfd400841d3985)
Abstract:
Cassava starch grafted with polystyrene (PS-g-starch) copolymer was synthesized via free-radical polymerization of styrene by using suspension polymerization technique. Potassium persulfate (PPS) was used as an initiator and water was used as a medium. The graft copolymer was characterized by Fourier transform infrared spectroscopy, differential scanning calorimetry, thermal gravimetric analysis, X-ray diffraction and scanning electron microscopy. The sub-micron spherical beads of PS were observed on the surface of starch granules. SEM micrographs showed porous

patches of PS adhering on the starch granules after Soxhlet extraction. FTIR spectra also indicated the presence of PS-g-starch copolymer. XRD analysis exhibited insignificant changes in crystalline structure and degree of crystallinity. The effects of starch:styrene weight ratio, amount of PPS, reaction time and reaction temperature on the percentage of grafting - G (%), were investigated. G (%) increased with increasing starch content. Other variables showed their own individual optimal values. The optimum condition yielding 31.47% of G (%) was derived when the component ratio was 1:3 and reaction temperature and time were 50 [degree sign]C and 2 h, respectively. Graft copolymerization did not change granular shape and crystallinity of starch. This study demonstrated the capability of polymerization of styrene monomer on the granular starch without emulsifier and the synthesis of graft copolymer without gelatinization of starch.
Keywords: Cassava starch; Polystyrene; Biodegradable polymer; Graft copolymer; Bioplastic

Laurence Mondolot, Amandine Marlas, Damien Barbeau, Annick Gargadennec, Benoit Pujol, Doyle McKey, Domestication and defence: Foliar tannins and C/N ratios in cassava and a close wild relative, Acta Oecologica, Volume 34, Issue 2, September-October 2008, Pages 147-154, ISSN 1146-609X, DOI: 10.1016/j.actao.2008.05.009.
(http://www.sciencedirect.com/science/article/B6VR3-4SVD1JS-3/2/4f24c09975ffb833599d3c659bef2e9c)
Abstract:
Plant domestication is accompanied by shifts in resource allocation, as a result of farmer selection for genotypes that give high yields in agricultural habitats. Relaxed natural selection for chemical and physical defences in these habitats could facilitate resource allocation to yield. We compared the concentrations of tannins, and C/N ratios, which are often correlated with investment in cell-wall compounds, in leaves of landraces of domesticated cassava (Manihot esculenta) and a close wild relative in French Guiana. Foliar concentrations of tannins were about 1.9 times higher in the wild relative than in domesticated cassava. Histochemical analyses showed that tannins were present in nearly all palisade and spongy parenchyma cells of the wild taxon, but in only some cells of these tissues in M. esculenta. C/N ratios were also 1.9 times higher in leaves of the wild relative than in those of domesticated cassava. Tannins accounted for only a small proportion of total carbon, and the higher C/N ratio in wild than in domesticated cassava may reflect higher investment in carbon-containing compounds additional to tannins, such as cell-wall compounds. The divergence in these traits between cassava and this close wild relative mirrors a broad pattern observed in wild plant species across habitats varying in resource availability. One explanation for our results is that domestication in cassava may have favoured a shift from a resource conservation strategy to a resource acquisition strategy.
Keywords: Agricultural environments; Domestication; Leaf construction strategy; Manihot; Resource allocation

Min Wang, Yuan Hu, Zhiliang Tan, Shaoxun Tang, Zhihong Sun, Xuefeng Han, In situ ruminal phosphorus degradation of selected three classes of feedstuffs in goats, Livestock Science, Volume 117, Issues 2-3, September 2008, Pages 233-237, ISSN 1871-1413, DOI: 10.1016/j.livsci.2007.12.016.
(http://www.sciencedirect.com/science/article/B7XNX-4RJ4KW1-1/2/ce965cdeb24f7c8072b815d75491a542)
Abstract:
Three 4-month-old growing wether goats were used to determine the ruminal P degradability of three classes of feedstuffs with in situ nylon bag technique. Three classes of feedstuffs were cereal (maize, wheat, barley, buckwheat, rice, millet, and sorghum), legume (horsebean, soybean, pea, mungbean, and jequirity) and tuber (potato, sweat potato, and cassava). The experiment consisted of 15 periods. During each period, the ruminal P disappearance of each one of these feedstuffs was measured at 0, 2, 4, 8, 12, 24 and 36 h, respectively. The exponential model of

Orskov and McDonald was employed to estimate degradation kinetics. Results showed that the degradability of feed P ranged from 805 to 986 g/kg P. Effective degradability of P generally exceeded 830 g/kg P, except for rice and millet. This updates the feed database of in situ P degradability in China, which would play an important role in improving biological P efficiency for modern ruminant production system.
Keywords: Feedstuffs; In situ ruminal degradability; Phosphorus; Goat

Khuc Thi Hue, Do Thi Thanh Van, Inger Ledin, Effect of supplementing urea treated rice straw and molasses with different forage species on the performance of lambs, Small Ruminant Research, Volume 78, Issues 1-3, August 2008, Pages 134-143, ISSN 0921-4488, DOI: 10.1016/j.smallrumres.2008.05.010.
(http://www.sciencedirect.com/science/article/B6TC5-4T1SFMY-1/2/80f603b30c45226cd16520df91182556)
Abstract:
Weaned lambs of the Phan Rang breed with an initial weight of 14.9 kg and 3.5 months of age were used to study the effect of supplementing urea treated rice straw (UTRS) and molasses with different forage species as protein sources compared to a commercial concentrate with respect to digestibility, growth performance and number of gastro-intestinal parasite eggs. Eight males were used in a digestibility trial in a double 4 x 4 Latin square design and 32 lambs (12 males and 20 females) in a growth trial lasting 84 days. The treatments were four diets containing urea treated rice straw ad lib and molasses supplemented with concentrate (control), Stylosanthes (Stylosanthes guianensis) forage (UTR-S), Cassava (Manihot esculenta Crantz) foliage (UTR-C) or Jackfruit (Artocarpus heterophyllus) foliage (UTR-J). The live weight gain (LWG) was 73.3, 70.0, 77.7 and 70.2 g/day and the feed conversion ratio 9.3, 9.0, 7.5, 10.4 kg DM/kg LWG for control, UTR-S, UTR-C and UTR-J, respectively. The DM intake ranged from 33 to 44 g DM/kg body weight. The DM digestibility was 0.66, 0.55, 0.60 and 0.54 and the CP digestibility 0.64, 0.65, 0.67 and 0.52 for the control, UTR-S, UTR-C and UTR-J, respectively. The nitrogen retained was 10.4, 9.8, 10.9 and 9.8 g/day for the diets control, UTR-S, UTR-C and UTR-J, respectively, and was not significantly different among treatments. The UTR-C and UTR-J diets had a weak effect on the number of Nematode eggs, which was reduced or slightly increased during the experimental period. In conclusion Stylosanthes forage and Cassava and Jackfruit foliage could be used as protein sources in diets based on urea treated rice straw and replace a commercial concentrate without any effect on the live weight gain of the lambs.
Keywords: Urea treated rice straw; Molasses; Stylosanthes guianensis; Manihot esculenta Crantz; Artocarpus heterophyllus; Lambs; Growth; Digestibility; Parasites

P. Podwojewski, D. Orange, P. Jouquet, C. Valentin, Van Thiet Nguyen, J.L. Janeau, Duc Toan Tran, Land-use impacts on surface runoff and soil detachment within agricultural sloping lands in Northern Vietnam, CATENA, Volume 74, Issue 2, 15 July 2008, Pages 109-118, ISSN 0341-8162, DOI: 10.1016/j.catena.2008.03.013.
(http://www.sciencedirect.com/science/article/B6VCG-4SM1WWD-1/2/c256cb79b817a7dc73fe46fec94652c2)
Abstract:
Two consecutive years of investigation on soil surface features, surface runoff and soil detachment within 1-m2 microplots on 40% slope highlighted the effects of land-use change, vegetation cover and biological activity on the water pathways in Northern Vietnam. Three replicate plots were set up on each of five land-uses: cassava (CAS), grass fodder of Bracharia ruziziensis (BRA), a 3-year old fallow (FAL), tree stands of Acacia mangium and Venicia montana (FOR), and a fallow with regrowth of Eucalyptus regularly cut (EUC). The second year, two of the microplots under FAL and EUC were treated with herbicide (FALh, EUCh), one of them was burnt (FALh+b, EUCh+b). The highest yearly surface runoff coefficient of 16%, and soil detachment rate of 700 g

m- 2 yr- 1 in average with a maximum of 1305 g m- 2 yr- 1 have been recorded under CAS. On FALh and FALh+b, runoff ratios were 8.7 and 13.5%, respectively and detachment rates were 86 and 389 g m- 2. On FAL and BRA the yearly runoff ratio varied from 5.9 to 9.8% but the detachment rate was limited at 24 to 35 g m- 2. FOR and EUC annual runoff was <= 3.1% and annual soil detachment <= 71 g m- 2. These values were very low compared to the values reported on steep slopes in Laos within similar climate and vegetation cover.
The runoff and detachment rates underlined the importance of rainfall intensities, soil physical properties, soil surface features, soil vegetation cover and biological activity. The annual surface runoff was highly correlated to the soil surface crusting. CAS and BRA plots were prone to crusting especially after weeding at the onset of the rainy season, when the soil surface was still uncovered. Soil bioturbation (earthworm casting activity) was the second factor that explains local variation of surface runoff and soil detachment. The continuous production of earthworms casts on soil surface, especially on FOR and EUC microplots, induced a marked surface roughness and reduced the surface runoff. The production of casts was very limited in FAL and completely absent in CAS microplots. So it is evident that our results confirm the deleterious effects of cassava on soil and water conservation.
Keywords: Cassava; Earthworms; Land-use; Sloping lands; Soil detachment; Surface runoff; Vietnam

Sabrina S. Paes, Iryna Yakimets, John R. Mitchell, Influence of gelatinization process on functional properties of cassava starch films, Food Hydrocolloids, Volume 22, Issue 5, July 2008, Pages 788-797, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2007.03.008.
(http://www.sciencedirect.com/science/article/B6VP9-4NC4MD0-1/2/83ec99f5797746527ad1a58bee5aac1a)
Abstract:
The effect of the paste preparation conditions on the properties of cassava starch paste and its films was investigated. Films were prepared by casting starch pastes gelatinized under eight different conditions: 70, 80, 90 or 100 [degree sign]C at high (18,000 rpm) and low shear rate (150 rpm). The pasting properties measured by the Rapid Visco Analyzer (RVA) showed a peak at heating temperature of 80 [degree sign]C. It was shown that the use of a high shear affected all mechanical properties determined by tensile tests, which were lower for all temperatures compared to the films prepared using low shear. Furthermore, films prepared at different temperatures and high shear showed a high scattering of data for all mechanical parameters (elasticity modulus, strain at break and maximum stress). The films prepared with low shear also showed high scattering for the strain at break at low moisture contents (RH<45%). It was shown that different methods of paste preparation resulted in different film structures. For mild conditions (lower temperature, low shear), the effect of paste preparation on the film properties was related to the presence of remnants of the granules or ghosts in different extents. On the other hand, in the case of severe conditions (higher temperatures, high shear), this effect was due to phase separation in amylose- and amylopectin-rich regions. The importance of use of standard preparation method for starch films was demonstrated.
Keywords: Cassava; Mechanical properties; Gelatinization; Films

Marek Sikora, Stanislaw Kowalski, Piotr Tomasik, Binary hydrocolloids from starches and xanthan gum, Food Hydrocolloids, Volume 22, Issue 5, July 2008, Pages 943-952, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2007.05.007.
(http://www.sciencedirect.com/science/article/B6VP9-4NTBFN2-1/2/0db7b2064b7760be3b613d720b5c5252)
Abstract:
Brabender viscography and flow curves were taken for cassava, corn, oat and potato starch-xanthan gum binary blends of widely varying component proportions. Xanthan gum causing water

deficiency in the granule environment complicated the course of gelation. Thermodynamic incompatibility of starches and that of gum additionally complicated the pattern of the Brabender characteristics of gelation. Consistency of the gels and their flow properties non-linearly depended on gel composition.
Keywords: Cassava starch; Cornstarch; Mixed gels; Oat starch; Potato starch; Rheology; Xanthan gum

T.A. Shittu, A. Dixon, S.O. Awonorin, L.O. Sanni, B. Maziya-Dixon, Bread from composite cassava-wheat flour. II: Effect of cassava genotype and nitrogen fertilizer on bread quality, Food Research International, Volume 41, Issue 6, July 2008, Pages 569-578, ISSN 0963-9969, DOI: 10.1016/j.foodres.2008.03.008.
(http://www.sciencedirect.com/science/article/B6T6V-4S39MM7-1/2/7d45421a9b2bca10417ced523c51920c)
Abstract:
There is an increasing interest in the use of cassava roots for food and industrial purposes especially in the baking industry in Nigeria. Development of some cassava mosaic disease (CMD) resistant clones and application of inorganic fertilizers are principal strategies targeted in the country to boost and sustain cassava root production and utilization. A study was conducted to determine the effect of cassava genotype and field application of nitrogen fertilizer on some physical properties of bread from composite cassava-wheat (CCW) flour. Five CMD cassava clones were planted in a randomized complete block design with two level of fertilizer treatments (0 and 160 kg nitrogen/ha) with two replications while harvesting was done 12 months after planting. Composite flour was produced at a ratio of 10/90 (cassava/wheat flour, w/w). The oven spring, specific volume, crumb texture (softness) and crumb moisture of loaves ranged from -0.57 to 0.63 cm, 4.37 to 6.85 cm3/g, 18.4 to 29.4 mm and 31.40% to 34.70%, respectively. The crust's tristimulus color parameters L*, a*, b* and brownness index also ranged from 54 to 67, 9 to 15, 22 to 29, and 57 to 83, respectively. These values differed significantly from each other at $p < 0.01$. Out of all these loaf properties, crumb texture was the most affected by the main and interactive effects of cassava genotype and fertilizer application ($p < 0.001$) while loaf weight was only affected by their interactive effects ($p < 0.05$). Digital image analysis of the bread crumb showed that the total number of cells, number of small cells and total cell area of the bread crumb ranged from about 22 to 27 cm-3, 20 to 25 cm-3 and 12% to 29%, respectively. The distribution of large cells and total cell area occupied in the crumb were principally determined by the genotypic difference ($p < 0.05$) in the cassava roots. The main effect of fertilizer application significantly affected the distribution of small cells, total number of cell and the cell area ($p < 0.05$). However, the interactive effects of genotype and fertilizer application was more significant ($p < 0.01$) on the crumb cell characteristics. The study indicated that optimal quality of CCW bread loaf could be attained by appropriate selection of cassava genotype and fertilizer application.
Keywords: Cassava; Wheat; Composite bread; Physical properties; Image analysis

G. Lorenzo, N. Zaritzky, A. Califano, Optimization of non-fermented gluten-free dough composition based on rheological behavior for industrial production of 'empanadas' and pie-crusts, Journal of Cereal Science, Volume 48, Issue 1, July 2008, Pages 224-231, ISSN 0733-5210, DOI: 10.1016/j.jcs.2007.09.003.
(http://www.sciencedirect.com/science/article/B6WHK-4PNM47W-1/2/a1a1d8a0b79be5f1e6d3fc72dcab4ec6)
Abstract:
Celiac disease is an autoimmune disorder caused by intolerance to gluten, which is found in wheat and similar proteins in barley, rye and oats. The present study was designed to examine the effects of the addition of gums, whey protein concentrate, dry egg, and water to corn and cassava starches on the rheological properties of a non-fermented dough used for the production of

'empanadas' (a traditional meal in Latin America) and pie-crusts suitable for people with celiac disease. A 24 full factorial design was chosen. Viscoelastic measurements and texture analysis (puncture and elongation tests) were performed. The increase in gums content and the decrease in water level produced an increase in both moduli (G' and G") and a more elastic dough was obtained. Higher protein contents interfered with the formation of the three-dimensional gum network making the dough less ductile. Texture analysis led to similar conclusions to those obtained by dynamic rheological analysis. Formulations containing higher percentages of gums and lower water content led to an appropriate behavior for industrial production of these doughs.
Keywords: Gluten-free dough; Texture; Rheology; Hydrocolloids

W. Schiettecatte, L. D'hondt, W.M. Cornelis, M.L. Acosta, Z. Leal, N. Lauwers, Y. Almoza, G.R. Alonso, J. Diaz, M. Ruiz, D. Gabriels, Influence of landuse on soil erosion risk in the Cuyaguateje watershed (Cuba), CATENA, Volume 74, Issue 1, 15 June 2008, Pages 1-12, ISSN 0341-8162, DOI: 10.1016/j.catena.2007.12.003.
(http://www.sciencedirect.com/science/article/B6VCG-4RWK0B9-1/2/faef1d91cd4532b26a83e81527da8c21)
Abstract:
Landuse changes may dramatically enhance erosion risk. Besides deforestation, also arable landuse may have an important influence on soil loss. We investigated the erosion risk in a 151 km2 subwatershed of the Cuyaguateje watershed (Cuba) using the RUSLE model. It was found that the valleys used for agriculture have the highest erosion risk, with actual erosion surpassing soil loss tolerance. Over the period 1985-2000, about 14 km2 of forest has been converted into arable land. As a result, the area with a very high erosion risk increased with 12%. On arable land it was found that the crop management factor C of a 'tobacco/maize' rotation was 0.478, compared to 0.245 for a rotation of various crops (sweet potato, beans, maize, cassava and fallow). When maize in the 'tobacco/maize' rotation was intercropped with a leguminous crop (hyacinth bean) the C factor decreased to a value of 0.369. Also contouring may halve soil loss on moderate slopes (< 10%) when high ridges are applied, which is in Cuba generally the case for maize, cassava and sweet potato.
Keywords: RUSLE; C factor; Soil loss; Erosivity

Pascal Jouquet, Pascal Podwojewski, Nicolas Bottinelli, Jerome Mathieu, Maigualida Ricoy, Didier Orange, Toan Duc Tran, Christian Valentin, Above-ground earthworm casts affect water runoff and soil erosion in Northern Vietnam, CATENA, Volume 74, Issue 1, 15 June 2008, Pages 13-21, ISSN 0341-8162, DOI: 10.1016/j.catena.2007.12.006.
(http://www.sciencedirect.com/science/article/B6VCG-4RTKMWR-1/2/cc7fb2284c20b2eb3f98311b74458c1c)
Abstract:
This manuscript focuses on the effects of above-ground earthworm casts on water runoff and soil erosion in steep-slope ecosystems in Northern Vietnam. We investigated the effects of Amynthas khami, an anecic species producing above-ground casts of prominent size, on water infiltration and soil detachment along a land-use intensification gradient: a cultivation of cassava (Mahinot esculenta; CAS), a plantation of Bracharia (Bracharia ruzziziensis; BRA), a fallow (FAL), a fallow after a forest of Eucalyptus sp. (EUC) and a plantation of trees (Acacia mangium and Venicia Montana; FOR). Two scales of studies were considered: (i) at the structure scale (cm2), a water runoff simulation was used to differentiate the effects of casts, free biogenic aggregates that previously belong to casts, and free physicogenic aggregates; (ii) at the station levels, 1-m2 plots were used to determine runoff and soil detachment rates during the rainy season in 2005.
A. khami was sensitive to land-use management. Earthworm density was low in all the fields (0-1 ind m- 2). The highest densities were found in EUC and FOR and no individual was found in CAS. As a consequence, soil surface in EUC and FOR was covered with casts and free biogenic

aggregates (approximately 22 and 8 kg m- 2, respectively). In FAL and BRA, casts covered the soil only sparsely with < 3 kg m- 2. In CAS, soil surface was characterized by free physicogenic aggregates that might be produced by human activity or endogeic earthworms through tillage (approximately 1 kg m- 2). Water runoff simulation clearly showed an enhancement of water infiltration with earthworm casting activity. Water runoff was more decreased with casts (R2 = 0.26) than free biogenic aggregates (R2 = 0.49). Conversely, physicogenic aggregates were not associated with higher water infiltration. Analyses of runoff and soil detachment rates during the rainy season underlined that the more land-use type have aggregates on soil surface and the less important is surface runoff (R2 = 0.922). Conversely, no relation occurred between aggregates and soil detachment rate. While above-ground casting activity decreased surface runoff, they were not involved in soil detachment, and therefore soil erosion.
Keywords: Erosion; Earthworms; Above-ground casts; Land-use change; Water runoff; Soil detachment

Simone Palma Favaro, Adelaide Beleia, Nelson da Silva Fonseca Junior, Keith William Waldron, The roles of cell wall polymers and intracellular components in the thermal softening of cassava roots, Food Chemistry, Volume 108, Issue 1, 1 May 2008, Pages 220-227, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.10.070.
(http://www.sciencedirect.com/science/article/B6T6R-4R1MF6G-1/2/8333d0f3457d7bab17868eb0e7ac2057)
Abstract:
Cassava varieties Iapar 19 - Pioneira (short cooking time, domestic vegetable), Taquari (medium-to-long cooking time, domestic vegetable), and Branca de Santa Catarina (long cooking time, industrial vegetable), were selected in order to investigate the cell wall and compositional basis for these textural differences. Pioneira had lower levels of Ca2+ and Mg2+, and higher levels of phytic acid and monovalent cations than the longer cooking time varieties. Detailed cell wall analysis indicated that the longer cooking Branca cultivar had higher levels of chelator-insoluble pectic polysaccharides. The potential causative roles of these different features were evaluated using vortex-induced cell separation (VICS) studies. Time to achieve the complete VICS of Branca cultivar was reduced to that of Pioneira with externally-supplied chelating agents (CDTA) and Na2CO3. Taquari roots did not respond in this way indicating a different biochemical basis for the maintenance of cell adhesion. The results are discussed in relation to the thermal stability of texture in these cassava varieties.
Keywords: Manihot esculenta Crantz; Monosaccharides; Phytic acid; Minerals; Cell adhesion

F.A. Oguntoyinbo, Evaluation of diversity of Candida species isolated from fermented cassava during traditional small scale gari production in Nigeria, Food Control, Volume 19, Issue 5, May 2008, Pages 465-469, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2007.05.010.
(http://www.sciencedirect.com/science/article/B6T6S-4NWCGSX-1/2/219d042b29185c26224b72297f933d40)
Abstract:
The yeast population dynamics during cassava fermentation at different time regimes was determined and the Candida species isolated from the fermented mash were identified using combined phenotypic and genomic methods. The yeast population increases as the fermentation progresses with corresponding pH reduction mediated by lactic acid bacteria and yeast co-metabolism. The phenotypic characteristic of the Candida species isolated from fermented cassava during gari production in Nigeria was determined using the sugar fermentation profile of the API 20AUX that generated the phenotypic identity of Candida species as Candida guilliermondii, Candida krusei, Candida maris, Candida galabrata. Only strain 1RB identified phenotypically as C. guilliermondii fermented all the sugars except inositol and lactose. Although, the strain 2RB identified by the API 20AUX as C. maris fermented galactose, all other strains could

only ferment glucose with the presence of pseudohypae. The result of the comparison of the 18S rDNA gene sequencing with the blast database identified the strains of C. guilliermondii 100% C. krusei 98%, Candida inconspicua 100%, Candida rugopelliculosa 98%. The results also demonstrated that different strains of Candida species participated in the traditional fermentation of cassava and differentiated C. krusei from C. inconspicua using the 18S rDNA gene sequencing. C. inconspicua has not been previously reported due to its phenotypic relatedness to C. krusei. C. inconspicua may not be a good candidate to be selected as starter culture due to its medical importance; it must be genetically differentiated from the diverse strains of C. krusei that participated in the fermentation.
Keywords: Cassava; Characterization; Fermentation; Candida

I.S.M. Zaidul, N. Absar, S.-J. Kim, T. Suzuki, A.A. Karim, H. Yamauchi, T. Noda, DSC study of mixtures of wheat flour and potato, sweet potato, cassava, and yam starches, Journal of Food Engineering, Volume 86, Issue 1, May 2008, Pages 68-73, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.09.011.
(http://www.sciencedirect.com/science/article/B6T8J-4PNM44P-3/2/931418b0cc2d82362788ca5cabad4ef7)
Abstract:
Differential scanning calorimetry (DSC) traces at a 30 wt% suspension were studied for mixture of wheat flour and following starches: potato (PS), sweet potato (SPS), yam (YS), and cassava (CS) at 10% to 50% starch. In the endothermal transition, the gelatinization peak temperature of the first peak (TP1) was attributed to the wheat flour and that of the second peak (TP2), to the starches. The TP1 of the control wheat flour was lower (62.6 [degree sign]C) than the TP2 of the control PS (67.1 [degree sign]C), SPS (77.6 [degree sign]C), YS (67.2 [degree sign]C), and CS (69.7 [degree sign]C). In the endotherm of the mixtures, the TP1 was always closer to that of control wheat (about 62 [degree sign]C). In contrast, the TP2 of the mixtures was always shifted towards higher values than those of the control starches. However, the TP2 was found to be lower as the starch in the mixtures was increased, and the values ranged from 68.6 to 69.4 [degree sign]C, 80.1 to 82.2 [degree sign]C, 69.3 to 70.7 [degree sign]C, and 73.3 to 74.3 [degree sign]C for the wheat-PS, wheat-SPS, wheat-YS, and wheat-CS mixtures, respectively, at 10% to 50% starch. The apparent shifting towards higher temperatures resulted in a more prominent biphasic gelatinization behavior due to the influence of the wheat gluten in the mixtures of wheat flour and starches.
Keywords: Wheat flour; Tuber and root starches; Substitution; Gelatinization temperature

Carmen M.O. Muller, Fabio Yamashita, Joao Borges Laurindo, Evaluation of the effects of glycerol and sorbitol concentration and water activity on the water barrier properties of cassava starch films through a solubility approach, Carbohydrate Polymers, Volume 72, Issue 1, 3 April 2008, Pages 82-87, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2007.07.026.
(http://www.sciencedirect.com/science/article/B6TFD-4P9SNFC-3/2/563373c225f776c01fe76b20e0250aa8)
Abstract:
The effects of glycerol and sorbitol on the water sorption isotherms and water vapor permeability (Kw) of cassava starch films prepared by casting were investigated. Kw values were determined in three ranges of relative humidity, RH, (2-33%, 33-64% and 64-90%) and the GAB model was used to fit experimental water sorption isotherms. These data were used to determine the relative influence of the diffusion coefficient of water (Dw) and the average solubility coefficient () of water in the films on the Kw value. In all cases, an increase in Kw values were observed with increasing plasticizer concentration and RH. The Dw, and Kw values of films prepared with glycerol were greater than those of films prepared with sorbitol. For high RH, the values increased 6-fold for films with glycerol and 7-fold for films with sorbitol, while Dw values did not change significantly. These results indicate that Kw values are dependent on the solubility coefficient () of water in the film,

which is not consistent with the proposal that an opening of polymer chains promoted by plasticizers leads to an increase in Dw and Kw.
Keywords: Starch films; Water permeability; Solubility approach

Prabha K. Padmavathiamma, Loretta Y. Li, Usha R. Kumari, An experimental study of vermi-biowaste composting for agricultural soil improvement, Bioresource Technology, Volume 99, Issue 6, April 2008, Pages 1672-1681, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.04.028.
(http://www.sciencedirect.com/science/article/B6V24-4NXGS8D-2/2/892776f54c2bd900e5798b72cdac2404)
Abstract:
Vermitechnology was investigated as a means of reducing organic waste materials. Vermicomposting conditions were optimized to convert the biowastes to nutritious composts for amending agricultural soil. Studies were undertaken to select the most suitable earthworm species for vermicomposting, to enrich vermicompost by inoculation with beneficial microbes, to standardize an economically feasible method of vermicomposting, to achieve nutrient economy through vermicompost application in acid soils (pH 4.5), and to assess the performance of vermicompost as a bioinoculant in cow-pea, banana, and cassava. Earthworm species Eudrillus eugineae, Eisenia foetida, Perionyx sansibaricus, Pontoscolex corethrurus and Megascolex chinensis were compared for their efficiencies in biodegrading organic wastes. E. eugineae was found to be a superb agent. As a bioinoculant, vermicompost increased nitrogen and phosphorous availability by enhancing biological nitrogen fixation and phosphorous solubilisation. Vermicompost-amended acid-agriculture-soil significantly improved the yield, biometric character and quality of banana, cassava and cow-pea. Vermicompost application stimulated root growth, facilitating nutrient absorption and thereby favouring higher yield.
Keywords: Vermicomposting; Eudrillus eugineae; Humification indices; Bioinoculant; Nutrient enrichment

Pablo R. Salgado, Vivian C. Schmidt, Sara E. Molina Ortiz, Adriana N. Mauri, Joao B. Laurindo, Biodegradable foams based on cassava starch, sunflower proteins and cellulose fibers obtained by a baking process, Journal of Food Engineering, Volume 85, Issue 3, April 2008, Pages 435-443, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.08.005.
(http://www.sciencedirect.com/science/article/B6T8J-4PF1W6W-1/2/c736208650bcdf565f8fcd142113aeac)
Abstract:
Biodegradable food packaging trays made from cassava starch, sunflower proteins and cellulose fibers were obtained by a foam baking process. The effect of varying the proportions of these three components on physico-chemical and mechanical properties of the trays was studied, as was the relationship between these properties and the trays' microstructure. All trays presented thicknesses between 1.55 and 1.76 mm, and densities between 0.46 and 0.59 g/cm3. The increment of fiber concentration from 10% to 20% w/w improved the mechanical properties and slightly reduced the post-pressing moisture content, but increased the water absorption capacity of the material in at least 15%. The addition of sunflower proteins till 20% w/w reduced significantly the post-pressing moisture content (ca. 5.7%), the water absorption capacity (till 43%) and the relative deformation of the trays (till 21%). The formulation presenting the best properties contained 20% fiber and 10% protein isolate, and had a maximal resistance of 6.57 MPa and a 38% reduction in water absorption capacity, corresponding to a more compact, homogeneous and dense microstructure.
Keywords: Biodegradable; Baked foams; Food packaging; Sunflower proteins; Cassava starch; Cellulose fibers

David Chikoye, Friday Ekeleme, Ayeoffe Fontem Lum, Steffen Schulz, Legume-maize rotation and nitrogen effects on weed performance in the humid and subhumid tropics of West Africa, Crop Protection, Volume 27, Issues 3-5, March-May 2008, Pages 638-647, ISSN 0261-2194, DOI: 10.1016/j.cropro.2007.09.007.
(http://www.sciencedirect.com/science/article/B6T5T-4R1FS3S-1/2/a86b65bd29a8adda85560c98820529d6)
Abstract:
A long-term trial was established in 1998. The objectives among others were to assess the impact of nitrogen, natural bush fallow, and legume-maize rotations on weed growth and species composition in the forest/savanna transition zone (Ibadan) and northern Guinea savanna (Zaria) in Nigeria. At both locations, the experiment was arranged as a split-plot design. The main plots were green manure legumes (Pueraria phaseoloides [Roxb.] Benth in Ibadan and Aeschynomene histrix Poir. in Zaria), a forage legume (Stylosanthes guianensis [Aubl.] Sw.), grain legumes (cowpea [Vigna unguiculata {L.} Walp `IT-90K-284-2' or soybean [Glycine max {L.} Merr `TGx 1864 and TGx 1485-1 D'), natural bush fallow, and continuous cropping with maize [Zea mays L.]/cassava [Manihot esculenta Crantz] `82/00058' at Ibadan and maize at Zaria. Grain legumes were either double-cropped in one season by growing short-duration soybean with cowpea varieties sequentially, or by growing long-duration cultivars within one growing season. Nitrogen levels (0 and 30 kg N ha-1) were the subplot treatments. Weed data were collected in 2000 and 2003 after 2 years of continuous cropping or rotation with natural fallow or legumes. Weed density was significantly higher at Zaria (177 plants m-2) than at Ibadan (149 plants m-2). Weed dry matter was higher at Ibadan than at Zaria. Weed density and dry matter were lower in the green manure and forage legume treatments in both years at Ibadan. At Zaria, the forage legume treatment had the lowest weed density and dry matter in 2003 only. In 2003 at Ibadan, per capita weed population growth rate (WPGR) decreased in the green manure and forage legume treatments. There was an increase in WPGR in continuous cropping, double-cropping with cowpea and soybean, and natural bush fallow treatments. At Zaria, WPGR was not affected by fallow type or nitrogen (P>0.05). Redundancy analysis showed significant differences in species composition among the various treatments. Nitrogen level did not affect density, dry matter, or the composition of weeds.
Keywords: Bush fallow; Continuous cropping; Species composition; Weed density

Gerard M. O'Brien, Angel SH Ip, Initial evaluation of a field-friendly incubation procedure for the colorimetric assay of cassava linamarase, Food Chemistry, Volume 107, Issue 1, 1 March 2008, Pages 576-579, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.08.039.
(http://www.sciencedirect.com/science/article/B6T6R-4PGPVXF-5/2/12afaafdbaf673d0091c32fe8d84fcb2)
Abstract:
The Cooke colorimetric assay of cassava linamarase activity is temperature- and time-inflexible, making 'real time' monitoring of linamarase activity in remote cassava-processing sites practically impossible. A modified incubation procedure is described, in which the 30 [degree sign]C linamarase incubation step is terminated through acidification, yielding a stable cyanohydrin solution. Using partially purified linamarase as a 'standard extract', the solution - held for up to 21 days at ambient/refrigeration temperatures before colorimetry - showed reductions of up to 21% compared with the standard Cooke assay. In a separate trial, a strong linear relationship (r2 > 0.95) was observed between recorded linamarase activity values and incubation temperature in the 25-40 [degree sign]C range, indicating that incubation may take place in remote processing sites without a water bath, and resulting data may reliably be adjusted in keeping with the standard 30 [degree sign]C incubation assay. The novel procedure thus appears to offer a satisfactory 'field-friendly' means of assaying linamarase activity.

Keywords: Cassava; Linamarase; Cyanogens; Cyanide; Cyanogenic potential; Assay; Colorimetric; Quantitative; Field-friendly; Remote site

S. Morales, H. Alvarez, C. Sanchez, Dynamic models for the production of glucose syrups from cassava starch, Food and Bioproducts Processing, Volume 86, Issue 1, March 2008, Pages 25-30, ISSN 0960-3085, DOI: 10.1016/j.fbp.2007.10.011.
(http://www.sciencedirect.com/science/article/B8JGD-4R7F8GG-4/2/f4c7e40b89f330f41b87950ab812c5fc)
Abstract:
This paper presents two dynamic models for the production of glucose syrups from cassava starch. The models used are based on those proposed by Paolucci et al. [Paolucci, D., Belleville, M.P., Zakhia, N. and Rios G.M., 2000a, Kinetics of cassava starch hydrolysis with Termamyl enzyme, Biotechnol Bioeng, 68(1): 71-77; Paolucci, D., Belleville, M.P., Rios, G.M. and Zakhia, N., 2000b, Kinetics of continuous starch hydrolysis in a membrane reactor, Biochem Eng J, 6(3): 233-238] for the liquefaction stage, and Zanin and Moraes [Zanin, G.M. and Moraes, F.F., 1996, Modelling cassava starch saccharification with amyloglucosidase, Appl Biochem Biotechnol 57-58: 617-625] for the saccharification stage. These models were modified in order to include aspects that were not considered in previously reported studies. Hence, the liquefaction stage can be modeled at different operating temperatures and substrate concentrations; furthermore, this model relates the activity of the enzyme with the temperature. This model of the saccharification stage simulates continuous operation at variable operating temperatures. Additionally, it enables the prediction of reduced glucose production due to the inclusion of a thermal deactivation constant. The improvements to each stage of the models permit a better approximation to real behavior by linking the two models to provide a complete simulation of the process.
Keywords: Modelling; Liquefaction; Saccharification; Cassava starch

G.J.B. Gnonlonfin, K. Hell, P. Fandohan, A.B. Siame, Mycoflora and natural occurrence of aflatoxins and fumonisin B1 in cassava and yam chips from Benin, West Africa, International Journal of Food Microbiology, Volume 122, Issues 1-2, 29 February 2008, Pages 140-147, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2007.11.047.
(http://www.sciencedirect.com/science/article/B6T7K-4R7NPVT-B/2/635a1790973685aa9430f90c2e3d1eb6)
Abstract:
The presence of fungi, aflatoxins and fumonisin B1 in cassava and yam chips (during 28 processing and storage) were evaluated during two consecutive seasons in two agroecological zones of Benin (Northern Guinea Savannah, NGS and Sudan Savannah, SS). The Benin samples were assessed for moisture content, fungal infestation and total aflatoxin and fumonisin B1 contamination. During the two seasons, samples collected from the NGS, had moisture contents ranging from 10.0 to 14.7% in cassava chips and from 11.4 to 15.3% in yam chips. In samples from the SS, moisture content ranged from 10.1 to 14.5% and 11.1 to 14.5% in cassava and yam chips, respectively. A. flavus was the predominant fungal species. The maximum cfu/g in cassava and yam chips was 8950 and 6030, respectively. Other fungal species isolated included P. chrysogenum, M. piriformis, Phoma sorghina, F. verticillioides, R. oryzae and Nigrospora oryzae. High performance liquid chromatography analysis of both cassava and yam chips showed no contamination by either aflatoxins or fumonisin B1.
Keywords: Benin; Cassava; Yam; Chips; Fungi; Aflatoxins; Fumonisin B1

Efstathios Z. Panagou, Ulrich Schillinger, Charles M.A.P. Franz, George-John E. Nychas, Microbiological and biochemical profile of cv. Conservolea naturally black olives during controlled fermentation with selected strains of lactic acid bacteria, Food Microbiology, Volume 25, Issue 2, February 2008, Pages 348-358, ISSN 0740-0020, DOI: 10.1016/j.fm.2007.10.005.

(http://www.sciencedirect.com/science/article/B6WFP-4PTW4NF-3/2/726215765987015f87198e6e838d5629)
Abstract:
The effect of controlled fermentation processes on the microbial association and biochemical profile of cv. Conservolea naturally black olives processed by the traditional anaerobic method was studied. The different treatments included (a) inoculation with a commercial starter culture of Lactobacillus pentosus, (b) inoculation with a strain of Lactobacillus plantarum isolated from a fermented cassava product and (c) uninoculated spontaneous process. Microbial growth, pH, titratable acidity, organic acids and volatile compounds were monitored throughout the fermentation. The initial microbiota consisted of Gram-negative bacteria, lactic acid bacteria and yeasts. Inhibition of Gram-negative bacteria was evident in all processes. Both starter cultures were effective in establishing an accelerated fermentation process and reduced the survival period of Gram-negative bacteria by 5 days compared with the spontaneous process, minimizing thus the likelihood of spoilage. Higher acidification of the brines was observed in inoculated processes without any significant difference between the two selected starter cultures (113.5 and 117.6 mM for L. plantarum and L. pentosus, respectively). L. pentosus was also determined as the major species present during the whole process of spontaneous olive fermentation. It is characteristic that lactic acid fermentation was also initiated rapidly in the spontaneous process, as the conditions of fermentation, mainly the low salt level (6%, w/v) favored the dominance of lactic acid bacteria over yeasts. Lactic, acetic and propionic were the organic acids detected by HPLC in considerable amounts, whereas citric and malic acids were also present at low levels and degraded completely during the processes. Ethanol, methanol, acetaldehyde, ethyl acetate were the major volatile compounds identified by GC. Their concentrations varied among the different treatments, reflecting varying degrees of microbial activity in the brines. The results obtained from this study could help the Greek table olive industry to improve the existing processing schemes in order to increase product consistency and quality expanding the international market for naturally black olives.
Keywords: Conservolea; Fermentation; Lactobacillus pentosus; Lactobacillus plantarum; Naturally black olives; Organic acids; Volatile compounds

W. Somboonchai, M. Nopharatana, W. Songkasiri, Kinetics of cyanide oxidation by ozone in cassava starch production process, Journal of Food Engineering, Volume 84, Issue 4, February 2008, Pages 563-568, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.06.015.
(http://www.sciencedirect.com/science/article/B6T8J-4P4NPBP-1/2/1b4bede7a317b8b043c8972e8bfc8106)
Abstract:
This research investigated the kinetics of cyanide oxidation by ozone in cassava starch production process. An acrylic column, equipped with a gas sparger located at the bottom of the column, were used as a reactor. Cassava starch solutions with the cyanide concentrations of 10, 20, 30, 40 mg/l were prepared from fresh cassava roots. The experiments were performed at the ozone generation rates of 7.4, 15.0, 22.6, and 30.0 g O3/h. The results showed that the cyanide concentration sharply decreased during the first 30 s of the reaction time, and after that the concentration slightly decreased. Moreover, cyanohydrin, which could not be oxidized by ozone, was not completely converted to hydrogen cyanide. The kinetics of cyanide oxidation was first order with respect to cyanide and zero order with respect to ozone. The rate constant obtained from the first order equation of cyanide oxidation with ozone was 2.76 min-1.
Keywords: Cassava starch; Cyanide oxidation; Kinetics; Ozone

A.O. Obadina, O.B. Oyewole, L.O. Sanni, K.I. Tomlins, A. Westby, Identification of hazards and critical control points (CCP) for cassava fufu processing in South-West Nigeria, Food Control,

Volume 19, Issue 1, January 2008, Pages 22-26, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2007.01.002.
(http://www.sciencedirect.com/science/article/B6T6S-4MYVG61-1/2/2cce1ddb62c18df887eb792ca2f73805)
Abstract:
A hazard analysis survey of wet fufu processing was carried out for five processors around Abeokuta. This analysis consisted of observing the raw materials and environment, watching all steps of the processing, recording pH during steeping/fermentation, and collecting of samples from diced cassava, washed cassava, soaked cassava and wet fufu for total viable count, Coliform, Staphylococcal and Bacillus counts. The pH of steeping/fermentation for the processors varies between 4.08 and 4.58. The total viable count increases with increase in pH level of the wet fufu and Coliforms, Bacillus cereus and Staphylococcus aureus were isolated from the wet fufu. The presence of Coliforms, S. aureus and B. cereus indicates that the processing is carried out in a highly contaminated environment. Education of processors on the hazards, critical control point (CCP) and the importance of hygienic environment is imperative. Therefore, control measures and proper monitoring procedures for wet fufu processing are suggested.
Keywords: Cassava; Wet fufu; CCP; Food safety; Hazards

A.L. Charles, T.C. Huang, Y.H. Chang, Structural analysis and characterization of a mucopolysaccharide isolated from roots of cassava (Manihot esculenta Crantz L.), Food Hydrocolloids, Volume 22, Issue 1, 8th International Hydrocolloids Conference, January 2008, Pages 184-191, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2006.10.012.
(http://www.sciencedirect.com/science/article/B6VP9-4MJJCC2-3/2/f1d02b29a8917a4cf747712559d48429)
Abstract:
A mucopolysaccharide, referred to as cassava tuber mucilage (CTM), was isolated from the roots of sweet cassava and studied for its characteristic physical, molecular, and structural properties. Sugar composition and molecular properties of purified samples were analyzed using high-performance liquid (HPLC), anion exchange (HPAEC-) and size exclusion (HPSEC- MALLS-RI) chromatographic techniques. Structural properties of crude and purified samples were analyzed and compared using Fourier transformation infrared (FT-IR) and nuclear magnetic resonance spectroscopy. CTM is mainly composed of the major neutral sugars sucrose, fructose, glucose, galactose, and arabinose. It has a molecular average weight of 3.6x105, number average molecular mass (Mn) of 2.4x106, and a polydispersity index (Mw/Mn) of 1.5. FT-IR spectroscopy revealed high protein content in the crude fractions, whereas purified fractions were mainly carbohydrate. 1H NMR and 13CNMR showed that the mucilage consists of 1, 3-linked glucan chains with 1, 6-linked galactan side chains attached to position 6. The mucilage is purely hemicellulosic and possibly an arabinogalactan, confirmed by SDS gel electrophoresis of crude CTM samples, containing a (1, 3)-linked [beta]-glucan backbone having side chain branching with non-reducing terminal residues mostly of (1, 6)-linked galactose and some arabinose and glucosyl moieties.
Keywords: Cassava; Mucilage; Arabinogalactan; Fructose; 13CNMR; [beta]-glucan

Akhila Rajan, J.D. Sudha, T. Emilia Abraham, Enzymatic modification of cassava starch by fungal lipase, Industrial Crops and Products, Volume 27, Issue 1, January 2008, Pages 50-59, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2007.07.003.
(http://www.sciencedirect.com/science/article/B6T77-4PKX5PN-1/2/1434cd33959972f88c60b96853906678)
Abstract:
Esterification of starch was carried out to expand the usefulness of starch for a myriad of industrial applications. Lipase obtained from Candida rugosa (lipase AYS) was used for starch esterification

by two methods: liquid state and microwave oven. The esterification of cassava starch with recovered coconut oil (lauric acid) using microwave heating gave a degree of substitution of 55.28% with degree of substitution (DS) 1.1 and liquid state esterification with palmitic acid gave a degree of substitution of 65.86% with DS 1.04. Esterification was confirmed by IR spectroscopy studies. Thermal gravimetric analysis (TGA) showed that the higher DS attributed to the thermostability, since onset of decomposition is at a higher temperature (390 [degree sign]C) than the unmodified (280 [degree sign]C) and was stable above 600 [degree sign]C. [alpha]-Amylase digestibility was found to be reduced for modified starch compared to the control (76.5-4.6%). Viscosity differed with the acyl donor used, palmitic acid increased viscosity while hydrolysed coconut oil reduced viscosity of modified starch ester. Esterification of starch with long chain fatty acids like palmitic acid gives thermoplastic starch which has got wide use in plastic industry, pharmaceutical industries, and in biomedical applications such as materials for bone fixation and replacements, carriers for controlled release of drugs and other bioactive agents. Unlike chemical esterification, enzymatic esterification is ecofriendly and avoids the use of nasty solvents.
Keywords: Starch; Esterification; Degree of substitution; Recovered coconut oil; Lipase AYS; Starch ester; Coconut oil

S. Lertworasirikul, Y. Tipsuwan, Moisture content and water activity prediction of semi-finished cassava crackers from drying process with artificial neural network, Journal of Food Engineering, Volume 84, Issue 1, January 2008, Pages 65-74, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.04.019.
(http://www.sciencedirect.com/science/article/B6T8J-4NKXWCV-2/2/191e7f249fd99c71e50f6f47dc460d5d)
Abstract:
This paper is concerned with a prediction of moisture content and water activity of semi-finished cassava crackers from a hot air drying process in a tray dryer. A Multilayer Feedforward Neural Network in the form of Nonlinear-Auto-Regressive with Exogenous input (MFNN-NARX) was proposed to predict the product quality from the dynamic drying process. The process was carried out at seven drying temperature settings of 50, 55, 60, 65, 70, 75, and 80 [degree sign]C. The MFNN-NARX was composed of one hidden layer, three exogenous inputs (drying temperature, relative humidity, and sample temperature), and two state inputs and outputs (moisture content and water activity). A number of hidden neurons and transfer functions were investigated in this study. Based on our results, the best network was composed of nine hidden nodes and used a logarithmic sigmoid transfer function in the first layer. The mean squared error (MSE) and regression coefficient (r2) between the normalized predicted and experimental outputs from the best network were 0.0034 and 0.9910, respectively. A simulation test with a testing data set showed that MSE was low and r2 was close to 1. This result showed the good generalization of the developed model.
Keywords: Cassava cracker; Drying process; Artificial neural network; Modeling

Nelson K.O. Ojijo, Eyal Shimoni, Minimization of cassava paste flow properties using the `Farris effect', LWT - Food Science and Technology, Volume 41, Issue 1, January 2008, Pages 51-57, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.01.020.
(http://www.sciencedirect.com/science/article/B6WMV-4N3GHR9-2/2/eca579e26ace11cf64382874b39c0412)
Abstract:
Cereals and tuber crops are the raw materials for thin porridges meant for infant feeding in many parts of the world. However, the high viscosity and low energy density of such starchy porridges limit their use as complementary foods. In this study, we have employed the so-called 'Farris effect' to minimize the apparent viscosity of cooked cassava pastes. The particle size distributions of cassava flour, ground to varying degrees of fineness, were obtained using a laser diffraction

particle size analyzer. Pastes were then prepared at various flour solids concentrations by boiling for 15 min under reflux. Flow properties were then determined at 25+/-0.02 [degree sign]C over the shear rate range 0-1200 s-1 using a Haake Rheostress I rheometer. The swelling power, extent of solubilization, volume fraction at maximum packing, paste viscosity, and yield stress all depended on the average flour particle size. By mixing fine and coarse flours of different particle size distributions, the apparent viscosity and yield stress of the resulting pastes were reduced by over 20% at a some critical volume fraction and particle size ratio. This technique could provide an effective means of improving the energy density of cereal and root crop-based thin porridges.
Keywords: Cassava; Paste; Viscosity; Energy density; Rheology; Particle size distribution

Euziclei G. Almeida, Caio C.T.C. Rachid, Rosane F. Schwan, Microbial population present in fermented beverage `cauim' produced by Brazilian Amerindians, International Journal of Food Microbiology, Volume 120, Issues 1-2, 20th International ICFMH Symposium on FOOD MICRO 2006, 30 November 2007, Pages 146-151, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2007.06.020.
(http://www.sciencedirect.com/science/article/B6T7K-4PGPVMN-4/2/07927dc5812c424fc2bcee76078c2252)
Abstract:
The Tapirape Amerindians of the Tapi'itawa tribe produce several fermented foods and beverages among them the beverage called `cauim'. This beverage is the main staple food for infants until two years old and their parents. For producing the beverage, several substrates are used, such as: cassava, rice, corn, maize and peanuts. The fermentation using mainly cassava was accomplished and samples were collected for chemical and microbiological analysis. A progressive acidification during the fermentation was observed and pH value decreased from 5.5 to 3.4. Lactic acid was the most important fermentation metabolite found but significant amounts of ethanol and acetic acid were also observed. The microbial load was high at the beginning of the fermentation, bacterial population was about 6.8 log cfu/ml and yeast population was 3.7 log cfu/ml. A total of 355 bacteria were isolated and identified. All the isolates were grouped into Gram-negative (3.5%), Gram-positive non-sporulating (78%) and Gram-positive sporulating bacteria (18.5%). Lactic acid bacteria increased from the beginning of fermentation and became the dominant microorganism throughout the fermentation. Species of bacteria were varied and they were found to be Lactobacillus pentosus, L. plantarum, Corynebacterium xerosis, C. amylocolatum, C. vitarumen, Bacillus cereus, B. licheniformis, B. pumilus, B. circulans and Paenibacillus macerans. The species L. pentosus and L. plantarum were the dominant bacteria and were present in all the periods of evaluation of the samples.
Keywords: Lactic acid bacteria; Cauim; Fermented food; Cassava; Indigenous food

Natalia Szerman, Ignacio Schroh, Ana Lia Rossi, Adriana Mabel Rosso, Norberto Krymkiewicz, Susana Alicia Ferrarotti, Cyclodextrin production by cyclodextrin glycosyltransferase from Bacillus circulans DF 9R, Bioresource Technology, Volume 98, Issue 15, November 2007, Pages 2886-2891, ISSN 0960-8524, DOI: 10.1016/j.biortech.2006.09.056.
(http://www.sciencedirect.com/science/article/B6V24-4MK60XB-1/2/f7e14e6a9719f3e518019893a4963393)
Abstract:
Cyclodextrins (CD) are cyclic oligosaccharides with multiple applications in the food, pharmaceutical, cosmetic, agricultural and chemical industries. In this work, the conditions used to produce CD with cyclodextrin glycosyltransferase from Bacillus circulans DF 9R were optimized using experimental designs. The developed method allowed the partial purification and concentration of the enzyme from the cultural broth and, subsequently, the CD production, using the same cassava starch as enzyme adsorbent and as substrate. Heat-treatment of raw starch at 70 [degree sign]C for 15 min in the presence of adsorbed cyclodextrin glycosyltransferase allowed

the starch liquefaction without enzyme inactivation. The optimum conditions for CD production were: 5% (w/v) cassava starch, 15 U of enzyme per gram of substrate, reaction temperature of 56 [degree sign]C and pH 6.4. After 4 h, the proportion of starch converted to CD reached 66% (w/w) and the weight ratio of [alpha]-CD:[beta]-CD:[gamma]-CD was 1.00:0.70:0.16.
Keywords: Cyclodextrins production; Cyclodextrin Glycosyltransferase; Bacillus circulans

S.R.P. Avancini, G.L. Faccin, M.A. Vieira, A.A. Rovaris, R. Podesta, R. Tramonte, N.M.A. de Souza, E.R. Amante, Cassava starch fermentation wastewater: Characterization and preliminary toxicological studies, Food and Chemical Toxicology, Volume 45, Issue 11, November 2007, Pages 2273-2278, ISSN 0278-6915, DOI: 10.1016/j.fct.2007.06.006.
(http://www.sciencedirect.com/science/article/B6T6P-4NYJ0Y4-2/2/decdce1d2e8d01a3ab253d5026ee607a)
Abstract:
Cassava starch fermentation wastewater is an industrial residue composed mainly of lactic acid bacteria with predominance of the genera Lactobacillus, and organic acids. To evaluate the safety of this residue for possible production of probiotic beverages, acute in mice and sub-chronic (28-day repeated dose) toxicity studies in rats were carried. The administration of a single dose of 5 g/kg/body weight did not produce mortality in mice. Rats treated with water containing 0 (control), 25%, 50%, and 100% of the residue for 28 days, did not present alterations in behaviour or in food and water consumption. There were no treatment-related changes of toxicological significance in the relative weight of the organs neither in the haematological nor in the biochemical parameters. Histopathologic alterations observed in the small intestine did not seem to be associated with the treatment.
Keywords: Cassava; Fermentation; Wastewater; Toxicity

O.S.A. Oluwole, A.O. Onabolu, K. Mtunda, N. Mlingi, Characterization of cassava (Manihot esculenta Crantz) varieties in Nigeria and Tanzania, and farmers' perception of toxicity of cassava, Journal of Food Composition and Analysis, Volume 20, Issue 7, November 2007, Pages 559-567, ISSN 0889-1575, DOI: 10.1016/j.jfca.2007.04.004.
(http://www.sciencedirect.com/science/article/B6WJH-4NK4G5G-4/2/32de26ce38584fc5f89d34b7f9a1fd53)
Abstract:
Cassava (Manihot esculenta Crantz) roots in endemic and non-endemic areas for cassava associated neurological syndromes in Nigeria and Tanzania were characterized for levels of cyanogenic compounds, taste, weight and farmers' perception of toxicity. Mean cyanogenic compounds (mg HCN eq/kg dry wt) in cassava roots was 133 (range 8-1063) in Nigeria (n=97), but 61 (range 22-244) in Tanzania (n=57), P<0.0001. 13% of cassava varieties in Nigeria were bitter, compared with 12% in Tanzania. Mean cyanogenic compounds (mg HCN eq/kg dry wt) was 103 (range 27-543) in bitter roots compared with 105 (range 8-1064) in sweet roots (P>0.05). Sweet cassava predominates in Nigeria and Tanzania. Mean weight (range) was 405 g (49-3100) for roots of cassava planted at altitude<100 m above sea level, but 298 g (25-2300) for roots of cassava planted at altitude >100 m above sea level, P=0.02. Multivariate model shows significant relationship of levels of cyanogenic compounds in cassava roots and altitude, weight of roots and country. High cyanogenic cassava varieties were present in the endemic area in Nigeria, where the altitude is low, but low cyanogenic cassava varieties were present in the endemic area in Tanzania, where the altitude is high. Both sweet and bitter cassava were consumed raw by farmers, who do not perceive bitter cassava as a toxic crop. The practise of delayed harvesting of cassava for food security is low in both countries.
Keywords: Cassava; Manihot esculenta Crantz; Cyanide; Taste; Nutrition; Ataxia; Tropical; Food

Lucia Fama, Silvia Goyanes, Lia Gerschenson, Influence of storage time at room temperature on the physicochemical properties of cassava starch films, Carbohydrate Polymers, Volume 70, Issue 3, 1 October 2007, Pages 265-273, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2007.04.003.
(http://www.sciencedirect.com/science/article/B6TFD-4NH7F1J-2/2/26f27bae12159b4411f07293a006c22e)
Abstract:
The influence of storage time on colour, moisture content, crystallinity and mechanical performance of edible cassava starch films containing glycerol and sorbate, were studied. The effect of the pH of the film forming systems was also evaluated.
It was observed that, for storage times of 4 weeks or longer, tan [delta] curves shifted to higher temperatures independently of the pH. Films obtained from systems of pH 5 showed a decrease in the intensity of the loss tangent-peak observed between -30 and 10 [degree sign]C, fact that is in accordance with a slight increase in the crystalline fraction. At room temperature, E' increased and tan [delta] decreased between 2 and 4 weeks trends that are in accordance with the increase in crystallinity and the decrease in moisture content observed with storage time.
Colour parameters and sorbate content did not change significantly along 8 week-storage, showing that sorbate was not destroyed along the period studied.
It can be concluded that changes of starch along storage were mostly responsible for the changes observed in mechanical properties.
Keywords: Edible starch films; Storage; Physicochemical properties

Muthiah Gomathinayagam, Cheruth Abdul Jaleel, G.M. Alagu Lakshmanan, Rajaram Panneerselvam, Changes in carbohydrate metabolism by triazole growth regulators in cassava (Manihot esculenta Crantz); effects on tuber production and quality, Comptes Rendus Biologies, Volume 330, Issue 9, September 2007, Pages 644-655, ISSN 1631-0691, DOI: 10.1016/j.crvi.2007.06.002.
(http://www.sciencedirect.com/science/article/B6X1F-4P5RVXV-1/2/342474098ce2c613866391d56e3f50c5)
Abstract:
We have evaluated the ability of two triazole growth regulators, viz. triadimefon (TDM) and hexaconazole (HEX), in the enhancement of tuber production and quality in cassava (Manihot esculenta Crantz) through their effects on carbohydrate metabolism. One litre of 20 mg-1 TDM and 15 mg-1 HEX solution per plant were used for the treatments and groundwater was given to control plants. Triazole treatments reduced plant height and leaf area, but increased fresh and dry weights. Plants treated with TDM showed an increased net assimilation rate, which is followed by HEX and control plants. Triazole compounds increased the relative growth rate of cassava after 200 DAP, i.e. in the phase of tuber enlargement. Triazole compounds increased the starch and other carbohydrate contents and carbohydrate metabolising enzyme activities. From the results of this study, it can be concluded that these triazoles can significantly enhance the tuber production and quality by affecting the starch metabolism, apart from their fungicidal properties. To cite this article: M. Gomathinayagam et al., C. R. Biologies 330 (2007).
Keywords: Starch; Sugar; Growth; Yield; Triadimefon; Hexaconazole

Eun Young Choi, Robin Graham, James Stangoulis, Semi-quantitative analysis for selecting Fe- and Zn-dense genotypes of staple food crops, Journal of Food Composition and Analysis, Volume 20, Issue 6, September 2007, Pages 496-505, ISSN 0889-1575, DOI: 10.1016/j.jfca.2007.01.004.
(http://www.sciencedirect.com/science/article/B6WJH-4N5CX9Y-1/2/1853171f6d48a25f4edc73185f6013c5)
Abstract:
Four semi-quantitative screening methods were developed for plant breeding purposes to identify iron (Fe) and zinc (Zn)-dense genotypes in germplasm, elite lines and early generation progeny.

Methods include colour image analysis for Fe and Zn in wheat and rice grains, and spectrophotometric analysis of Fe and Zn in ground flour of rice, wheat, potato, sweet potato and cassava. Staining with 71 mM Perl's Prussian blue solution (PPB) and subsequent image analysis with Adobe Photoshop(R) to determine pixel numbers in the stained regions lead to the quantification of Fe. Due to differences in grain size between the genotypes evaluated, correlations between inductively coupled plasma-optical emission spectrophotometry (ICP-OES) Fe and PPB derived Fe were improved by standardizing according to grain weight. The ratio of total blue pixel number (TPN)/total grain weight (TGW) of 21 rice lines correlated ($r=0.84$, $p<0.001$) with the Fe concentration derived by ICP-OES. Similarly, a colorimetric method was developed for Zn analysis using 1.56 mM Dithizone (DTZ) solution and subsequent quantification by image analysis with Adobe Photoshop(R). As with the Fe analysis, the ratio of TPN/TGW of 70 wheat lines correlated better with ICP-OES Zn analysis ($r=0.82$, $p<0.001$) and successfully separated low and high Zn grain germplasm. Ground polished rice and wheat flour were spectrophotometrically analysed after simple extraction in 0.5 M HCl solution using a modified 2,2'-dipyridyl method for Fe, and a modified Zincon(R) method for Zn. These two methods show good correlations with ICP analyses ($r=0.93$ and 0.92 for Fe and Zn, respectively) and thus can be used for semi-quantitative screening to discriminate between genotypes that are either high or low in Fe or Zn. The more precise ICP-OES and AAS methods could then be used to quantify actual amounts of Fe and Zn in those genotypes identified as Fe- and Zn-dense from the initial screening.
Keywords: Perl's Prussian blue (PPB); Dithizone (DTZ); 2,2'-dipyridyl; Zincon

S.O. Jekayinfa, J.O. Olajide, Analysis of energy usage in the production of three selected cassava-based foods in Nigeria, Journal of Food Engineering, Volume 82, Issue 2, September 2007, Pages 217-226, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.02.003.
(http://www.sciencedirect.com/science/article/B6T8J-4N2KT65-8/2/a8261908b3a21f280a5b90ad735bb23f)
Abstract:
A study was conducted in 18 cassava processing mills situated in the southwestern part of Nigeria to investigate the energy utilization pattern in the production of three different cassava products, viz: `gari', cassava flour and cassava starch. Six mills specializing in the production of each of the products were randomly selected for investigation. The computation of energy use was done using the spreadsheet program on Microsoft Excel. Optimization models were developed to minimize the total energy input into each production line. The results of the study showed that the observed energy requirements per tonne of fresh cassava tuber for production of gari, starch and flour were 327.17, 357.35 and 345 MJ, respectively. The study identified the most energy-intensive operations in each production line and concluded from optimization results that the total minimum energy inputs required for the production of gari, cassava starch and cassava flour per tonne of fresh cassava tuber were 290.53, 305.20 and 315.60 MJ, respectively.
Keywords: Cassava products; Energy requirement; Unit operation; Optimization models

S. Adjei-Nsiah, T.W. Kuyper, C. Leeuwis, M.K. Abekoe, K.E. Giller, Evaluating sustainable and profitable cropping sequences with cassava and four legume crops: Effects on soil fertility and maize yields in the forest/savannah transitional agro-ecological zone of Ghana, Field Crops Research, Volume 103, Issue 2, 30 August 2007, Pages 87-97, ISSN 0378-4290, DOI: 10.1016/j.fcr.2007.05.001.
(http://www.sciencedirect.com/science/article/B6T6M-4P00S38-1/2/f26585709201a881b44de9beb104a272)
Abstract:
Rotations are important practices for managing soil fertility on smallholder farms. Six cropping sequences (cassava, pigeonpea, mucuna-maize-mucuna, cowpea-maize-cowpea, maize-maize-maize, and speargrass fallow) were evaluated during 2003-2004 in Wenchi district of Ghana for

their effects on the profitability of the different rotations and the productivity of subsequent maize. Soil chemical properties were not significantly affected by cropping sequence. On the researcher-managed and farmer-managed plots maize grain yields were significantly influenced by cropping sequence. On the researcher-managed plots maize grain yield ranged from 1.0 t ha-1 after speargrass fallow to 3.0 t ha-1 with cassava cropping when N fertiliser was not applied to maize and from 2.1 t ha-1 with continuous maize to 4.2 t ha-1 with mucuna-maize-mucuna when 60 kg N ha-1 was applied to maize. On the farmer-managed plots where N fertiliser was not applied to maize, maize grain yields ranged from 0.4 t ha-1 on speargrass fallow to 2.2 t ha-1 on plots previously cropped to pigeonpea. High maize grain yields associated with the cropping sequences involving cassava, mucuna and pigeonpea were related to the faster decomposition and N release of the biomass compared with the slower release of N by the poorer quality materials like maize stover and speargrass. Return on investment of the different rotational sequences ranged from -22% with speargrass/maize to 235% with cassava/maize when no N application was made to maize, and from 29% with continuous maize to 196% with cassava/maize when N fertiliser was applied to maize. Cassava/maize rotation was ranked by native farmers as the most preferred rotation whereas migrant farmers ranked cowpea-maize-cowpea-maize as the most preferred rotation. Among natives, male farmers ranked rotation involving cowpea as the next most preferred rotation after cassava/maize. In contrast, female farmers ranked pigeonpea/maize rotation as the second most preferred rotation, due to low labour and external input requirements of pigeonpea compared with cowpea. The choice of a particular rotational sequence is related to access to resources and the needs of the farmer. The study therefore suggests that, in a heterogeneous farming community like Wenchi, technology development should be targeted to suit the needs and resources available to each particular group of farmers.
Keywords: Cassava; Cropping sequence; Rotation; Nitrogen; Pigeonpea; Speargrass; Return on investment

G.V. Kozloski, M.V. Reffatti, L.M. Bonnecarrere Sanchez, L.D. Lima, R.L. Cadorin Jr., C.J. Harter, G. Fiorentini, Intake and digestion by lambs fed a low-quality grass hay supplemented or not with urea, casein or cassava meal, Animal Feed Science and Technology, Volume 136, Issues 3-4, 1 August 2007, Pages 191-202, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2006.09.002.
(http://www.sciencedirect.com/science/article/B6T42-4KYXHTD-2/2/67581bd78ffa714ecff6118e0173f7bf)
Abstract:
Ten PolwarthxTexel lambs (21 +/- 3 kg live weight), housed in metabolic cages and fed ad libitum a low-quality grass hay (Cynodon sp.) were used in a replicated 5x5 Latin Square experiment to evaluate effects of supplement type on forage and total intake, rumen fermentation, microbial protein synthesis, digestibility and N retention. Supplements were a non-fibre carbohydrate (NFC) source (i.e., cassava meal), NFC plus a degradable true protein N (TPN) source (i.e., calcium caseinate), NFC plus a non-protein N (NPN) source (i.e., urea:ammonia sulphate, 9:1), NPN alone or no supplement (control). Hay and fibre intake, as well as fibre digestibility, rumen microbial protein synthesis and N retention were lowest ($P<0.05$) in lambs supplemented with NFC alone. Total organic matter (OM), digestible energy intake, rumen microbial protein synthesis and N retention improved ($P<0.05$) with supplementation with NFC plus either TPN or NPN. Rumen pH, as well as rumen concentrations of ammonia, sugars, amino acids and peptides was markedly affected by supplement type and time after feeding (treatmentxtime interaction, $P<0.05$). Hay utilization by lambs was not improved by any supplement and markedly depressed with NFC as the sole supplement. This effect, however, was likely not due a decreased rumen pH, given that the mean rumen pH values were near 7.0 in all treatments. Digestible energy intake, rumen microbial protein synthesis and N retention were improved only when supplementation included both NFC and degradable N sources, regardless of whether it was TPN or NPN.

Keywords: Rumen fermentation; Rumen microbial protein synthesis; Supplementation; Tropical grass

Vanthong Phengvichith, Inger Ledin, Effect of feeding different levels of wilted cassava foliage (Manihot esculenta, Crantz) on the performance of growing goats, Small Ruminant Research, Volume 71, Issues 1-3, August 2007, Pages 109-116, ISSN 0921-4488, DOI: 10.1016/j.smallrumres.2006.05.009.
(http://www.sciencedirect.com/science/article/B6TC5-4KCPV9N-1/2/90896a3902cd149d779009ed1643ff0d)
Abstract:
The effects of feeding different levels of wilted cassava foliage (Manihot esculenta, Crantz) on growth and diet digestibility were studied using local male growing goats with an average body weight of 14.5 kg. Thirty-two animals were randomly allocated to four groups of eight animals in a growth experiment, and four animals were assigned to a 4 x 4 Latin Square design to study digestibility. The four diets in both the growth and the digestibility studies were Gamba grass (Andropogon gayanus) as a sole diet offered ad libitum (control) or supplemented with wilted cassava foliage (WCF) at 20%, 30% and 40% of an expected daily DM intake of 3% of BW. Dry matter (DM) intake was significantly lower in the control group and increased with the level of WCF in the diet, while the DM intake of Gamba grass was not significantly changed. Total DM intake and DM intakes from Gamba grass were 472, 546, 584 and 616 g/d and 472, 457, 457 and 470 g/d for the control and treatments with 20%, 30% and 40% of WCF in the diet, respectively. The inclusion of WCF in the diet increased the apparent digestibility of DM, organic matter, N, Neutral detergent Fibre and Acid Detergent Fibre, and resulted in a higher N-retention. The average daily gains of animals fed diets with WCF were significantly higher than in the control group. The highest gain was recorded in goats with 40% of WCF in the diet (55.0 g/d) and lowest for the control (28.9 g/d). In conclusion, supplementing a basal diet of Gamba grass (Andropogon gayanus) with WCF improved DM intake, digestibility, N-retention and weight gain. The inclusion level of WCF in the diet can be up to 30%-40% of diet DM (21%-24% of total DM intake).
Keywords: Digestibility; Gamba grass; Intake; Local goats; Live weight gain; Wilted cassava foliage

E.M. Teixeira, A.L. Da Roz, A.J.F. Carvalho, A.A.S. Curvelo, The effect of glycerol/sugar/water and sugar/water mixtures on the plasticization of thermoplastic cassava starch, Carbohydrate Polymers, Volume 69, Issue 4, 2 July 2007, Pages 619-624, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2007.01.022.
(http://www.sciencedirect.com/science/article/B6TFD-4N0X5RF-2/2/2b3b9122c5f93521a90e7eb7ba749c25)
Abstract:
The use of 2 wt% sugars as co-plasticizer in combination with glycerol was investigated for thermoplastic starch (TPS) from cassava. The results were compared to those for whole cassava root TPS, which naturally contains sugars in the same proportion. The main objective was to investigate the influence of natural sugars present in the cassava root on the properties of thermoplastic starch produced with cassava root. TPS produced with sugar and water without the addition of glycerol was also investigated. The materials were prepared by melt-processing cassava starch or ground and dried cassava root in a high-power batch mixer, Haake Rheomix 600, at 120 [degree sign]C. The samples were tested by X-ray diffraction (XRD), dynamic mechanical thermal analysis (DMTA), scanning electron microscopy (SEM) and water absorption experiments. The results showed that the addition of 2 wt% sugars (glucose, fructose and sucrose) to the starch-glycerol systems causes a reduction in the glass transition temperature (Tg) of the TPS accompanied by a reduction in the storage modulus determined by DMTA and inhibits the formation of VH-type crystal structures in the resulting TPS. The use of only sugar and water

as plasticizers in the TPS causes a considerable reduction (~60%) in the subsequent water uptake.
Keywords: Thermoplastic cassava starch; Plasticizers; Sugars; Dynamical mechanical thermal analysis (DMTA)

I.S.M. Zaidul, N.A. Nik Norulaini, A.K. Mohd. Omar, H. Yamauchi, T. Noda, RVA analysis of mixtures of wheat flour and potato, sweet potato, yam, and cassava starches, Carbohydrate Polymers, Volume 69, Issue 4, 2 July 2007, Pages 784-791, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2007.02.021.
(http://www.sciencedirect.com/science/article/B6TFD-4N49VMS-2/2/9f760caf75a3b17f37019618158a9d35)
Abstract:
Rapid visco analysis (RVA) was performed to study the pasting properties of mixtures of wheat flour and tuber starches, i.e., potato starch (PS), sweet potato starch (SPS), yam starch (YS), and cassava starch (CS), at 10-50% starch in the mixtures. Lower phosphorus and higher amylose contents were observed in CS, followed by YS, SPS, and PS. The peak, breakdown, final, and setback viscosities of the control wheat flour were lower than those of the control PS, SPS, YS, and CS. The peak viscosity of wheat-PS mixtures was higher than those of the wheat-SPS, wheat-YS, and wheat-CS because of the higher phosphorus and lower amylose content of PS, which resulted in higher swelling of PS than that of SPS, YS, and CS. The breakdown viscosities increased as the starch content of the PS, SPS, and CS in the mixtures increased to up to the 50%, and the values tended to decrease in the wheat-YS mixture. The setback viscosities of wheat-SPS, wheat-YS, and wheat-CS increased significantly as the starch content increased from 10% to 50%, and that of wheat-PS dropped dramatically at 50%. The findings in this work provide evidence that tuber starches could be used as a partial substitute for wheat flour in some wheat-based products.
Keywords: Wheat flour; Potato starch; Sweet potato starch; Yam starch; Cassava starch; Mixture; Pasting properties

M. Siegmund-Schultze, B. Rischkowsky, J.B. da Veiga, J.M. King, Cattle are cash generating assets for mixed smallholder farms in the Eastern Amazon, Agricultural Systems, Volume 94, Issue 3, Special Section: sustainable resource management and policy options for rice ecosystems, International symposium on sustainable resource management and policy options for rice ecosystems, June 2007, Pages 738-749, ISSN 0308-521X, DOI: 10.1016/j.agsy.2007.03.005.
(http://www.sciencedirect.com/science/article/B6T3W-4NT57V8-2/2/950fe6793655cd889f6497f9731f3302)
Abstract:
The presence of cattle in the Amazon region is controversial in terms of their ecological suitability and profitability compared with crops. Nevertheless, they are widely distributed in the study area in north-eastern Para and, contrary to the common image of cattle on large ranches, a high proportion of them are kept on smallholder farms. To explain their presence, cattle are assumed to have benefits beyond physical production, such as complementing resource use or representing capital. To test this hypothesis, the costs and benefits of the three main agricultural activities, cattle, cassava and black pepper production, in terms of land, labour and capital productivity, were recorded in 37 small farms over a period of 15 months. To provide a longer perspective, benefits and costs of these activities were calculated for their assumed lifetime, which in the case of cattle, assumed a stable herd, derived from a deterministic herd model. The resultant values for land, labour and capital productivity of cattle were much lower than the values derived from direct observations during the study period, and were not as high as those for cassava and black pepper. Furthermore, the analysis of resource use in the farms showed that cattle production was not usually integrated with cropping activities, did not improve the use of available labour, and

competed for land. Therefore, there had to be a reason for keeping cattle beyond their physical productivity. It was deduced to be their functional quality. Cattle could be disposed of quickly and easily at any time, in order to acquire large sums of cash or the equivalent in kind. The liquidity derived from keeping living stock was not matched by other agricultural activities or by the financial market. Hence, cattle turned out to be the best instrument of finance for the smallholder. Farmers were not interested in the continuous development of their herds, or sustainable production practices, and favoured low input management. Consequently, development plans relying on long-term, continuous commitments to pasture and cattle management are inappropriate. Instead, research and extension work should focus on simple, flexible and low-cost improvements to cattle keeping on crop-livestock smallholder farms, until credit programmes are available that replace the financing function of cattle.
Keywords: Cattle; Cash generating asset; Smallholder; Eastern Amazon; Systems approach; Modelling

V.B. Anihouvi, E. Sakyi-Dawson, G.S. Ayernor, J.D. Hounhouigan, Microbiological changes in naturally fermented cassava fish (Pseudotolithus sp.) for lanhouin production, International Journal of Food Microbiology, Volume 116, Issue 2, 10 May 2007, Pages 287-291, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2006.12.009.
(http://www.sciencedirect.com/science/article/B6T7K-4MT5JVD-8/2/021e688342eea0609ae18a0c404a10dd)
Abstract:
Cassava fish (Pseudotolithus sp.) was naturally fermented on three different occasions at room temperature (28-30 [degree sign]C) for 3 to 8 days and the microbial population and the occurrence of various bacterial species were monitored. In general, after a slight increase during the early stages of fermentation, the microbial population decreased as the fermentation progressed. A total of 224 isolates belonging to the genera Bacillus, Staphylococcus, Micrococcus, Streptococcus, Corynebacterim, Pseudomonas, Achromobacter and Alcaligenes were isolated from the fermenting fish samples and the predominant ones were identified at the species level. Bacillus spp. and Staphylococcus spp. were the predominant genera and accounted for 48.7% and 27.3% of the total number of isolates respectively. Bacillus subtilis and Bacillus licheniformis, Staphylococcus lentus and Staphylococcus xylosus and Micrococcus luteus were the representative strains isolated during the fermentation. Bacillus spp., Staphylococcus spp. and Micrococcus spp. initiated the fermentation but Micrococcus spp. were few in numbers and died off after four (4) days of fermentation while Bacillus spp. and Staphylococcus spp. persisted up to the end of fermentation. Enterobacteriaceae were fewer in numbers at the start of fermentation (102 cfu/g) and their numbers decreased to less than 10 cfu/g after two days of fermentation. Bacillus spp. as well as Staphylococcus spp. isolated possessed moderate proteolytic and lipolytic activities. Micrococcus spp. showed weak proteolytic activity and no lipolytic activity.
Keywords: Fish; Lanhouin; Fermentation; Microbial population; Identification

G. Ruysschaert, J. Poesen, G. Verstraeten, G. Govers, Soil loss due to harvesting of various crop types in contrasting agro-ecological environments, Agriculture, Ecosystems & Environment, Volume 120, Issues 2-4, May 2007, Pages 153-165, ISSN 0167-8809, DOI: 10.1016/j.agee.2006.08.012.
(http://www.sciencedirect.com/science/article/B6T3Y-4M7CD6Y-1/2/61037a01414d37fc04a86de4ec6bd122)
Abstract:
Soil erosion studies on cropland usually only consider water, wind and tillage erosion. However, significant amounts of soil are also lost from the field during the harvest of crops such as sugar beet (Beta vulgaris L.), potato (Solanum tuberosum L.), chicory roots (Cichorium intybus L.), cassava (Manihot spp.) and sweet potato (Ipomoea batatas (L.) Lam). During the harvest soil

adhering to the crop, loose soil or soil clods and rock fragments are exported from the field together with these crops.
This soil erosion process is referred to as `soil losses due to crop harvesting' (SLCH). Most of the studies investigated SLCH variability and its controlling factors for one crop type in similar agro-ecological environments and for comparable harvesting techniques. In this study, a compilation of SLCH studies was made in order to investigate the effect of crop type, agricultural systems, ecological conditions and harvesting technique on SLCH variability. SLCH rates ranged from few to tens of Mg ha-1 harvest-1 and SLCH was highly variable both in space and time. Comparison of four studies on SLCH for sugar beet revealed that harvesting technique and soil moisture content at harvesting time can be equally important for SLCH variability. The occurrence of soil clods harvested with the crop explained why SLCH was significantly larger for mechanically harvested potato in Belgium compared to manually harvested potato in China. SLCH values for manually harvested sugar beet, potato, cassava and sweet potato in China and Uganda were in general smaller than SLCH values for mechanically harvested sugar beet, potato and witloof chicory roots measured in Belgium and France. However, SLCH may also vary significantly within Europe due to differences in harvesting techniques. Soil moisture content at harvesting time was besides harvesting technique one of the key factors controlling SLCH variability. There were no systematic differences in SLCH between crop types, although the soil-crop contact area-crop mass ratio could explain more than 40% of the means from several SLCH studies.
Keywords: Soil erosion; Soil loss; Crop harvest; SLCH; Sugar beet; Potato; Cassava; Sweet potato; Chicory

I.K. Okore, H. Tijani-Eniola, A.A. Agboola, E.A. Aiyelari, Impact of land clearing methods and cropping systems on labile soil C and N pools in the humid zone Forest of Nigeria, Agriculture, Ecosystems & Environment, Volume 120, Issues 2-4, May 2007, Pages 250-258, ISSN 0167-8809, DOI: 10.1016/j.agee.2006.09.011.
(http://www.sciencedirect.com/science/article/B6T3Y-4M93BGY-1/2/c019163463c6721ffedd27244ca4b287)
Abstract:
Labile soil C and N play vital roles in soil-plant nutrient dynamics, especially in the low input cropping system and are vulnerable to perturbation. Surface (0-0.15 m) soils from three land clearing methods (slash and burn, bulldozed non-windrowed and bulldozed windrowed) and each with two cropping systems (5-and 4-year cropping/2-year cassava fallow) were collected in the humid forest ecosystem of Nigeria.
The soils were analysed for total C and N, microbial biomass C and N (SMB C and N), particulate organic matter C and N (POM C and N), water-soluble C, potentially mineralizable N (PMN) and mineral N. The size of the labile C and N and their relative contributions to the organic C and total N differed significantly among land clearing methods, irrespective of the cropping system. Soils under slash and burn had a significantly ($p > 0.05$) higher particulate organic matter C, N (10.80 and 0.16 g kg-1, respectively) and microbial biomass C and N (1.07 and 0.12 g kg-1) compared to the bulldozed windrow, regardless of the cropping system. Four years cropping/2-year cassava fallow resulted in a significant higher labile C and N, relative to 5-year cropped plots across the land clearing methods. Effect of the treatments on the concentration of PMN and mineral N mirrored the SMB N and POM N. However, the quantity of most of the labile C and N pool and crop yield obtained from the slash and burn and bulldozed non-windrowed treatment did not differ significantly. Hence, bulldozed non-windrowed clearing could be a viable alternative to slash and burn in the case of large-scale farming in ensuring reduced losses of soil organic matter and nutrient during land clearing in the humid tropics.
Keywords: Soil fertility; Cropping system; Deforestation; Soil organic matter; Cassava fallow; Particulate organic matter

Benoit Pujol, Francois Renoux, Marianne Elias, Laura Rival, Doyle Mckey, The unappreciated ecology of landrace populations: Conservation consequences of soil seed banks in Cassava, Biological Conservation, Volume 136, Issue 4, May 2007, Pages 541-551, ISSN 0006-3207, DOI: 10.1016/j.biocon.2006.12.025.
(http://www.sciencedirect.com/science/article/B6V5X-4N3X0VM-3/2/800d20cf85a5d9543920443ec995cb0d)
Abstract:
Failure to take into account the ecological complexity of landrace populations of crop plants limits our ability to conserve their genetic resources in situ. Soil seed banks are a central feature of the ecology of landrace populations of cassava; their existence has consequences for conservation. Seedlings recruited from seed banks are incorporated by farmers into their stocks of clones of this vegetatively propagated crop, transforming pure clonality into a mixed clonal/sexual reproductive system. Soil seed banks, and farmers' responses to them, play an important role in maintaining diversity in populations of cassava landraces. In a study combining genetic and ethnobiological approaches, we showed the following: (i) Recruitment from soil seed banks increased diversity of populations at the local scale. At the level of a field, the presence of plants issued from seeds resulted in significantly greater diversity of genotypes and phenotypes than if only individuals planted by farmers had been present. (ii) Farmers' use of seed banks has enabled indirect `exchange' of locally adapted cassava germplasm between cultural groups, without requiring that groups actually encountered one another and engaged in social exchange of cultivars. (iii) Farmers have responded to catastrophic crop failure by using seed banks to regenerate stocks of clones. This use of seed banks should enable cassava populations to respond to disasters by an increase of genetic diversity, rather than by a narrowing of the genetic base, often feared in such situations.
Keywords: In situ conservation; Long term gene flow; Manihot esculenta Crantz; Amerindian traditional cultivation

Ignace Dossa Zannou, Rachid Hanna, Bonaventure Agboton, Gilberto Jose de Moraes, Serge Kreiter, George Phiri, Abu Jone, Native phytoseiid mites as indicators of non-target effects of the introduction of Typhlodromalus aripo for the biological control of cassava green mite in Africa, Biological Control, Volume 41, Issue 2, May 2007, Pages 190-198, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2007.01.016.
(http://www.sciencedirect.com/science/article/B6WBP-4N0X5PB-2/2/9ae6f30e11ee46a7bc7b711477dcb705)
Abstract:
The need to evaluate non-target effects of classical biological control of arthropod pests has received considerable attention in recent years. We determined with repeated field surveys the changes in abundance and distribution of the phytoseiid mite fauna in cassava fields resulting from the introduction of the neotropical phytoseiid Typhlodromalus aripo into two countries--Malawi and Mozambique--in southern Africa for the biological control of Mononychellus tanajoa. Typhlodromalus aripo abundance was similar, while the abundance of the target pest M. tanajoa declined progressively, during the 2 years after the introduction of T. aripo into the target countries. We did not detect any changes in the abundance of the most common native phytoseiids mites--Euseius baetae, Euseius bwende and Ueckermannseius saltus--on cassava in Mozambique. In contrast, the abundance of two of the most common native phytoseiids, Euseius fustis and Iphiseius degenerans, on cassava in Malawi were apparently facilitated--i.e., their abundance was enhanced by the introduction of T. aripo; while the abundance of a third species, U. saltus, was not affected. For only one species, E. baetae, within-plant distribution shifted to the lower parts of the cassava canopy as a result of the introduction of T. aripo, which resides in the upper parts of the cassava canopy, but without any measurable negative effects on biological control of M. tanajoa. While the overall abundance of phytoseiid mites found on non-cassava vegetation was not

affected by T. aripo introduction, there were some changes in relative abundance of some species in Malawi. Possible mechanism for the increase in abundance of I. degenerans and E. fustis in Malawi, and changes in within-plant distribution of E. baetae and I. degenerans in Mozambique and Malawi, respectively, are discussed. The methodology developed for assessing potential non-target effects of T. aripo introduction into southern Africa has significantly advanced classical biological control efforts against an economically important cassava pest.
Keywords: Acari; Tetranychidae; Phytoseiidae; Mononychellus tanajoa, Classical biological control

X. Colin, J.-L. Farinet, O. Rojas, D. Alazard, Anaerobic treatment of cassava starch extraction wastewater using a horizontal flow filter with bamboo as support, Bioresource Technology, Volume 98, Issue 8, May 2007, Pages 1602-1607, ISSN 0960-8524, DOI: 10.1016/j.biortech.2006.06.020.
(http://www.sciencedirect.com/science/article/B6V24-4KWK0YJ-1/2/a16379a6354f51e1f7192d41088b87f2)
Abstract:
Small-scale sour starch agroindustry in Colombia suffer from absence of water treatment. Although starch processing plants produce diluted wastewater, it is a source of pollution and cause environmental problems to the nearby rural population. A laboratory scale anaerobic horizontal flow filter packed with bamboo pieces was evaluated for the treatment of cassava starch extraction wastewater. The wastewater used in the experimentation was the draining water of the starch sedimentation basin. The reactor was operated for 6 months. It was inoculated with a semi-granular sludge from an anaerobic UASB reactor of a slaughterhouse. Maximum organic loading rate (OLR) applied was 11.8 g COD/L d without dilution of the wastewater. At steady state and maximum OLR applied, 87% of the COD was removed and a gas productivity of 3.7 L/L d was achieved. The average biogas yield was 0.36 L/g COD removed. Methane content in the biogas was in the range of 69-81%. The total suspended solids (TSS) removed were 67%. The relative high lactic acid content did not negatively influence the performance of the reactor. No perturbation due to cyanide (3-5 mg/L) was observed during the reactor operation. The results obtained indicated that the anaerobic horizontal flow filter could be used efficiently for the treatment of wastewater from Colombian starch processing small-scale agroindustry.
Keywords: Cassava wastewater; Anaerobic digestion; Horizontal flow filter

A.L. Charles, T.C. Huang, P.Y. Lai, C.C. Chen, P.P. Lee, Y.H. Chang, Study of wheat flour-cassava starch composite mix and the function of cassava mucilage in Chinese noodles, Food Hydrocolloids, Volume 21, Issue 3, May 2007, Pages 368-378, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2006.04.008.
(http://www.sciencedirect.com/science/article/B6VP9-4JWDY4F-4/2/ba27ff73133599d2fd5de11e07231215)
Abstract:
Starch and mucilage extracts of sweet cassava tubers were incorporated into wheat flour-cassava starch (WF-CS) composite mix to make Chinese noodle. CS was extracted from fresh 1- and 2-yr-old sweet cassava tubers and was mixed at an optimized ratio of 70:30 into patent hard red Spring wheat (HRSW) flour. Noodles of proportional substitution of cassava mucilage in WF-CS blends were also manufactured to investigate the hydrocolloidal properties of both extracts. Wheat noodles containing CS (WF-CS) showed improved textural attributes, cutting and biting forces especially tensile strengths than the control noodles. Cooking tests indicated improved cooking, texture properties with addition of 30% CS. The incremental addition of cassava mucilage demonstrated improved desirable color development in the WF-CS composite noodles and was proposed to inhibit or reduce intramolecular interaction among the amylopectin and amylose molecules, creating softer gel structures in the noodle food system. The diverse noodle textural developments were attributed to both molecular and hydrocolloidal properties of the extracts studied.

Keywords: Wheat flour; Cassava starch; Cassava mucilage; Chinese noodle

H.E. Gan, R. Karim, S.K.S. Muhammad, J.A. Bakar, D.M. Hashim, R.Abd. Rahman, Optimization of the basic formulation of a traditional baked cassava cake using response surface methodology, LWT - Food Science and Technology, Volume 40, Issue 4, May 2007, Pages 611-618, ISSN 0023-6438, DOI: 10.1016/j.lwt.2006.05.005.
(http://www.sciencedirect.com/science/article/B6WMV-4KF78H2-1/2/fe2b93226bf280889017a7fdec87feab)
Abstract:
The optimum formulation for production of a Malaysian traditional baked cassava cake was determined using response surface methodology (RSM). Effects of amount of ingredients such as sugar (10-30%) and coconut milk (15-35%) on the textural characteristics (hardness and chewiness) and sensory qualities (colour, firmness, cassava flavour and overall acceptability) of cakes were investigated. Significant regression models which explained the effects of different percentages of sugar and coconut milk on all response variables were determined. The coefficients of determination, R2 of all the response variables were higher than 0.8. Based on the response surface and superimposed plots, the basic formulation for production of Malaysian traditional baked cassava cake with desired sensory quality was obtained by incorporating with 25% of sugar and 20% of coconut milk.
Keywords: Cassava; Basic formulation; Response surface methodology; Baked cassava cake

Adriana V. Menoli, Adelaide Beleia, Starch and pectin solubilization and texture modification during pre-cooking and cooking of cassava root (Manihot esculenta Crantz), LWT - Food Science and Technology, Volume 40, Issue 4, May 2007, Pages 744-747, ISSN 0023-6438, DOI: 10.1016/j.lwt.2005.12.011.
(http://www.sciencedirect.com/science/article/B6WMV-4J7H4JW-1/2/34cefd4cc2ff1160cce5aae64fd7fd04)
Abstract:
Physico-chemical alterations of cell-wall constituents and of substances stored in the cell characterize the behavior of fresh vegetables during cooking. Pre-cooking for 1 h at three different temperatures was used to identify alterations in hydration, pectin and starch solubilization and the relation to texture determination by a compression and a shear test. Samples of cassava (Catarina amarela) harvested 8 months after planting date were used. Soluble galacturonic acid in the treatment water varied from 0.07 to 0.2.1 mg/100 ml while soluble solids varied from 271.3 to 599.6 mg/100 ml. Soluble starch varied from 114.3 to 437.7 mg/100 ml and total solids varied from 292.4 to 611.4 mg/100 ml during pre-cooking from 55 to 75 [degree sign]C. There was weight reduction of 4 and 2 g/100 g of material and reduction of compression force in the treatments at 55 and 65 [degree sign]C in relation to the raw sample and weight gain of 6.7 g/100 g and increase in compression force at 75 [degree sign]C. Shear force decreased from the raw sample to the 65 [degree sign]C treated sample while pectin solubility increased up to 75 [degree sign]C. Samples cooked in boiling water had weight gain of 6.8 g/100 g of material, 493.3 mg/100 ml of soluble solids and 588 mg/ 100 ml of total solids of which 507.6 mg was starch.
Keywords: Compression force; Shear; Texture; Cassava

Kamolwan Israkarn, Pranithi Hongsprabhas, Parichat Hongsprabhas, Influences of granule-associated proteins on physicochemical properties of mungbean and cassava starches, Carbohydrate Polymers, Volume 68, Issue 2, 21 March 2007, Pages 314-322, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2006.12.016.
(http://www.sciencedirect.com/science/article/B6TFD-4MMWHJ5-1/2/47c974133aa5c19e0c29f53a392c19f1)
Abstract:

The architecture and physicochemical properties of mungbean starch (MB) and cassava starch (CS) granules were modified by calcium cross-linking under extreme alkaline conditions (pH ~ 12) and the addition of cysteine and calcium lactate at slightly acidic conditions (pH ~ 5-6). The presence of calcium lactate up to 100 mM at pH ~ 12 resulted in the low swelling of heated starch granules but high degree of starch leaching. Confocal laser scanning microscopy indicated that the formation of a rigid starch envelope induced by Ca2+ cross-linking under extreme alkaline pH led to the massive leaching of starch content without collapsing the envelope and consequently lowered the final viscosity of both MB and CS ($P < 0.05$). However, the addition of both cysteine and calcium lactate increased gelatinisation temperature of both starches. Results suggested that the protein-containing envelope plays an important role in determining the granule's ability to retain the starch content after heat treatment and subsequent pasting and thermal characteristics of MB and CS.
Keywords: Architecture; Cassava; Mungbean; Protein; Starch; Granule

M. Kostinek, I. Specht, V.A. Edward, C. Pinto, M. Egounlety, C. Sossa, S. Mbugua, C. Dortu, P. Thonart, L. Taljaard, M. Mengu, C.M.A.P. Franz, W.H. Holzapfel, Characterisation and biochemical properties of predominant lactic acid bacteria from fermenting cassava for selection as starter cultures, International Journal of Food Microbiology, Volume 114, Issue 3, 20 March 2007, Pages 342-351, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2006.09.029.
(http://www.sciencedirect.com/science/article/B6T7K-4MNHXWF-3/2/89e28fb788a4310ad915cf37acb1bcae)
Abstract:
A total of 375 lactic acid bacteria were isolated from fermenting cassava in South Africa, Benin, Kenya and Germany, and were characterised by phenotypic and genotypic tests. These could be divided into five main groups comprising strains of facultatively heterofermentative rods, obligately heterofermentative rods, heterofermentative cocci, homofermentative cocci and obligately homofermentative rods, in decreasing order of predominance. Most of the facultatively heterofermentative rods were identified by phenotypic tests as presumptive Lactobacillus plantarum-group strains, which also comprised the most predominant bacteria (54.4% of strains) isolated in the study. The next predominant group of lactic acid bacteria (14.1% of total isolates) consisted of obligately heterofermentative rods belonging either to the genus Lactobacillus or Weissella, followed by the heterofermentative cocci (13.9% of isolates) belonging to the genera Weissella or Leuconostoc. Homofermentative cocci were also isolated (13.3% of isolates). Biochemical properties such as production of [alpha]-amylase, [beta]-glucosidase, tannase, antimicrobials (presumptive bacteriocin and H2O2-production), acidification and fermentation of the indigestible sugars raffinose and stachyose, were evaluated in vitro for selection of potential starter strains. A total of 32 strains with one or more desirable biochemical properties were pre-selected and identified using rep-PCR fingerprinting in combination with 16S rRNA sequencing of representative rep-PCR cluster isolates. Of these strains, 18 were identified as L. plantarum, four as Lactobacillus pentosus, two each as Leuconostoc fallax, Weissella paramesenteroides and Lactobacillus fermentum, one each as Leuconostoc mesenteroides subsp. mesenteroides and Weissella cibaria, while two remained unidentified but could be assigned to the L. plantarum-group. These strains were further investigated for clonal relationships, using RAPD-PCR with three primers, and of the 32 a total of 16 strains were finally selected for the development as starter cultures for Gari production.
Keywords: Fermentation; Cassava; Gari; Lactic acid bacteria; [beta]-glucosidase

Zu-Qiang Huang, Jian-Ping Lu, Xuan-Hai Li, Zhang-Fa Tong, Effect of mechanical activation on physico-chemical properties and structure of cassava starch, Carbohydrate Polymers, Volume 68, Issue 1, 1 March 2007, Pages 128-135, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2006.07.017.

(http://www.sciencedirect.com/science/article/B6TFD-4KSD5DK-3/2/bd2a3f6185e105818262789c0cc7ea9a)
Abstract:
Cassava starch was mechanically activated with a stirring ball mill and subsequently studied for cold-water solubility and rheological characteristics. In addition, the crystal structure, thermal properties, functional groups, granular morphology and size distribution of the activated cassava starch were further characterized using granularity analysis, scanning electron microscopy, X-ray diffractometry, Fourier transform infrared spectroscopy and differential scanning calorimetry. It was found that the crystal structure and granular morphology of cassava starch were significantly altered. Specifically, the crystalline structure of the cassava starch was significantly degraded, and the resulting amorphous particles were seen to agglomerate during the process of mechanical activation. Also, the gelatinization temperature and enthalpy, apparent viscosity and shear thinning of cassava starch were reduced, resulting in enhancement of cold-water solubility of the starch. Infrared spectroscopy showed no new functional groups produced during the mechanical activation process.
Keywords: Cassava starch; Mechanical activation; Modification; Structure; Physico-chemical property

S. Wongsasulak, T. Yoovidhya, S. Bhumiratana, P. Hongsprabhas, Physical properties of egg albumen and cassava starch composite network formed by a salt-induced gelation method, Food Research International, Volume 40, Issue 2, Starch Functionality III, March 2007, Pages 249-256, ISSN 0963-9969, DOI: 10.1016/j.foodres.2006.03.011.
(http://www.sciencedirect.com/science/article/B6T6V-4K19NP7-4/2/ad4a238c81a7ba1db347ce2e8f1d920d)
Abstract:
Effect of cassava starch (CS) filler on the physical properties of egg albumen (EA) and cassava starch composite (EA-CS) gels and films was investigated using EA as the continuous matrix embedded with CS granules. The composite network was formed at 55 [degree sign]C; below the thermal gelation temperature of both EA and CS, using the salt-induced gelation method. Increasing the pH from 8 to 11 and NaCl from 50 to 200 mM resulted in a softer but more cohesive EA gel (p [less-than-or-equals, slant] 0.05). Raising CS content increased Young's modulus, stress and opacity but reduced the cohesiveness of the mixed gel network (p [less-than-or-equals, slant] 0.05). The release of paprika oleoresin (O/R) from the dried EA-CS composite film into the oil phase was determined as the effective diffusion coefficient (Deff) based on Fick's second law of diffusion. Deff of O/R decreased with increases in the strength and elasticity of the composite film and relative humidity (RH) during film aging. Overall, the study showed that the salt-induced gelation method could be used to form an EA-CS composite film at room temperature. In addition to the strength and elasticity of the protein network, RH during aging could also provide a mean to regulate the controlled-release properties of such a composite film.
Keywords: Composite; Albumen; Cassava; Diffusion; Gel; Film

T.A. Shittu, A.O. Raji, L.O. Sanni, Bread from composite cassava-wheat flour: I. Effect of baking time and temperature on some physical properties of bread loaf, Food Research International, Volume 40, Issue 2, Starch Functionality III, March 2007, Pages 280-290, ISSN 0963-9969, DOI: 10.1016/j.foodres.2006.10.012.
(http://www.sciencedirect.com/science/article/B6T6V-4MK60XF-1/2/ab7d8e9fc5b92331f69b60ef75489ad7)
Abstract:
The use of composite cassava-wheat (CCW) flour for commercial breadmaking purposes and consumption of CCW bread are relatively new in Nigeria. This study investigated the effect of baking temperature and time on some physical properties of bread from composite flour made by

mixing cassava and wheat flour at ratio of 10:90 (w/w). A central composite rotatable experimental design was used while the baking temperature and time investigated ranged from 190 to 240 [degree sign]C and 20 to 40 min, respectively. Loaf volume, weight and specific volume varied significantly ($p < 0.001$) from 440 to 920 cm3, 162 to 183 g and 3.31 to 5.32 cm3/g, respectively. The tristimulus color parameters such as L* (lightness) and brownness index (BI) of the crust varied significantly ($p < 0.01$) from 31 to 72 and 68 to 123, respectively. Moreover, Fresh crumb moisture, density, porosity and softness as well as the dried crumb hardness were also significantly ($p < 0.01$) affected by both the baking temperature and time with values ranging from 34% to 39%, 0.16 to 0.20 g/cm3, 0.69 to 0.80, 13.00 to 18.05 mm and 0.90 to 2.05 kgf, respectively. Due to the complex effect of temperature and time combination, most of the measured properties could not be reliably predicted from the second order response surface regression equations except the loaf weight and crumb moisture. Further studies are required to optimize the CCW bread baking process based on some storage and consumption qualities.
Keywords: Bread loaf properties; Composite flour; Cassava; Wheat; Response surface methodology

Parichat Hongsprabhas, Kamolwan Israkarn, Chantana Rattanawattanaprakit, Architectural changes of heated mungbean, rice and cassava starch granules: Effects of hydrocolloids and protein-containing envelope, Carbohydrate Polymers, Volume 67, Issue 4, 19 February 2007, Pages 614-622, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2006.07.012.
(http://www.sciencedirect.com/science/article/B6TFD-4KPX8VH-3/2/9c689f1e64f49aa4a1b5eb2cf01e88f5)
Abstract:
Architectural changes of starch granules induced by heat were demonstrated using light microscopy and confocal laser scanning microscopy. Heat treatment (80 [degree sign]C, 30 min) on mungbean starch, cassava starch and rice flour suspensions resulted in the rearrangement of amylose and granule-associated proteins within the deformed granules. The presence of alginate and carrageenan influenced the RVA pasting characteristics of starch/flour-hydrocolloid mixed suspensions by maintaining the granular structure of amylose-rich swollen granules or inducing the aggregation of the swollen ones. Generally, the addition of hydrocolloid increased peak viscosity, lowered breakdown and reduced setback of the flour-hydrocolloid mixed paste. This study demonstrated that the heat treatment in excess water generated the protein-containing granule envelope encasing the mungbean and cassava starch content within the deformed granules.
Keywords: Architecture; Cassava; Granule; Mungbean; Rice; Starch

Jose Marcelino Oliveira Cavalheiro, Erivelto Oliveira de Souza, Pushkar Singh Bora, Utilization of shrimp industry waste in the formulation of tilapia (Oreochromis niloticus Linnaeus) feed, Bioresource Technology, Volume 98, Issue 3, February 2007, Pages 602-606, ISSN 0960-8524, DOI: 10.1016/j.biortech.2006.02.018.
(http://www.sciencedirect.com/science/article/B6V24-4JRVFT5-1/2/68482d9216ba422a5547cb787295fcef)
Abstract:
A rapid expansion of fisheries is demanding an adequate supply of efficient, nutritious and inexpensive fish feed, because feed contributes highly to the cost of fish production. Shrimp head, a waste product from the shrimp export industry qualifies as an economical, abundant and good quality protein source for fish feeds. In the present work, shrimp head silage powder, which contained approximately 40% protein, was used as a substitute for fish flour. Four feeds, in the form of pellets, were prepared by substituting shrimp head silage for fish flour at 0%, 33.3%, 66.6% and 100% dietary levels. Other ingredients such as corn, soy, bovine blood, cassava and corn cob flours, soy oil, vitamin premix, salt, and other components also were used in the

formulation. A commercial fish feed was used as the control. The proximate composition of these feeds did not differ significantly at $p > 0.05$, except for the protein content of the control feed, which was about 30.6% versus 35.4-36.9% protein in the other diets. No significant differences ($p > 0.05$ level) in weight and length of juveniles fed with the different feeds during a period of 60 days were observed. In all cases, an excellent correlation (0.9950-0.9996) between weight and length of juveniles was observed. No significant difference in growth of juveniles fed on R1, R2, R3, or R4, or the control feed, was observed. Similarly, the proximate analyses of the flesh of juveniles did not present significant differences ($p > 0.05$). The result of the study indicates that the shrimp head silage could replace fish flour as an ingredient in tilapia feed with economic advantages and without sacrificing the quality of the feed.
Keywords: Shrimp head silage; Fish feed; Tilapia; Growth factors

F. Martinez-Bustos, M. Lopez-Soto, E. San Martin-Martinez, J.J. Zazueta-Morales, J.J. Velez-Medina, Effects of high energy milling on some functional properties of jicama starch (Pachyrrhizus erosus L. Urban) and cassava starch (Manihot esculenta Crantz), Journal of Food Engineering, Volume 78, Issue 4, February 2007, Pages 1212-1220, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2005.10.043.
(http://www.sciencedirect.com/science/article/B6T8J-4JCCJFB-3/2/93ecdff880bc7b9f9239ba4d1a36579e)
Abstract:
In this study, the effect of high energy milling using a Spex ball mixer mill on some functional properties of cassava starch (Manihot utilissima) and jicama starch (Pachyrrisus erosus) were investigated. The properties of individual granules were strongly influenced by the high moisture of ball milling (friction and heat) and physicochemical properties of their amorphous and crystalline zones. High energy milling resulted in a partial fragmentation of the starch granules, increasing the water absorption index (WAI) and the water solubility index (WSI). Increasing moisture content the viscosity was decreased, attributable to the fragmentation of starch granules produced by the milling and favored by the increase of moisture content.
The crystallinity of cassava and jicama starches milled with high moisture contents and longer milling times was decreased. Thermal properties of both ball-milled starches were modified. The enthalpies were lower than native starch indicating that ball milling destroys the crystallinity and double helical order arrangements. Also, the resolution of the peaks was slightly decreased. Ball-milled jicama and cassava starches showed some functional characteristics of gelatinization that possibility their use in food systems as stabilizing, additives, moisture retainers and thickeners.
Keywords: Ball mill; Cassava; Jicama; Starch

Vanessa Dias Alves, Suzana Mali, Adelaide Beleia, Maria Victoria E. Grossmann, Effect of glycerol and amylose enrichment on cassava starch film properties, Journal of Food Engineering, Volume 78, Issue 3, February 2007, Pages 941-946, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2005.12.007.
(http://www.sciencedirect.com/science/article/B6T8J-4J6WNWX-1/2/69feae0103576fbfc4927d9b8e684e8a)
Abstract:
Cassava starch films were produced by casting with the objective to investigate the effect of glycerol and amylose enrichment on its properties. The effects of different amylose quantities (6.3, 15.6 and 25.0 g/100 g of starch) and glycerol contents (20.0, 32.5 and 45.0 g/100 g of starch) on filmogenic solution were evaluated in barrier and mechanical properties of films. Enrichment of amylose in films formulation produced starches in filmogenic solutions with amylose contents ranging between 25.5% and 36.6%. Mechanical and barrier properties of cassava starch films were influenced by glycerol and amylose contents (Tukey test, p [less-than-or-equals, slant] 0.05). The enrichment of filmogenic solutions with amylose solution originates stronger and more

permeable films. Glycerol behaved as a typical plasticizer in starch films; with increasing glycerol concentration, water vapor permeability, strain at break and puncture deformation increased, and stress at break, Young's modulus and puncture strength decreased.
Keywords: Biodegradable films; Barrier properties; Mechanical properties

Piyaporn Kampeerapappun, Duangdao Aht-ong, Duanghathai Pentrakoon, Kawee Srikulkit, Preparation of cassava starch/montmorillonite composite film, Carbohydrate Polymers, Volume 67, Issue 2, 22 January 2007, Pages 155-163, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2006.05.012.
(http://www.sciencedirect.com/science/article/B6TFD-4K7WJ7S-3/2/6982569dfeea14bee72250df09ee0c9d)
Abstract:
Cassava starch/montmorillonite composite films were prepared by casting. This research was focused on the exploitation of chitosan as a compatibilising agent in order to homogeneously disperse the clay particles in a starch matrix. Mixtures of cassava starch, montmorillonite (MMT), chitosan, glycerol as a plasticizer, and distilled water adjusted to pH 3 by acetic acid addition was well mixed with a homogenizer and gelatinized by heating to temperatures of 70-80 [degree sign]C. The obtained homogeneous starch solution was cast onto an acrylic mold and allowed to dry in open air.
X-ray diffraction of the dried film revealed that after treatment with chitosan the interlayer spacing of montmorillonite slightly increased from 14.78 A to 15.80 A, providing information that chitosan was too large to intercalate into clay the gallery in order to produce the nanocomposite. Despite the unachieved state of nanocomposite, the evidence from SEM showed that a finer size of clay particles was obtained in the case of the composite film containing chitosan. The results indicated that chitosan due to its hydrophilicity and capability of attaching to the clay surface played a role in compatabilising between starch matrix and montmorillonite. As a result, the starch/MMT composite film at low MMT content exhibited an improvement in tensile properties due to a reinforcement effect. It was also found that the surface hydrophobicity of the composite film increased with an increase in chitosan content. In association with film hydrophobicity, the water vapor transmission rate and moisture absorption were found to decrease with an increase in chitosan content.
Keywords: Cassava starch/montmorillonite composite film; Chitosan; Mechanical and physical properties

P. Veiga-Santos, L.M. Oliveira, M.P. Cereda, A.R.P. Scamparini, Sucrose and inverted sugar as plasticizer. Effect on cassava starch-gelatin film mechanical properties, hydrophilicity and water activity, Food Chemistry, Volume 103, Issue 2, 2007, Pages 255-262, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.07.048.
(http://www.sciencedirect.com/science/article/B6T6R-4M1TT63-K/2/b51c9c029f9f2b2d4f0ddb220fd1bbfa)
Abstract:
The effect of sucrose and inverted sugar as plasticisers on mechanical properties, hydrophilicity and water activity of cassava starch films has been studied. Other additives (gelatin, soybean oil, sodium phosphate and propylene glycol) and pH effect have also been investigated, using the same parameters. Sucrose addition resulted in the highest effect observed on cassava starch films elongation at break, however inverted sugar also had a great effect on this property. The addition of plasticiser and acidic pH increased film water absorption kinesis, while cassava starch concentration had the opposite effect.
Keywords: Bio-based films; Additives; Plasticizer; Characterization

Arnaldo Cumbana, Estevao Mirione, Julie Cliff, J. Howard Bradbury, Reduction of cyanide content of cassava flour in Mozambique by the wetting method, Food Chemistry, Volume 101, Issue 3, 2007, Pages 894-897, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.02.062.

(http://www.sciencedirect.com/science/article/B6T6R-4JT38RR-2/2/e0cd605371bfc48e00c4b37a68acddbf)
Abstract:
Fifty cassava flour samples from Mogincual District of Nampula Province in Mozambique were found to contain, on average, 43 mg HCN equivalents/kg flour (ppm), of total cyanide, which is typical for a year of average rainfall. Five gram samples of the 30 flour samples of highest cyanide content were mixed with water and left for 5 h at 30 [degree sign]C and it was found that the mean% retention of cyanide was 16.7%. Using 500 g instead of 5 g samples caused an increase in the % retention due to accumulation of the very weak acid, HCN, in the damp flour mass, which also decreased its pH and somewhat reduced the rate of breakdown of linamarin catalysed by linamarase. This problem was overcome by spreading out the damp flour in an approximately 0.5 cm thick layer on a tray, which allowed the release of HCN.
If the wetting/spreading method is acceptable to users it could greatly reduce the cyanide intake of the population of eastern, southern and central Africa and has the potential to eliminate konzo from Africa.
Keywords: Cyanide; Cassava flour; Wetting method; Konzo; Linamarin; Linamarase; Mozambique

T.A. Shittu, L.O. Sanni, S.O. Awonorin, B. Maziya-Dixon, A. Dixon, Use of multivariate techniques in studying the flour making properties of some CMD resistant cassava clones, Food Chemistry, Volume 101, Issue 4, 2007, Pages 1606-1615, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.04.017.
(http://www.sciencedirect.com/science/article/B6T6R-4JV448W-6/2/d4d22440f00d2bd683277575571002e7)
Abstract:
High quality cassava flour (HQCF) is one of the primary products of raw cassava root that has continued to find wider food application in Nigeria. In this study, some 43 newly developed cassava mosaic disease (CMD) resistant clones of cassava were screened based on some physical (flour yield, bulk density, and tri-stimulus colour characteristics (L*, a*, b*, Chroma and Hue)), chemical (moisture, protein, ash, starch, amylose, sugar contents, TTA, pH, and cyanogenic potential), functional (water and oil absorption capacities, water solubility, swelling power, least gelation capacity, diastatic activity, percent damaged starch, and alkaline water retention), and pasting properties. One-way analysis of variance (ANOVA) showed that all properties measured varied significantly ($P < 0.001$). The flours had a wider range of starch content (65-88%), amylose content (13-23%), water absorption capacity (136-224%), diastatic activity (128-354 mg maltose), peak viscosity (77-328 RVU), final viscosity (56-217 RVU), and trough (32-152). Due to the peculiarity of the experimental data generated, two protocols of applying multivariate statistical techniques were evaluated for discriminating the cassava clones. By first applying principal component analysis (PCA), followed by cluster analysis (CA) and finally, discriminant function analysis (DFA) of the experimental data, it was possible to achieve about 87% correct classification of the cassava clones. The final viscosity and diastatic activity of the flours were found to be the most important variables for classifying the cassava clones.
Keywords: Cassava mosaic disease resistant clones; Cassava flour; Physical properties; Chemical properties; Functional properties; Multivariate data analysis

Maoqiang Zheng, Zhengyu Jin, Yanping Zhang, Effect of cross-linking and esterification on hygroscopicity and surface activity of cassava maltodextrins, Food Chemistry, Volume 103, Issue 4, 2007, Pages 1375-1379, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.10.053.
(http://www.sciencedirect.com/science/article/B6T6R-4MJS0B9-2/2/627b992f514bba50fe2a87b99c786479)
Abstract:

The hygroscopicities of cassava maltodextrins, namely cassava maltodextrin (CMD), cassava cross-linked maltodextrin (CCMD), cassava octenyl succinic maltodextrin (COMD) and cassava cross-linked octenyl succinic maltodextrin (CCOMD), gradually increased as the dextrose equivalent (DE) and relative humidity (RH) increased. The hygroscopicities of four types of maltodextrins, with DE 10.2, were 13.42%, 9.89%, 11.80% and 8.91%, respectively, at 25 [degree sign]C and RH 85%. It was observed that cross-linking and esterification decreased hygroscopicities by 26.5% and 12.1%, whereas the combination of them reduced it by 33.7%. The surface activities of cassava maltodextrins were estimated from the surface tension measurement. At 5%, the air-water surface tensions of CMD, CCMD, COMD and CCOMD solutions were 67.24 mN/m, 64.61 mN/m, 52.93 mN/m and 52.21 mN/m, respectively. The influence of esterification on surface activity was more effective than that of cross-linking.
Keywords: Cross-linking; Esterification; Hygroscopicity; Surface activity

Mario Roberto Marostica Jr., Glaucia Maria Pastore, Production of R-(+)-[alpha]-terpineol by the biotransformation of limonene from orange essential oil, using cassava waste water as medium, Food Chemistry, Volume 101, Issue 1, 2007, Pages 345-350, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.12.056.
(http://www.sciencedirect.com/science/article/B6T6R-4JHMFRH-1/2/973c26e8ca3de61b540661a7c60b874f)
Abstract:
The use of two agro-residues (liquid cassava waste and orange essential oil) in the biotransformation of R-(+)-limonene was investigated. The main components of orange essential oil were determined by GC-MS and R-(+)-limonene was shown to be the predominant constituent, accounting for more than 94% of the total content. Cassava wastewater proved to be a suitable substrate for mycelial growth, leading to good, rapid growth with all the fungal strains tested, reaching 29.4 g/l (dry weight) after 3 days of growth (Penicillium sp. 2025). The best R-(+)-[alpha]-terpineol yields were achieved when the strains were grown in cassava media and the mycelia then transferred to a new flask containing mineral medium and orange essential oil as the sole C- and energy source. One of the strains tested, Fusarium oxysporum 152B, converted R-(+)-limonene to R-(+)-[alpha]-terpineol, yielding nearly 450 mg/l after 3 days of transformation. Growth in the presence of a solution of 1% orange essential oil in decane did not increase the transformation yields.
Keywords: Biotransformation; Industrial residues; R-(+)-limonene; R-(+)-[alpha]-terpineol; Fusarium oxysporum

Somphit Sornyotha, Khin Lay Kyu, Khanok Ratanakhanokchai, Purification and detection of linamarin from cassava root cortex by high performance liquid chromatography, Food Chemistry, Volume 104, Issue 4, 2007, Pages 1750-1754, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.10.071.
(http://www.sciencedirect.com/science/article/B6T6R-4MJJCDM-5/2/94107d6bba222dc0104e6e38a82314de)
Abstract:
Linamarin, a cyanogenic glycoside in cassava (Manihot esculenta Crantz cv. KU-50) root cortex and parenchyma was extracted with different acids (HCl, H2SO4, H3PO4 or CH3COOH) and detected by high performance liquid chromatography (HPLC). The highest linamarin was found in both tissues extracted with H2SO4. However, the concentration of linamarin in the extract of the root cortex was higher than that of the root parenchyma. Linamarin in crude extract of the root cortex using 0.25 M H2SO4 was purified by the second step HPLC with the yield of 91.54%. These extraction, detection and purification methods were useful to improve the purity of linamarin from cassava, especially the root cortex.
Keywords: Acid extraction; Cassava root cortex; HPLC; Linamarin detection; Linamarin purification

Mieko Kimura, Cintia N. Kobori, Delia B. Rodriguez-Amaya, Penelope Nestel, Screening and HPLC methods for carotenoids in sweetpotato, cassava and maize for plant breeding trials, Food Chemistry, Volume 100, Issue 4, 2007, Pages 1734-1746, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.10.020.
(http://www.sciencedirect.com/science/article/B6T6R-4HR76RR-8/2/d84bb68bec07b43329bc0fb83cde1e42)
Abstract:
Analytical methods for sweetpotato, cassava and maize were developed. In orange and salmon-fleshed sweetpotatoes, (all-E)-[beta]-carotene predominated and results of spectrophotometric screening and HPLC quantification did not differ significantly. In yellow-fleshed sweetpotato and cassava, however, spectrophotometric screening overestimated the HPLC values because of the presence of several minor carotenoids. Aside from (all-E)-[beta]-carotene, Z-isomers were present in cassava in appreciable amounts. For both crops, extraction with acetone or tetrahydrofuran:methanol (1:1), using a mortar and pestle or a Polytron homogenizer, gave equivalent results. Rehydration of dry maize at room temperature for 30 min or at 85 [degree sign]C for 5, 10 or 15 min gave equivalent results. Concentrations obtained with the C18 and C30 columns did not differ significantly for zeaxanthin, lutein, [beta]-cryptoxanthin and [beta]-carotene in the all-E-configuration, but their Z-isomers were difficult to locate in the chromatogram obtained with the C30 column. Extraction with tetrahydrofuran:methanol (1:1) gave significantly lower results for zeaxanthin and lutein.
Keywords: Sweetpotato; Cassava; Maize; Analysis; Carotenoids; Provitamin A

Olugbenga Owolabi Ogunlabi, Femi Kayode Agboola, A soluble [beta]-cyanoalanine synthase from the gut of the variegated grasshopper Zonocerus variegatus (L.), Insect Biochemistry and Molecular Biology, Volume 37, Issue 1, January 2007, Pages 72-79, ISSN 0965-1748, DOI: 10.1016/j.ibmb.2006.10.003.
(http://www.sciencedirect.com/science/article/B6T79-4M6XMFN-1/2/12ca8441a9e6c51fbace276bf205a642)
Abstract:
[beta]-Cyanoalanine synthase ([beta]-cyano-l-alanine synthase; l-cysteine: hydrogen sulphide lyase (adding hydrogen cyanide (HCN)); EC 4. 4.1.9) was purified from the cytosolic fraction of the gut of grasshopper Zonocerus variegatus (L.) by ion-exchange chromatography on DEAE-Cellulose and gel filtration on Sephadex G-100 columns. The crude enzyme had a specific activity of 2.16 nmol H2S/min/mg. A purified enzyme with a specific activity, which was seventeen times higher than that of the crude extract, was obtained. A molecular weight of about 55.23+/-1.00 Kd was estimated from its elution volume on Sephadex G-100. The fraction when subjected to sodium dodecyl sulphate-polyacrylamide elel electrophoresis revealed the presence of a protein band with Mr of 23.25+/-0.25 Kd. The enzyme exhibited Michaelis-Menten kinetics having Km of 0.38 mM for l-cysteine and Km of 6.25 mM for cyanide. The optimum temperature and pH for activity were determined to be at 30 [degree sign]C and pH 9.0, respectively. This enzyme might be responsible for the ability to detoxify cyanide in this insect pest and hence its tolerance of the cyanogenic cassava plant. Biophysical, biochemical and kinetic properties of this enzyme, which will reveal how this ability can possibly be compromised by enzyme inhibition, may lead, in the long term, to the potential use of this enzyme as drug target for pest control.
Keywords: Cyanide; Cyanoalanine; [beta]-Cyanoalanine synthase; l-cysteine; Grasshopper Zonocerus variegatus (L.)

A. Stewart-Jones, R.J. Hodges, D.I. Farman, D.R. Hall, Prey-specific contact kairomones exploited by adult and larval Teretrius nigrescens: A behavioural comparison across different stored-product

pests and different pest substrates, Journal of Stored Products Research, Volume 43, Issue 3, 2007, Pages 265-275, ISSN 0022-474X, DOI: 10.1016/j.jspr.2006.06.009.
(http://www.sciencedirect.com/science/article/B6T8Y-4MBT253-1/2/2d42103b03472eba8371f537a7f5648c)
Abstract:
Prostephanus truncatus is a serious exotic beetle pest of stored maize and cassava in Africa. Teretrius nigrescens is a classical biological control predator of this pest that was released into Africa in 1991. In previous work it was shown that adult T. nigrescens are arrested in the presence of dust and frass produced by P. truncatus feeding on maize, and both adult and larval T. nigrescens are arrested by solvent extracts of this dust/frass when presented on filter paper. The current study used these two complementary bioassay approaches to test crude dust/frass and then solvent extracts of the same materials. Results demonstrate that T. nigrescens adults are arrested more strongly by the dust/frass of P. truncatus than the dust/frass of six other beetle pests of stored grain. Similar behaviours are observed for responses of both adults and larvae to solvent extracts. However, extract of dust/frass from Sitophilus zeamais is repellent to adults and larvae of T. nigrescens. Collections of dust/frass from P. truncatus cultured on maize, cassava and an artificial maize substrate previously stripped of all hexane extractable compounds, are all shown to arrest adult T. nigrescens when presented in their crude form and to arrest both adults and larvae when presented as solvent extracts. These experiments demonstrate that P. truncatus produces a species-specific kairomone that is independent of the food or tunnelling substrate. Findings are discussed in the context of prey location, particularly in natural habitats.
Keywords: Prostephanus truncatus; Teretrius nigrescens; Kairomone; Maize; Cassava; EthoVision; Arrestant

E. Ebregt, P.C. Struik, P.E. Abidin, B. Odongo, Feeding activity of the East African millipede Omopyge sudanica Kraus on different crop products in laboratory experiments, NJAS - Wageningen Journal of Life Sciences, Volume 54, Issue 3, 2007, Pages 313-323, ISSN 1573-5214, DOI: 10.1016/S1573-5214(07)80022-4.
(http://www.sciencedirect.com/science/article/B94T2-4WFBS6B-6/2/3f1989cb28605284a22d77100d39db10)
Abstract:
Millipedes can cause considerable damage in the production of sweet potato and some other crops in East Africa. Quantitative information on intake of crop diets by and body weight gain of millipedes was collected in short-term no-choice feeding activity laboratory experiments conducted in north-eastern Uganda using female millipedes of the species Omopyge sudanica. Diets consisted of sweet potato and cassava storage root material, groundnut seeds, or maize grains. Differences in intake and body weight gain between diets were not statistically different. The consumption index, i.e., the ratio between intake and body weight gain, was significantly higher for sweet potato than for most other diets. The efficiency of conversion of ingested food, i.e., 100 x the ratio between body weight gain and intake, was significantly lower for the root crops -- especially sweet potato -- than for the grain crops. The research showed how difficult it is to obtain reliable, quantitative data on the feeding habits of millipedes, but also illustrated that O. sudanica can cause harm to crops in north-eastern Uganda and elsewhere in East Africa.
Keywords: no-choice feeding activity; food intake; body weight gain; consumption index; efficiency of conversion of ingested food

M. Isabirye, G. Ruysschaert, L. Van linden, J. Poesen, M.K. Magunda, J. Deckers, Soil losses due to cassava and sweet potato harvesting: A case study from low input traditional agriculture, Soil and Tillage Research, Volume 92, Issues 1-2, January 2007, Pages 96-103, ISSN 0167-1987, DOI: 10.1016/j.still.2006.01.013.

(http://www.sciencedirect.com/science/article/B6TC6-4JHMRNK-1/2/f5b85b922a4dcec566e3e4b03bda5d14)
Abstract:
Soil loss due to crop harvesting (SLCH) has been established as an important soil erosion process that has significantly contributed to soil degradation in highly mechanised agriculture. This has stimulated the need to investigate the importance of this process of erosion under low input agriculture where, until now, only water and tillage erosion are known as important phenomena causing soil degradation. This study was conducted in Eastern Uganda with the following objectives: (1) to assess the amount of soil lost due to the harvesting of cassava roots and sweet potato tubers under low input agriculture, (2) to look into the factors that influence variations in these soil losses, and (3) to estimate the amount of plant nutrients lost due to SLCH for cassava and sweet potato. Soil sticking to roots and tubers was washed and the soil suspension oven dried to estimate the amount of soil lost after harvesting. Mean annual soil loss for cassava was 3.4 tonnes ha-1 and for sweet potato was 0.2 tonnes ha-1. Ammonium acetate lactate extractable soil nutrient losses for cassava were N = 1.71 kg ha-1 harvest-1, P = 0.16 kg ha-1 harvest-1, K = 1.08 kg ha-1 harvest-1 and for sweet potato were N = 0.14, P = 0.01 kg ha-1 harvest-1, K = 0.15 kg ha-1 harvest-1. Difference in soil loss due to crop harvesting for cassava and sweet potato could be due to: (1) smaller yields of sweet potato leading to smaller soil losses on an area basis, (2) smoother skin and less kinked morphology of sweet potato that allowed less soil to adhere, and (3) the fact that sweet potato is planted in mounds which dry out faster compared to the soil under cassava. Soil moisture content at harvesting time and crop age were significant factors that explained the variations in the soil lost at cassava harvesting. Soil loss under cassava justifies the need to conduct further investigations on this process of soil erosion under low input agriculture.
Keywords: Soil erosion; Soil degradation; Soil loss; Cassava; Sweet potato; Roots; Tubers; Uganda; SLCH (soil loss due to crop harvesting)

Italo Delalibera Jr., Clarice G.B. Demetrio, Bryan F.J. Manly, Ann E. Hajek, Effect of relative humidity and origin of isolates of Neozygites tanajoae (Zygomycetes: Entomophthorales) on production of conidia from cassava green mite, Mononychellus tanajoa (Acari: Tetranychidae), cadavers, Biological Control, Volume 39, Issue 3, December 2006, Pages 489-496, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2006.08.003.
(http://www.sciencedirect.com/science/article/B6WBP-4KN5JV1-3/2/59a2721c152b181dc59b52ce2c2d80b1)
Abstract:
Neozygites tanajoae is a very specialized fungus pathogenic to the cassava green mite (CGM), Mononychellus tanajoa, an important cassava pest introduced to Africa from the Neotropics. Conidial discharge from cadavers of CGM that died from infections with 14 isolates of N. tanajoae collected from diverse climates of Brazil was quantified to help select potential candidate strains for introduction to Africa. Studies aimed to identify isolates with lower requirements for relative humidity for sporulation and isolates that discharged more conidia during short periods of moisture. At 96 +/- 0.5% RH, production of conidia was variable and even isolates from the Brazilian semi-arid region, e.g., Petrolina and Itaberaba, produced few conidia. Significant differences in the numbers of conidia produced by diverse Brazilian isolates were observed after 6, 9 and 12 h at 100% RH. At 100% RH, production of primary conidia increased considerably from an average of 57 +/- 4 conidia at 6 h to 509 +/- 37 conidia at 12 h. The isolate sporulating least (BIN21) discharged only 45.7% of the number of conidia produced by isolate BIN1, one of the isolates producing the most spores. Results from this study demonstrate that differences in production of conidia among isolates should be considered when selecting Neozygites isolates for new biological control introductions.
Keywords: Entomophthorales; Mononychellus tanajoa; Sporulation; Primary conidia; Capilliconidia; Biological control; Fungal pathogen

Martin Stupak, Herve Vanderschuren, Wilhelm Gruissem, Peng Zhang, Biotechnological approaches to cassava protein improvement, Trends in Food Science & Technology, Volume 17, Issue 12, December 2006, Pages 634-641, ISSN 0924-2244, DOI: 10.1016/j.tifs.2006.06.004.
(http://www.sciencedirect.com/science/article/B6VHY-4KMYFTK-1/2/b62e654ef7e749b4b31f6d089b427cfe)
Abstract:
Cassava starchy storage roots are an excellent source of carbohydrates but lacking in protein. To enhance their nutritional quality, here we discuss several biotechnological strategies that might be used to increase protein levels as well as improved essential amino acid content in transgenic cassava. Application of such strategies in this major crop could, in the long term, help to fight against malnutrition in those regions which depend heavily on cassava consumption.

Calvin Onyango, Thomas Bley, Annette Jacob, Thomas Henle, Harald Rohm, Influence of incubation temperature and time on resistant starch type III formation from autoclaved and acid-hydrolysed cassava starch, Carbohydrate Polymers, Volume 66, Issue 4, 23 November 2006, Pages 494-499, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2006.04.002.
(http://www.sciencedirect.com/science/article/B6TFD-4K48M7G-2/2/7180032156b5376eaa7cb0a6767937c5)
Abstract:
Raw cassava starch, having 74.94 and 0.44 g/100 g resistant starch type II and III (RS II and RS III), respectively, was autoclaved at 121 [degree sign]C in water, 1, 10 or 100 mmol/L lactic acid. The formation of RS III was evaluated in relation to variable incubation temperature (-20 to 100 [degree sign]C), incubation time (6-48 h) and autoclaving time (15-90 min). Negligible to low quantities of RS III (0.59-2.42 g/100 g) were formed from autoclaved starch suspended in 100 mmol/L lactic acid, whereas intermediate to high quantities (2.68-9.97 g/100 g) were formed from autoclaved starch suspended in water, 1 or 10 mmol/L lactic acid, except for treatments with water or 10 mmol/L lactic acid incubated at 100 [degree sign]C for 6 h (1.74 g/100 g). Autoclaving times corresponding to maximum RS III contents were 15 and 45 min for water and 10 mmol/L lactic acid, respectively. Whereas, the RS III fractions from cassava starch suspended in water had melt transitions between 158 and 175 [degree sign]C with low endothermic enthalpies (0.2-1.6 J/g), the thermal transitions of the acid treated samples were indistinct.
Keywords: Cassava starch; Resistant starch type II; Resistant starch type III; Differential scanning calorimetry

P.T. Marques, C. Perego, J.F. Le Meins, R. Borsali, V. Soldi, Study of gelatinization process and viscoelastic properties of cassava starch: Effect of sodium hydroxide and ethylene glycol diacrylate as cross-linking agent, Carbohydrate Polymers, Volume 66, Issue 3, 2 November 2006, Pages 396-407, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2006.03.028.
(http://www.sciencedirect.com/science/article/B6TFD-4JVT1RP-3/2/143073727fd629bad625a8baaf0953be)
Abstract:
The gelatinization of cassava starch was studied by means of differential scanning calorimetry (DSC) and dynamic rheological measurements. The influence of NaOH in the concentration range (2 x 10-3 M < [NaOH] < 0.5 M, corresponding to 0.2% < [mNaOH/mstarch] < 7.5%) on the gelatinization was investigated. Similar experiments were performed with ethylene glycol diacrylate acting as a cross-linker during gelatinization. The cassava starch was characterized by DSC measurements and static and dynamic light scattering. The influence of starch and NaOH concentrations on the gelatinization temperature, as well as the overshoot of the moduli values accompanying the phenomenon, were studied. An unusual shift in the gelatinization temperature was observed at an [NaOH] concentration of around 0.01 M. As far as the study in presence of

cross-linker is concerned, we focused on the effect of the cross-linker/starch ratio on the dynamic viscoelastic properties of the 'gel' obtained at a relatively high temperature, 85 [degree sign]C.
Keywords: Starch; Viscoelastic properties; Gel

F.N.A. Aryee, I. Oduro, W.O. Ellis, J.J. Afuakwa, The physicochemical properties of flour samples from the roots of 31 varieties of cassava, Food Control, Volume 17, Issue 11, November 2006, Pages 916-922, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2005.06.013.
(http://www.sciencedirect.com/science/article/B6T6S-4H4T0RX-1/2/5bf01cb9b549c9c6e319aa6fc625d57c)
Abstract:
Flours were prepared from 31 cassava varieties and evaluated for their physicochemical properties and pasting characteristics. The results showed that starch content ranged from 67.92% for sample 91/0055 to 88.11% for sample I93/0665. Amylose content of cassava flour varied from 10.9% (94/0050) to 44.3% (I93/0548). The cassava flour had low swelling power values ranging from 5.87(Abasafitaa) to 13.48(I89/02184). Water binding capacity varied from 113.66% for variety 92/0427 to 201.99% for variety 90/00330. Gelatinization temperature was in the range of 66.8 [degree sign]C for Gblemo Duade to 70.4 [degree sign]C for I82/0326 with peak temperatures varying between 73.1 [degree sign]C (92/0035) and 84.5 [degree sign]C (94/0107). The cyanogenic potential (CNp) ranged from 0.58 to 20.0 mg HCN per 100 g of dry weight with 081/00356 having the highest value, while 90/00330 had the lowest. From the data obtained it can be concluded that cassava varieties should not be abandoned because of poor cooking quality and high cyanogenic potential. These varieties could be used for other purposes such as starch production, glucose, adhesives, fuel alcohol, animal feed and other industrial uses.
Keywords: Cassava flour; Physiochemical properties

P. Lanthong, R. Nuisin, S. Kiatkamjornwong, Graft copolymerization, characterization, and degradation of cassava starch-g-acrylamide/itaconic acid superabsorbents, Carbohydrate Polymers, Volume 66, Issue 2, 27 October 2006, Pages 229-245, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2006.03.006.
(http://www.sciencedirect.com/science/article/B6TFD-4JSFVCM-3/2/82fa26cee9c81adc280d6cd13c544a24)
Abstract:
Biodegradable superabsorbent polymers were synthesized by graft copolymerization of acrylamide (AM)/itaconic acid (IA) onto cassava starch via a redox initiator system of ammonium persulfate (APS) and N,N,N',N'-tetramethylethylenediamine (TEMED), in the presence of N,N'-methylenebisacrylamide (N-MBA) crosslinking agent, sodium bicarbonate foaming agent, a triblock copolymer of polyoxyethylene/polyoxypropylene/polyoxyethylene as a foam stabilizer. The acrylamide-to-itaconic acid ratio, the starch-to-monomer ratio, and concentrations of the crosslinking agent and initiator, on the water absorption of the superabsorbent polymers were investigated. The swelling of starch-g-PAM was 39 g g-1 while the starch-g-P(AM-co-IA) with the IA content of 0.02-0.15% mole gave the water swelling value in the range of 70-390 g g-1. By-products of the reaction were removed by water extraction. The starch grafted composites were characterized by FTIR and SEM. Thermal gravimetric analysis was also used for determining the percentage of grafting ratio. Biodegradation of the starch grafted copolymer was carried out using [alpha]-amylase. After the [alpha]-amylase hydrolysis, the amount of reducing sugar was quantified by DNS method. The hydrolyzed solution gave a negative test with iodine solution and a positive test by Benedict's solution, an indication of the existence of glucose units.
Keywords: Cassava starch; Acrylamide; Biodegradable; Superabsorbent polymer; Enzymatic degradation

Lucia Fama, Silvia K. Flores, Lia Gerschenson, Silvia Goyanes, Physical characterization of cassava starch biofilms with special reference to dynamic mechanical properties at low temperatures, Carbohydrate Polymers, Volume 66, Issue 1, 5 October 2006, Pages 8-15, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2006.02.016.
(http://www.sciencedirect.com/science/article/B6TFD-4JYTRW8-1/2/55b32a2650e47043c0be16dd94a71bbf)
Abstract:
Biofilms based on cassava starch and containing glycerol as a plasticizer were characterized with respect to the effect of potassium sorbate concentration and pH on color, crystallinity and mechanical performance al low temperature.
It could be observed that a lower pH resulted in lower values of yellow index and tan [delta] and higher crystallinities.
Crystallinity decreased with sorbate addition, which also resulted, in general, an increase in yellow index and moisture content and a decrease of storage modulus for temperatures higher than the glycerol glass transition. Increase in sorbate content displaced the glass transition temperature of a glycerol-rich phase toward lower temperatures and increased the difference between the value that E' took in the glassy region and the value that it took in the rubbery region.
It is concluded that the physical properties of edible films can be affected by the antimicrobial agent, sorbate potentially compromising biofilm performance.
Keywords: Cassava starch; Biofilms; Physical characterization

Pedro Mayor, Yvonnick Le Pendu, Diva Anelie Guimaraes, Jurupytan Viana da Silva, Hilma Lucia Tavares, Montse Tello, Washington Pereira, Manel Lopez-Bejar, Ferran Jori, A health evaluation in a colony of captive collared peccaries (Tayassu tajacu) in the eastern Amazon, Research in Veterinary Science, Volume 81, Issue 2, October 2006, Pages 246-253, ISSN 0034-5288, DOI: 10.1016/j.rvsc.2005.12.003.
(http://www.sciencedirect.com/science/article/B6WWR-4J91R96-1/2/8199edcf7597f944d108d05393ca3e90)
Abstract:
This study pretends to determine baseline data on the health and mortality of a colony of captive collared peccaries in the Eastern Amazon (Belem, State of Para, Brazil) during a 65-months survey. Thirty-nine out of 166 animals (23.5%) died and were examined post-mortem. Monthly mortality averaged 1.2%. The highest mortality rate was observed in newborns (74.4%). Abandonment by the mother and aggression were responsible for 24.1% and 13.8% of the total newborn deaths, respectively. Most frequent causes of non-neonatal death were food poisoning (50.0%) due to an episode of accidental bitter cassava leaves ingestion and traumatism due to aggressions between animals (10.0%). Results from serology for different infectious diseases showed that 4.9% (2/41) collared peccaries had antibodies against Brucella spp. and 9.8% (4/41) animals had antibodies to two different Leptospira spp. serovars, butembo and autumnalis. This is the first survey of morbidity and mortality in captive collared peccaries in the Amazon region.
Keywords: Mortality; Pathology; Health; Collared peccary; Tayassu tajacu; Wildlife production

H. Ceballos, T. Sanchez, A.L. Chavez, C. Iglesias, D. Debouck, G. Mafla, J. Tohme, Variation in crude protein content in cassava (Manihot esculenta Crantz) roots, Journal of Food Composition and Analysis, Volume 19, Issues 6-7, Biodiversity and nutrition: a common path, September-November 2006, Pages 589-593, ISSN 0889-1575, DOI: 10.1016/j.jfca.2005.11.001.
(http://www.sciencedirect.com/science/article/B6WJH-4J7B0XN-3/2/3537e452a657f1d215f71e2d364e2391)
Abstract:
Cassava roots are perceived as having relatively low protein content compared with other sources of energy (such as maize and wheat). This perception is in part due to a deficient screening in

protein content levels in different cassava germplasm. For the current article, information on protein content of several cassava clones, gathered for a period of about 10 years, has been consolidated. Roots from a total of 149 accessions from the germplasm collection at the International Center for Tropical Agriculture (CIAT) were analyzed for total crude protein content. For 140 clones the evaluations were based on two different root samples and independent quantifications. Results from eight clones were based on three samples, and only for one clone had four different estimations been made. Large differences in protein content (ranging from 0.95% to 6.42%) were observed in the sample analyzed. Results suggest that a considerable proportion of these differences are genetic in nature and therefore that there are excellent possibilities for exploiting these differences and further increasing them by traditional breeding methods.
Keywords: Genetic variability; Nutritional quality; Cassava cultivar

Suzana Mali, Maria Victoria E. Grossmann, Maria A. Garcia, Miriam N. Martino, Noemi E. Zaritzky, Effects of controlled storage on thermal, mechanical and barrier properties of plasticized films from different starch sources, Journal of Food Engineering, Volume 75, Issue 4, August 2006, Pages 453-460, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2005.04.031.
(http://www.sciencedirect.com/science/article/B6T8J-4GHRBST-2/2/71492e16caa131e1af98457a08d25fa3)
Abstract:
Thermal, mechanical and barrier properties of corn, cassava and yam starch films were determined and the behavior of these three starches films under a controlled storage (64% RH and 20 [degree sign]C) was compared. Glass transition (Tg) in all unplasticized films was higher than in plasticized, and during storage, Tg decreased, except for samples with 40 g glycerol/100 g starch. Crystallinity was affected by plasticizer concentration and storage time; in unplasticized samples the increase in crystallinity was higher than in plasticized ones during storage, thus, unplasticized stored samples become more brittle and less permeable during storage. Unplasticized films showed water vapor permeability (WVP) values ranged from 6.75 to 8.33 x 10-10 g m-1 s-1 Pa-1. These values decrease when glycerol content reached at 20 g/100 g starch because a more compact structure was formed and, then, at 40 g glycerol/100 g starch, WVP increased because film matrixes became less dense.
Keywords: Corn; Cassava; Yam; Storage and biodegradable films

Nongnuch Charoenkul, Dudsadee Uttapap, Worayudh Pathipanawat, Yasuhito Takeda, Simultaneous determination of amylose content & unit chain distribution of amylopectins of cassava starches by fluorescent labeling/HPSEC, Carbohydrate Polymers, Volume 65, Issue 1, 10 July 2006, Pages 102-108, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2005.12.030.
(http://www.sciencedirect.com/science/article/B6TFD-4J6X4N1-1/2/f371d7aaaee116d42cb8407fd0612f91)
Abstract:
The fluorescent labeling of debranched starch/high-performance size-exclusion chromatography equipped with one column of Shodex OHpak SB-803HQ and two columns of SB-802.5HQ was proposed for simultaneous determination of amylose content and unit chain distribution of amylopectin of starch samples from four cassava varieties. Chromatograms obtained by refractive index (RI) response detection revealed that peaks of amylose and amylopectin fractions were completely separated, whereas only a peak of amylopectin was observed by fluorescent response detection. The amylose contents of cassava starch samples calculated from the RI response chromatograms were comparable to those determined by amperometric titration method and by overlaying the amylopectin profile on the profile of the starch isoamylolyzate. The values obtained for each starch sample were highly reproducible for duplicate analyses with standard deviations less than 0.6%. Distribution profiles of amylopectins from the starch isoamylolyzate were very

similar to those obtained from fractionated amylopectins. Molar- and weight-based unit-chain fraction and ratio of A+B1/B2+B3 were close to those derived from profiles of fractionated amylopectins. Differences of mole fraction of A, B1 and B2+B3 chains and ratio of A+B1/B2+B3 determined from starch and fractionated amylopectin chromatograms of all four cassava starches were less than 2.7, 2.7, 0.15 and 0.12%, respectively.
Keywords: Cassava starch; Amylose content; Labeling/HPSEC; Unit chain; Amylopectin

Shailesh Kumar, Bill Aalbersberg, Nutrient retention in foods after earth-oven cooking compared to other forms of domestic cooking: 1. Proximates, carbohydrates and dietary fibre, Journal of Food Composition and Analysis, Volume 19, Issue 4, After Processing: The Fate of Food Components, June 2006, Pages 302-310, ISSN 0889-1575, DOI: 10.1016/j.jfca.2005.06.006.
(http://www.sciencedirect.com/science/article/B6WJH-4J9N0RR-2/2/78fa3af7ce2ff8fc0b3762d46612124d)
Abstract:
Effects of Pacific traditional style of cooking in an earth-oven1 on proximate content of chicken, lamb chops, fish, cassava, taro and palusami2 were investigated. Retention of proximates in earth-oven-cooked samples was compared with the retention in microwaved and oven-roasted chicken and lamb chops, microwave-cooked fish, boiled cassava and taro, and steamed-cooked palusami, the nutrient analyses of all of which were conducted during the course of this study. Water content of the samples generally decreased most upon earth-oven cooking. As much as 32.9% moisture was lost from earth-oven-cooked lean of lamb chops. Loss of water from microwave-cooked meat, ranging from 6.6 to 25.8 g/100 g, was second to the moisture loss in earth-oven-cooked meat and the least amount of moisture was lost from the gas-oven roasted meat with the values ranging from 4.4 to 22.2 g/100 g. Retention of protein ranged from 96% to 103% in all samples, the differences being not statistically significant. However, interestingly high retention values of fat were noted in separable lean of lamb chops ranging from 291% to 294%. A simple and logical explanation for this observation is adsorption of fat from separable fat, as it melted during cooking, into the muscle tissue of lamb chops. Retention of over 100% dietary fiber in all foods that had this component in the raw state was noted upon all types of cooking, except in steam-cooked palusami. This implied an increase in this component of food after cooking, whereas starch and sugars generally decreased after cooking.
Keywords: Earth-oven; Palusami; Proximate; Water; Protein; Fat; Sugars; Starch; Dietary fiber; Ash

Shailesh Kumar, Bill Aalbersberg, Nutrient retention in foods after earth-oven cooking compared to other forms of domestic cooking: 2. Vitamins, Journal of Food Composition and Analysis, Volume 19, Issue 4, After Processing: The Fate of Food Components, June 2006, Pages 311-320, ISSN 0889-1575, DOI: 10.1016/j.jfca.2005.06.007.
(http://www.sciencedirect.com/science/article/B6WJH-4J9N0RR-3/2/7c578a01d8089252bb5f4e3c739a4535)
Abstract:
Effects of Pacific traditional style of cooking in an earth-oven1 on vitamin content of chicken, lamb chops, fish, cassava, taro and palusami2 were investigated. Retention of vitamins (retinol, [beta]-carotenes, thiamin, riboflavin, niacin and ascorbic acid) in earth-oven cooked samples was compared with the retention in microwaved and oven-roasted chicken and lamb chops, microwave-cooked fish, boiled cassava and taro, and steamed cooked palusami, the nutrient analyses of all of which were conducted during the course of this study. Retention of retinol ranged from 20% to 91% for all cooked samples. Generally higher retention of this vitamin was observed in microwave cooked samples whereas the lowest retentions were characteristic of earth-oven cooked samples. Retention of more than 100% was observed for [beta]-carotenes in cooked palusami. There was low retention of thiamin and riboflavin in most samples, with thiamin

generally showing lower retention levels. Highest losses were usually observed with oven roasting, slightly more than the losses with earth-oven cooking. Microwave cooking caused the least loss of these two B vitamins. Niacin was quite stable to all the cooking methods with the retentions ranging from 63% to 95%. Retention values were comparable between similar samples cooked by different methods. Steam cooking was most detrimental to ascorbic acid in palusami. It caused a total loss of ascorbic acid from palusami upon cooking compared to earth-oven cooking after which 62% was retained in the palusami. Most ascorbic acid was retained in earth-oven cooked cassava (76%).
Keywords: Earth-oven; Palusami; Thiamin; Riboflavin; Retinol; [beta]-carotene; Niacin; Ascorbic acid

T. Agbor-Egbe, I. Lape Mbome, The effects of processing techniques in reducing cyanogen levels during the production of some Cameroonian cassava foods, Journal of Food Composition and Analysis, Volume 19, Issue 4, After Processing: The Fate of Food Components, June 2006, Pages 354-363, ISSN 0889-1575, DOI: 10.1016/j.jfca.2005.02.004.
(http://www.sciencedirect.com/science/article/B6WJH-4J9X2W2-2/2/2fab30b71af8343c1f604aa13e06b44c)
Abstract:
This study investigated the effects of cassava processing techniques in reducing cyanogen levels to low levels during the production of some Cameroonian foods (baton de manioc, fufu and gari). The processing techniques used for each of the foods did not vary in details from one processor to the other, and no considerable differences were found in neighbouring villages. They were highly effective in substantially reducing mean total cyanogen contents (197.3-951.5 mg HCN equivalent/kg) to low levels (1.1-27.5 mg HCN equivalent/kg). In spite of the different cassava varieties used for processing, similar mean reduction levels (97.1-99.8%) in total cyanogens were obtained by the processors: 98.8%, 97.1% and 99.7% for baton de manioc, fufu and gari, respectively. With regard to the greatest changes in total cyanogens, the most important techniques were those that maximise root tissue disintegration causing marked decreases in both linamarin and pH levels, which coincided with significant increases in cyanohydrin. The residual cyanogens were in the form of cyanohydrin, which were partially removed during post-fermentation processes.
Keywords: Processing techniques; Cyanogens; Baton de manioc; Fufu; Gari

J. Howard Bradbury, Simple wetting method to reduce cyanogen content of cassava flour, Journal of Food Composition and Analysis, Volume 19, Issue 4, After Processing: The Fate of Food Components, June 2006, Pages 388-393, ISSN 0889-1575, DOI: 10.1016/j.jfca.2005.04.012.
(http://www.sciencedirect.com/science/article/B6WJH-4HTBKXP-1/2/2ce29ea001c9c1678c22ea22a58ebd9e)
Abstract:
Ten samples of cassava flour from Mozambique, Indonesia and Australia and one sample of gari from Mozambique were thoroughly mixed with water in the ratio 1:1.25. All the water was absorbed by the flour and the mixture was left in an open beaker at 30 [degree sign]C. It was found that, providing that there was a reasonable amount of linamarase in the flour, the total cyanide content reduced about three-fold over 5 h. Addition of exogenous linamarase increased greatly the rate of breakdown of linamarin in the flour. There was no breakdown of linamarin from a gari sample at pH 4.2, but breakdown occurred when the pH was increased to 6 with buffer.
The rationale for using this wetting method is that it is simple: the cassava flour is thoroughly mixed with water and allowed to stand in an open vessel for about 5 h, and then it is used for cooking. If the results in this brief paper are confirmed in the field and the method is acceptable to women, then it should decrease substantially the cyanide intake of those people in eastern, central

and southern Africa who consume cassava flour, and thus reduce the incidence of cyanide poisoning and konzo.
Keywords: Casssava flour; Wetting method; Reduces cyanide intake; Konzo; Linamarase; Linamarin

Duong Nguyen Khang, Hans Wiktorsson, Performance of growing heifers fed urea treated fresh rice straw supplemented with fresh, ensiled or pelleted cassava foliage, Livestock Science, Volume 102, Issues 1-2, June 2006, Pages 130-139, ISSN 1871-1413, DOI: 10.1016/j.livsci.2005.12.003.
(http://www.sciencedirect.com/science/article/B7XNX-4J91NS2-1/2/d10ddeba5f16f5918d89754f0f1dabad)
Abstract:
Sixty-eight growing heifers were used in three experiments to evaluate the effects on feed intake, growth, liver enzymes and thyroid hormone status of four supplemental levels of cassava foliage: 0 (T0), 50 (T50), 75 (T75) and 100 g (T100) crude protein 100 kg- 1 LWt provided by fresh, ensiled or pelleted cassava foliage in diets based on urea treated fresh rice straw (UFRS) ad libitum, 0.72 kg dry matter (DM) of napier grass and 0.26 kg DM of cassava root meal (CRM) 100 kg- 1 LWt. The ensiled cassava foliage (ECF) supplement experiment was conducted from June to October in 2002, and the fresh (FCF) and pelleted (PCF) cassava foliage supplement experiments from February to June and August to December in 2003, respectively. The results showed that increasing the level of cassava foliage supplementation in the all experiments slightly decreased UFRS intake ($p < 0.001$), but to a lower extent than the added amount of cassava foliage. The highest total DMI was on the highest level of cassava foliage supplement (T100). At the highest level offered, of 100 g CP of PCF 100 kg- 1 LWt day- 1, the heifers readily consumed all PCF, while the daily intakes of the FCF and ECF were 80% and 94% of the amount offered, respectively. The daily intake of HCN on T100 for heifers fed FCF, ECF and PCF were 1.94, 0.52 and 0.17 g 100 kg- 1 LWt day- 1, respectively. Increasing the levels of ECF and PCF supplement significantly increased live weight gain ($p < 0.001$), while the increase was not significant for FCF. Daily live weight gains at T100 were 0.160, 0.233 and 0.266 kg day- 1 for FCF, ECF and PCF, respectively. Significant effects of FCF level were found on triiodothyronine ($p < 0.01$) and on thyroxin ($p < 0.05$) when comparing T75 and T100 versus T0 and T50, while the levels of free thyroxin, thyrotropin-stimulating hormone, aspartate aminotransferase and alanine aminotransferase were not significantly different at all FCF levels. Thyroid hormones and liver enzymes did not differ among treatments ($p > 0.05$) in the PCF and ECF supplement experiments. It is concluded that FCF with its high HCN and condensed tannin content was slightly unpalatable, had a negative effect on circulating thyroid hormones at higher supplemental levels and an adverse effect on growth rate, while ECF and PCF supplementation resulted in improved growth rate without adverse effect on thyroid hormones and feed intake when fed to growing heifers.
Keywords: Growing heifers; Cassava foliage; Feed intake; Thyroid gland hormones; Liver enzymes

Adelaide Beleia, Soraya S. Butarelo, Rui Sergio F. Silva, Modeling of starch gelatinization during cooking of cassava (Manihot esculenta Crantz), LWT - Food Science and Technology, Volume 39, Issue 4, May 2006, Pages 400-405, ISSN 0023-6438, DOI: 10.1016/j.lwt.2005.02.021.
(http://www.sciencedirect.com/science/article/B6WMV-4FWS7K1-2/2/7ddc7dec31fe536abc540118b28f0668)
Abstract:
There is a great variability in cooking time and final texture among cassava cultivars and one factor in determining these characteristics is the age of roots at harvest. Final texture after cooking is an important attribute for the acceptability of cassava and starch gelatinization has a role in softening the tissue. Two cassava cultivars at two different harvest maturities were cooked at 90

[degree sign]C and at boiling water temperature (98 [degree sign]C) and the extent of gelatinization was determined using an iodine colorimetric method. A generalized model for starch gelatinization, considering temperature and cooking time as continuous variables and age at harvest as qualitative variable, was used to model the cooking process and applied for each cultivar. At 90 [degree sign]C IAPAR-19 Pioneira reached maximum gelatinization in 32 min for the 12 month old sample and 88 min for the 25 month old sample, while double the time was needed for Catarina Amarela. At 98 [degree sign]C Pioneira gelatinized in 12 min for the 12 month and 32 min for the 25 month old sample while Catarina Amarela needed 28 and 56 min. Calculated activation energy for starch gelatinization was 122.3+/-5.2 and 98.6+/-4.7 kJ/mol for cultivar IAPAR-19 Pioneira and Catarina Amarela, respectively.
Keywords: Manihot esculenta; Cassava; Activation energy; Modeling; Thermal treatment

F.P. Portilho, D.M.S.S. Vitti, A.L. Abdalla, C.M. McManus, M.J.M. Rezende, H. Louvandini, Minimum phosphorus requirement for Santa Ines lambs reared under tropical conditions, Small Ruminant Research, Volume 63, Issues 1-2, May 2006, Pages 170-176, ISSN 0921-4488, DOI: 10.1016/j.smallrumres.2005.03.006.
(http://www.sciencedirect.com/science/article/B6TC5-4G65C8X-1/2/99d111b3ee9046ca62b58158688d660e)
Abstract:
The aim of this study was to determine endogenous fecal loss and phosphorus absorption, as well as to estimate minimum phosphorus requirement for Santa Ines lambs supplemented with different levels of dicalcium phosphate. Twelve male non-castrated Santa Ines sheep, weighing 22.6 +/- 2.21 kg, received a basal diet containing Coast cross hay offered ad libitum, 200 g/day cassava meal, 15 g/day urea and 10 g/day mineral mixture to meet their maintenance requirements. The treatments consisted of adding dicalcium phosphate to the basal diet to give 1.5, 3.0 and 4.5 g of phosphorus/animal/day. On the 22nd day of the experiment, 7.4 MBq of 32P was injected through the jugular vein of each animal. Samples of blood, faeces and urine were collected for a 7-days period and specific activities were determined. There was a significant regression between phosphorus absorption, total phosphorus excreted in faeces, endogenous faecal loss and retention with phosphorus intake. For zero retention, the phosphorus intake was 140.86 mg/kg live weight, resulting a minimum requirement of 3.18 g/day/animal of phosphorus and close to that recommended for wool lambs.
Keywords: Endogenous loss; Sheep; Metabolism; Santa Ines; 32P

Luciana A. Oliveira, Ana L.F. Porto, Elias B. Tambourgi, Production of xylanase and protease by Penicillium janthinellum CRC 87M-115 from different agricultural wastes, Bioresource Technology, Volume 97, Issue 6, April 2006, Pages 862-867, ISSN 0960-8524, DOI: 10.1016/j.biortech.2005.04.017.
(http://www.sciencedirect.com/science/article/B6V24-4GCX1DH-3/2/9b9459fd733c525c494f05b4b0752ac0)
Abstract:
Five agricultural wastes were evaluated in submerged fermentation for xylanolytic enzymes production by Penicillium janthinellum. The wastes were hydrolyzed in acid medium and the liquid fraction was used for cultivation. Corn cob (55.3 U/mL) and oat husk (54.8 U/mL) were the best inducers of xylanase. Sugar cane bagasse (23.0 U/mL) and corn husk (23.8 U/mL) were moderately good, while cassava peel was negligible. Protease production was very low in all agro-industrial residues. The maximum biomass yields were 1.30 and 1.17 g/L for cassava peel and corn husk after 180 h, respectively. Xylanolytic activity showed a cell growth associated profile.
Keywords: Xylanase production; Biomass; Penicillium janthinellum; Agricultural residues; Submerged fermentation

S. Wongsasulak, T. Yoovidhya, S. Bhumiratana, P. Hongsprabhas, D.J. McClements, J. Weiss, Thermo-mechanical properties of egg albumen-cassava starch composite films containing sunflower-oil droplets as influenced by moisture content, Food Research International, Volume 39, Issue 3, April 2006, Pages 277-284, ISSN 0963-9969, DOI: 10.1016/j.foodres.2005.07.014.
(http://www.sciencedirect.com/science/article/B6T6V-4H3JJ8V-1/2/0eb1b07e5a8fe447b369f5b441a88153)
Abstract:
The effect of moisture content on the thermo-mechanical and structural properties of egg albumen-cassava starch composite films containing sunflower oil droplets was studied using dynamic mechanical analysis (DMA), differential scanning calorimetry (DSC) and scanning electron microscopy (SEM). Composite films were prepared by cold gelation, dried in a moisture controlled incubator (83.5%RH) at 25 [degree sign]C for 8 days and aged at different relative humidity at room temperature (21 +/- 1 [degree sign]C) for 7 days to obtain composite films with moisture contents of 4%, 7%, 11%, 17% and 46% (dry weight basis). In DMA thermograms the magnitude of G' and G'' increased with increasing temperature in high-moisture samples, decreased and then again gradually increased for intermediate-moisture samples, and decreased in low moisture samples. DSC thermograms indicated two distinct peaks (at 49-53 [degree sign]C and 79.8 to 132.4 [degree sign]C) which were attributed to phase transitions and protein denaturation. SEM images indicated that the microstructure of the composite matrix changed with moisture content and heating temperature. Our study confirms that moisture content plays a key role in the thermo-mechanical properties and microstructure of egg albumen-cassava starch composite films containing sunflower oil.
Keywords: Egg albumen; Cassava starch; Composite film; Thermo-mechanical properties; Phase transition

Y. Sudaryanto, S.B. Hartono, W. Irawaty, H. Hindarso, S. Ismadji, High surface area activated carbon prepared from cassava peel by chemical activation, Bioresource Technology, Volume 97, Issue 5, March 2006, Pages 734-739, ISSN 0960-8524, DOI: 10.1016/j.biortech.2005.04.029.
(http://www.sciencedirect.com/science/article/B6V24-4GDBT7V-2/2/96e2e2eb623e12da635cad885b932770)
Abstract:
Cassava is one of the most important commodities in Indonesia, an agricultural country. Cassava is one of the primary foods in our country and usually used for traditional food, cake, etc. Cassava peel is an agricultural waste from the food and starch processing industries. In this study, this solid waste was used as the precursor for activated carbon preparation. The preparation process consisted of potassium hydroxide impregnation at different impregnation ratio followed by carbonization at 450-750 [degree sign]C for 1-3 h. The results revealed that activation time gives no significant effect on the pore structure of activated carbon produced, however, the pore characteristic of carbon changes significantly with impregnation ratio and carbonization temperature. The maximum surface area and pore volume were obtained at impregnation ratio 5:2 and carbonization temperature 750 [degree sign]C.
Keywords: Activated carbon; Pore structure; Cassava peel; Activation

J.I. Lenis, F. Calle, G. Jaramillo, J.C. Perez, H. Ceballos, J.H. Cock, Leaf retention and cassava productivity, Field Crops Research, Volume 95, Issues 2-3, 15 February 2006, Pages 126-134, ISSN 0378-4290, DOI: 10.1016/j.fcr.2005.02.007.
(http://www.sciencedirect.com/science/article/B6T6M-4FRB7WW-1/2/bde1ca835819a293b75e5b98cef1a930)
Abstract:
Increased longevity of leaves, or improved leaf retention, has been suggested as a possible means to increase productivity of cassava (Manihot esculenta Crantz). This study evaluated

variation in leaf retention and its relation to cassava productivity under irrigated and stressed conditions. In the first trial 1350 clones were evaluated on the North Coast of Colombia with a 5-month dry period towards the end of the growth cycle. Clones with the leaf retention trait produced more total fresh biomass and yielded 33% more root dry matter than plants without the trait. In the irrigated trial 110 clones were evaluated on the CIAT farm at about 1000 mamsl. Leaf retention was quantified using a 1-5 visual score with five corresponding to excellent leaf retention. Genetic correlations between leaf retention and fresh foliage production (0.49), root dry matter yield (0.46), fresh root production (0.43) and root dry matter content (0.25) were obtained. Increased root yield under stressed and unstressed conditions was associated with increased total biomass production and increased harvest index. These finding concur with the results of cassava growth models that include leaf longevity as a variable. The lack of any negative genetic correlations between leaf retention and useful agronomic traits coupled with the relatively high genetic correlation for root yield and the high heritability (0.55) for leaf retention indicate that it should be relatively easy and advantageous to incorporate this characteristic in breeding and selection programs directed to increasing root yield under both water stressed and unstressed conditions.
Keywords: Cassava; Stay green; Leaf retention; Breeding; Yield; Physiology; Heritability

P. Coulin, Z. Farah, J. Assanvo, H. Spillmann, Z. Puhan, Characterisation of the microflora of attieke, a fermented cassava product, during traditional small-scale preparation, International Journal of Food Microbiology, Volume 106, Issue 2, 1 February 2006, Pages 131-136, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2005.06.012.
(http://www.sciencedirect.com/science/article/B6T7K-4H87794-3/2/45f59413a7bfff6ebdf0d62b9c2d02d3)
Abstract:
Attieke is a fermented cassava product consumed mainly in Cote d'Ivoire. The aim of this study was to characterise the attieke fermentation by examining products from 15 small-scale production sites at various stages of its preparation. For the preparation of attieke, fresh cassava is grated to a pulp and inoculated with 10% of a spontaneous traditional inoculum. The inocula contained aerobic mesophiles at mean numbers of 8.2 x 107 cfu/g and lactic and acetic acids at mean concentrations of 0.2% and 0.1%, respectively. The mean pH was 5.0. Lactic acid bacteria were the dominant microorganisms in cassava pulp throughout fermentation with the mean numbers being 1.2 x 109 cfu/g after 15 h. The identification to the species level of microorganisms from one representative attieke production of good quality showed that, at the start of fermentation, Leuconostoc mesenteroides subsp. mesenteroides was present in the highest numbers, accounting for 20% of all lactic acid bacteria. As the fermentation proceeded, this species was replaced by homofermentative lactic acid bacteria, Lactobacillus salivarius and Lactobacillus delbrueckii subsp. delbrueckii, present at 20% and 16%, respectively, and obligate heterofermentatives, Lactobacillus fermentum and Lactobacillus confusus at 12% and 10%, respectively, of total lactic acid bacteria in the flora at the end of fermentation. High numbers of acid-sensitive microorganisms, Bacillus circulans, Bacillus lentus, Enterobacter sakazakii, Enterobacter cloacae and Klebsiella pneumoniae subsp. pneumoniae, were transferred to the pulp in the inocula, but acidification to a mean pH of 4.4 with mean lactic and acetic acid concentrations of 0.59% and 0.2%, respectively, prevented their growth and reduced their numbers to less than 102 cfu/g at the end of fermentation. The mean numbers of Candida tropicalis, the main yeast present, remained relatively constant at about 105 cfu/g throughout attieke production. The mean numbers of aerobic mesophiles decreased to below 102 cfu/g as a result of the steaming process. The finished attieke had a mean pH of 4.4 and mean lactic and acetic acid concentrations of 0.6% and 0.1%, respectively.
Keywords: Cassava fermentation; Attieke; Lactic acid bacteria

Cholwasa Bangyekan, Duangdao Aht-Ong, Kawee Srikulkit, Preparation and properties evaluation of chitosan-coated cassava starch films, Carbohydrate Polymers, Volume 63, Issue 1, 18 January 2006, Pages 61-71, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2005.07.032.
(http://www.sciencedirect.com/science/article/B6TFD-4HM7S0S-1/2/67f2bfe62b5678884b1f9b37b9459eeb)
Abstract:
Chitosan-coated cassava starch films were prepared. In this study, chitosan coating solutions varying from 1 to 4 wt% were coated onto the free starch films containing 2, 3, 4, 5, and 6 wt% glycerol as a plasticizer. The X-ray patterns of the coated dry film showed that the reflection of B-type starch crystalline shifted to slightly higher degrees at about 17.2[degree sign] (2[theta]) compared with the free starch film found at 17.0[degree sign] (2[theta]). The shifting in starch diffraction peak was probably due to the change in its chain orientation caused by hydrogen-bonding interaction between chitosan and starch molecules, resulting in their good adhesion. Coating of chitosan solutions led to an improvement in several film properties including mechanical and physical properties. The results of mechanical properties evaluation showed that an increase in chitosan coating concentration resulted in a significant increase in tensile stress at maximum load and tensile modulus, and a decrease in percent elongation at break. Film strength along coating direction was higher than that of transverse direction as a result of force applied during coating process. Concerning physical properties, a remarkable decrease in water uptake was observed due to the contribution of hydrophobicity of chitosan coating layer. The hydrophobic acetyl groups of chitosan caused a notable reduction of wettability as well as water vapour permeability which are preferable for packaging film application.
Keywords: Chitosan-coated starch film; Biodegradable film; Water vapour transmission rate; Surface properties and mechanical properties

M. Horsfall Jr., A.A. Abia, A.I. Spiff, Kinetic studies on the adsorption of Cd2+, Cu2+ and Zn2+ ions from aqueous solutions by cassava (Manihot sculenta Cranz) tuber bark waste, Bioresource Technology, Volume 97, Issue 2, January 2006, Pages 283-291, ISSN 0960-8524, DOI: 10.1016/j.biortech.2005.02.016.
(http://www.sciencedirect.com/science/article/B6V24-4FWKM8F-3/2/170e38acf68e5ecf056d137ae1f513dd)
Abstract:
The kinetics of Cd2+, Cu2+ and Zn2+ adsorption onto pure and thioglycolic acid treated cassava tuber bark wastes (CTBW) were investigated using a batch sorption technique at 30 [degree sign]C. Kinetic data suggested that the adsorption process was exothermic, the rate limiting sorption step was physisorption and adsorption rates could be best described by a pseudo-second order model. Rate coefficients were determined to range between 1.39 x 10-2 min-1 and 5.94 x 10-2 min-1, 1.46 x 10-3 min-1 and 5.76 x 10-3 min-1 and 0.69 x 10-3 min-1 and 5.8 x 10-3 min-1 for Cd2+, Cu2+ and Zn2+, respectively. The results from these studies indicated that the sorption process is fast and stable. The adsorption equilibria were evaluated using the Langmuir equation and the monolayer sorption capacity was found to range between 5.88-26.3 mg/g, 33.3-90.9 mg/g and 22.2-83.3 mg/g for Cd2+, Cu2+ and Zn2+, respectively. Negative values of indicated that the adsorption process was spontaneous and exothermic in nature.
Keywords: Adsorption; Kinetic study; Bioremediation; Cassava waste; Wastewater treatment; Thiolation

Marcia Nitschke, Glaucia Maria Pastore, Production and properties of a surfactant obtained from Bacillus subtilis grown on cassava wastewater, Bioresource Technology, Volume 97, Issue 2, January 2006, Pages 336-341, ISSN 0960-8524, DOI: 10.1016/j.biortech.2005.02.044.
(http://www.sciencedirect.com/science/article/B6V24-4G0M3M8-1/2/d5eb0c66c0ca0a3bcdc599ed7ca48e88)

Abstract:
The production and properties of a biosurfactant, synthesized by Bacillus subtilis LB5a strain, using cassava wastewater as substrate were investigated. The microorganism was able to grow and to produce surfactant on cassava waste, reducing the surface tension of medium to 26.6 mN/m and giving a crude surfactant concentration of 3.0 g/L after 48 h. The surface-active compound retained its properties during exposure to elevate temperatures (100 [degree sign]C), high salinity (20% NaCl) and a wide range of pH values. The surfactant was capable of forming stable emulsions with various hydrocarbons. Preliminary chemical characterization revealed that the surfactant has a lipopeptide composition with a CMC value of about 33 mg/L. Cassava wastewater proved to be a suitable substrate for biosurfactant biosynthesis, providing not only bacterial growth and product accumulation but also a surfactant that has interesting and useful properties with potential for many industrial applications.
Keywords: Biosurfactant; Bacillus subtilis; Cassava wastewater; Lipopeptide

J.B. Assanvo, G.N. Agbo, Y.E.N. Behi, P. Coulin, Z. Farah, Microflora of traditional starter made from cassava for 'attieke' production in Dabou (Cote d'Ivoire), Food Control, Volume 17, Issue 1, January 2006, Pages 37-41, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2004.08.006.
(http://www.sciencedirect.com/science/article/B6T6S-4DN13NP-2/2/66a0b1d339fa40b0e0be013e8a823f94)
Abstract:
Attieke is a food made from cassava in Cote d'Ivoire by fermentation. The process uses a traditional starter. Studies on 81 starter samples from 3 villages showed that the dominant microflora consists of lactic acid bacteria (5.7 x 107 cfu/g), yeasts (5.5 x 107 cfu/g), Bacillus (3.8 x 107 cfu/g), Enterococcus (3.0 x 106 cfu/g), total coliforms (3.0 x 106 cfu/g), thermotolerant coliforms (8.0 x 103 cfu/g) and mould (2.0 x 106 cfu/g). Lactic acid bacteria, Bacillus spp, yeasts, faecal Enterococci and moulds are organisms which could play a role in the cassava fermentation. Coliforms may indicate contamination from the environment during production.
Keywords: Cassava; Traditional starter; Microflora; Attieke

Kerstin Hell, Yendouban Lamboni, Thomas Houndekon, Guirguissou Maboudou Alidou, Augmented release of Teretrius nigrescens Lewis (Coleoptera: Histeridae) for the control of Prostephanus truncatus (Horn) (Coleoptera: Bostrichidae) in stored cassava chips, Journal of Stored Products Research, Volume 42, Issue 3, 2006, Pages 367-376, ISSN 0022-474X, DOI: 10.1016/j.jspr.2005.09.001.
(http://www.sciencedirect.com/science/article/B6T8Y-4J0X8B9-2/2/62347081f5614191a93c0629e92b1938)
Abstract:
A trial was set up in northern Benin to evaluate the potential of Teretrius nigrescens to reduce the infestation and damage to cassava chips caused by storage insects. Cassava chips were stored for 5 months in mud silos and 50 adults of T. nigrescens were added when the stores were first filled. Stores where no predator was released were monitored as controls. The main storage insects observed were Prostephanus truncatus and Dinoderus spp. Initial chip weight varied between 102 and 246 g with no difference between treatments. Chip weight and number of holes on chips initially differed between treatments after 2 months of storage. After 3 months of storage, losses reached 40-50% without T. nigrescens and 30-40% when cassava chips were stored with T. nigrescens. A farmer can increase his profit by 1437 Fcfa/100 kg (1$=560 Fcfa, 1[pound sign]=968 Fcfa; 1[euro]=656 Fcfa, as on 2 December 2005) through the use of T. nigrescens because losses are reduced by 11%. Data analysis showed that there were significant differences (P<0.0001) between the two treatments for the number of holes, number of insects, weight of each chip as well as damage. There were twice as many P. truncatus and holes on chips in stores

where T. nigrescens was not released. The addition of the predator to farmers' stores is an economic option for controlling losses due to insects in cassava chips.
Keywords: Teretrius nigrescens; Prostephanus truncatus; Cassava chips; Insect losses; Storage; West Africa

A.P.J. Mol, Tran Thi My Dieu, Analysing and governing environmental flows: the case of Tra Co tapioca village, Vietnam, NJAS - Wageningen Journal of Life Sciences, Volume 53, Issues 3-4, 2006, Pages 301-317, ISSN 1573-5214, DOI: 10.1016/S1573-5214(06)80011-4.
(http://www.sciencedirect.com/science/article/B94T2-4WFBS5M-4/2/534274897566c4086ed217ec226bd290)
Abstract:
Environmental flows are of crucial importance for questions of sustainability. But analysing only the material side of environmental flows brings us half way understanding questions of sustainability. This article reports on the development of a more integrative approach in studying environmental impacts of agro-industrial systems in Asia, taking tapioca (cassava starch) processing in Vietnam as an example. The analysis of material flows and technological options to close material cycles is combined with an actor-network analysis from three angles: a policy, an economic and a social perspective, respectively. The paper finally assesses the additional value of the developed methodology and points out ways for further investigation and development of a more integrative approach to industrial transformations.
Keywords: cassava starch; agro-industries

F.D.S. Larotonda, K.N. Matsui, P.J.A. Sobral, J.B. Laurindo, Hygroscopicity and water vapor permeability of Kraft paper impregnated with starch acetate, Journal of Food Engineering, Volume 71, Issue 4, December 2005, Pages 394-402, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2004.11.002.
(http://www.sciencedirect.com/science/article/B6T8J-4F37M3D-5/2/bc16032b6074f6d010735b7ec348b565)
Abstract:
This study describes the use of cassava starch acetate (CSA) to impregnate Kraft paper and its influence on the water vapor permeability (Kw). This barrier property depends on the water vapor diffusion coefficient (Deff) and the material hygroscopicity properties (adsorptivity, [beta]). The influences of Deff and [beta] on the Kw value were studied. Kraft paper samples were impregnated at atmospheric pressure and under vacuum. The results showed an important decrease on the Kw values, which was associated with two factors: (a) the partial filling of the Kraft paper superficial and internal pores by the impregnated CSA, reducing the Kw; (b) as CSA is much less hygroscopic than paper, its adsorptivity is reduced significantly by impregnation. This paper demonstrates that CSA impregnation of Kraft paper is an interesting alternative for the improvement of the hygroscopic properties and water vapor permeability of the Kraft paper.
Keywords: Kraft paper; Starch acetate; Water vapor permeability; Hygroscopicity

Inayara C.A. Lacerda, Rose L. Miranda, Beatriz M. Borelli, Alvaro C. Nunes, Regina M.D. Nardi, Marc-Andre Lachance, Carlos A. Rosa, Lactic acid bacteria and yeasts associated with spontaneous fermentations during the production of sour cassava starch in Brazil, International Journal of Food Microbiology, Volume 105, Issue 2, 25 November 2005, Pages 213-219, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2005.04.010.
(http://www.sciencedirect.com/science/article/B6T7K-4H2G8V8-1/2/134bada468410386428b713974d1c686)
Abstract:
Sour cassava starch is a traditional fermented food used in the preparation of fried foods and baked goods such as traditional cheese breads in Brazil. Thirty samples of sour cassava starch

were collected from two factories in the state of Minas Gerais. The samples were examined for the presence of lactic acid bacteria, yeasts, mesophilic microorganisms, Bacillus cereus and faecal coliforms. Lactic acid bacteria and yeasts isolates were identified by biochemical tests, and the identities were confirmed by molecular methods. Lactobacillus plantarum and Lactobacillus fermentum were the prevalent lactic acid bacteria in product from both factories, at numbers between 6.0 and 9.0 log cfu g- 1. Lactobacillus perolans and Lactobacillus brevis were minor fractions of the population. Galactomyces geothricum and Issatchenkia sp. were the prevalent yeasts at numbers of 5.0 log cfu g- 1. A species similar to Candida ethanolica was frequently isolated from one factory. Mesophilic bacteria and amylolytic microorganisms were recovered in high numbers at all stages of the fermentation. B. cereus was found at low numbers in product at both factories. The spontaneous fermentations associated with the production of sour cassava starch involve a few species of lactic acid bacteria at high numbers and a variety of yeasts at relatively low numbers.
Keywords: Sour cassava starch; Spontaneous fermentations; Acid lactic bacteria; Yeasts

P. Veiga-Santos, C.K. Suzuki, M.P. Cereda, A.R.P. Scamparini, Microstructure and color of starch-gum films: Effect of gum deacetylation and additives. Part 2, Food Hydrocolloids, Volume 19, Issue 6, November 2005, Pages 1064-1073, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2005.02.007.
(http://www.sciencedirect.com/science/article/B6VP9-4FTS348-1/2/14c376ede9bd5975dd384b1bc26b4ef8)
Abstract:
Xanthan gum deacetylation, additives (sucrose, soybean oil, sodium phosphate and propylene glycol) and pH modifications influence on cassava starch-based films microstructure and color has been studied. X-ray diffraction and microscopic analysis have demonstrated that sucrose addition influenced ($p<0.05$) the film crystallinity during 60 days storage (75% RH, 23 [degree sign]C). Although not enough to prevent sucrose crystallization, deacetylated xanthan gum addition delayed the crystallization process. Comparing to the control, only cassava starch concentration and the additives sucrose and sodium phosphate affected samples total color difference ([Delta]E). However, all samples presented high lightness and low color values for `a' redness and `b' yellowness, indicating that, independent of the additives or pH modifications, the materials were almost colorless, with a high brilliancy.
Keywords: Biofilms; Microstructure; Color; Starch; Xanthan gum

G. Oboh, A.A. Akindahunsi, Nutritional and toxicological evaluation of Saccharomyces cerevisae fermented cassava flour, Journal of Food Composition and Analysis, Volume 18, Issue 7, November 2005, Pages 731-738, ISSN 0889-1575, DOI: 10.1016/j.jfca.2004.06.013.
(http://www.sciencedirect.com/science/article/B6WJH-4FG4B7R-3/2/09694d20a114df79c01549c33d366be9)
Abstract:
Pure strain of Saccharomyces cerevisae was used to ferment cassava pulp for 72 h with the aim of increasing the protein content of the cassava product. The mash obtained was processed to cassava flour, one of the forms in which cassava product is commonly consumed in Nigeria. The nutritional and toxicological potentials of the fungus fermented cassava flour were evaluated using rat bioassay. S. cerevisae fermented cassava flour (40%) fed to albino rat for 21 days had high feed conversion and digestibility (apparent and dry matter). Moreover, this level of cassava incorporation had no negative haematological (packed cell volume, red blood cell counts and white blood cell counts) effect. However, there was a significant ($P<0.05$) rise in the serum glutamate pyruvate transaminase and serum glutamate oxaloacetate transaminase activities indicating a possible damage to the liver (hepatotoxic) and/or heart (cardiotoxic), while there was no significant ($P>0.05$) rise in the serum albumin and bilirubin. Further pathological investigation revealed that

the spleen showed some dark red colouration while the liver had some necrotic lesion. The possible cause of this damage is the theme of further investigation in our laboratory.
Keywords: Cassava flour; Fermentation; S. cerevisae; Nutrition; Toxicology

Edmundo Barrios, Juan G. Cobo, Idupulapati M. Rao, Richard J. Thomas, Edgar Amezquita, Juan J. Jimenez, Marco A. Rondon, Fallow management for soil fertility recovery in tropical Andean agroecosystems in Colombia, Agriculture, Ecosystems & Environment, Volume 110, Issues 1-2, Fallow Management in the Tropics, 1 October 2005, Pages 29-42, ISSN 0167-8809, DOI: 10.1016/j.agee.2005.04.009.
(http://www.sciencedirect.com/science/article/B6T3Y-4G65TWT-1/2/a86eb327507fc1d015ab79c53c3a1965)
Abstract:
Andean hillsides dominate the landscape of a considerable proportion of Cauca Department in Colombia. The typical cropping cycle in the region includes monocrops or intercrops of maize (Zea mays L.), beans (Phaseolus vulgaris L.) and/or cassava (Manihot esculenta Crantz). Cassava is usually the last crop before local farmers leave plots to natural fallow until soil fertility is recovered and a new cropping phase can be initiated. Previous studies on land use in the Rio Cabuyal watershed (6500 ha) show that a considerable proportion of land (about 25-30%) remains under natural fallow every year. The focus of our studies is on systems of accelerated regeneration of soil fertility, or improved fallow systems, as an alternative to the natural regeneration by the native flora. Fallow improvement studies were conducted on plots following cassava cultivation. The potential for soil fertility recovery after 12 and 28 months was evaluated with two fast growing trees, Calliandra calothyrsus Meissn (CAL) and Indigofera constricta L.(IND), and one shrub, Tithonia diversifolia (Hemsl.) Gray (TTH), as slash/mulch fallow systems compared to the natural fallow (NAT). All planted slash/mulch fallow systems produced greater biomass than the natural fallow. Greatest dry biomass (16.4 Mg ha-1 year-1) was produced by TTH. Other planted fallows (CAL and IND) produced about 40% less biomass than TTH and the control (NAT) about 75% less. Nutrient levels in the biomass were especially high for TTH, followed by IND, CAL, and NAT. The impact of fallow management on soil chemical, physical and biological parameters related to residual soil fertility during the cropping phase was evaluated. Soil parameters most affected by slash/mulch fallow systems included soil total N, available N (ammonium and nitrate), exchangeable cations (K, Ca, Mg and Al), amount of P in light fraction, soil bulk density and air permeability, and soil macrofauna diversity. Results from field studies suggest that the Tithonia slash/mulch fallow system could be the best option to regenerate soil fertility of degraded volcanic-ash soils of the Andean hillsides.
Keywords: Calliandra; Fallows; Indigofera; Slash and mulch; Soil quality; Tithonia

Manfred Denich, Paul L.G. Vlek, Tatiana D. de Abreu Sa, Konrad Vielhauer, Wolfgang Lucke, A concept for the development of fire-free fallow management in the Eastern Amazon, Brazil, Agriculture, Ecosystems & Environment, Volume 110, Issues 1-2, Fallow Management in the Tropics, 1 October 2005, Pages 43-58, ISSN 0167-8809, DOI: 10.1016/j.agee.2005.05.005.
(http://www.sciencedirect.com/science/article/B6T3Y-4GJM3CV-1/2/ba1971b0c4e7cd0c8a33257a1bddd737)
Abstract:
Research-based improvements in small-farmer land-use systems are difficult to bring about. Often such improvements developed under research station conditions fail to address the true system problems or farmer concerns. In the search for ways to improve the traditional fallow system of the Eastern Amazon, field experiments were conducted in farmers' fields, but under researcher management with farmers helping to identify the critical needs for improvement. To achieve the objective a phased plan was followed: (1) exploratory research, (2) solution-oriented research with technology development and prototype evaluation, and (3) implementation-oriented research. The

initial exploratory or diagnostic studies focused on (1) biomass accumulation, (2) nutrient dynamics and (3) fallow regeneration. It was found that (1) the live and dead above-ground biomass of 1-10-year-old fallow vegetation amounts to 10-98 Mg ha-1, (2) in the nutrient balance of a crop/fallow cycle including slash burning and fertilization nutrient losses exceed inputs for N, K, Ca and Mg, but not for P, and (3) vegetative resprouting of trees/shrubs exceeds in importance their regeneration by seeds and mechanized land preparation halves the accumulation of woody biomass of a 2-year-old fallow vegetation, compared to no tillage. Instead of designing an entirely new land-use system, modifications were studied only to those practices and components recognized to be harmful to the sustainability of the traditional system itself. Also, additional components to further improve the system were tested. Thus, various technologies were developed as a set of modules. These include: (1) mulch technology, (2) fire-free land clearing with a newly developed tractor-driven bush chopper to transform fallow vegetation into mulch, (3) enrichment planting with Acacia auriculiformis to accumulate twice as much biomass within 2 years as not managed fallows, (4) modification of the cropping period by doubling it, by shifting the planting date, and by re-arranging the crop sequence, and (5) the test of modern low-input crop varieties: rice and cassava cultivars were identified for the mulch-based system which yield higher than locally widespread ones. Adoption of these modules is flexible, leaving the farmer in control of the innovation process. This last phase of implementation-oriented research, currently underway, is participatory and multidisciplinary in nature and seeks to develop and assess implementation strategies aimed at the diffusion of the farming system improvements.
Keywords: Alternative to slash-and-burn; Bush chopper; Mulch; Enrichment planting; On-farm research

Desire Gnanvossou, Rachid Hanna, J. Steve Yaninek, Muaka Toko, Comparative life history traits of three neotropical phytoseiid mites maintained on plant-based diets, Biological Control, Volume 35, Issue 1, October 2005, Pages 32-39, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2005.05.013.
(http://www.sciencedirect.com/science/article/B6WBP-4GNTFR9-1/2/b44a25c9e149cd9fdacfde2aef637dad)
Abstract:
Plant-based foods may serve as alternative resources in meeting the nutritional requirements of predatory mites, when the preferred prey species is scarce. In laboratory studies, we evaluated the effect of various plant-based food resources associated with cassava on development and reproduction of Neoseiulus (=Amblyseius) idaeus Denmark and Muma, Typhlodromalus manihoti Moraes, and Typhlodromalus aripo DeLeon, three predatory mites that have been used in classical biological control of the herbivorous mite Mononychellus tanajoa (Bondar) in Africa. The tests included five treatments (diets): pollen of three plant species--Zea mays L. (maize), of Leucaena leucocephala (Lam.) De Wit, and of Ricinus communis L.--cassava foliar exudate, and cassava leaf tissue (as the control). Neoseiulus idaeus did not complete development (hence no reproduction occurred) on any of the offered foods. Both T. aripo and T. manihoti successfully completed immature development--albeit in small proportions--on pollen of maize and L. leucocephala and on cassava foliar exudate. Only T. aripo completed immature development on pollen of R. communis and cassava leaf tissue; on the latter two foods, however, only males reached the adult stage. Moreover, of the five diets, none except pollen of maize was suitable for reproduction, and only for T. aripo, as T. manihoti did not reproduce on any of these diets. The duration of immature development of T. aripo was shorter on pollen of maize (6.9 days) than on cassava foliar exudate (11.1 days), while an intermediate value was recorded on pollen of L. leucocephala (8.6 days). Typhlodromalus manihoti developed faster on pollen of maize and cassava foliar exudate (6.8 days) than on pollen of L. leucocephala (9.8 days). Typhodromalus aripo lived much longer on pollen of maize and cassava foliar exudate compared with T. manihoti, whereas the two predator species had nearly similar female longevity on pollen of L. leucocephala. These results suggest that consumption of pollen of maize, pollen of L. leucocephala, or cassava

foliar exudate can enhance development of T. aripo and T. manihoti in the absence of M. tanajoa, their preferred prey. Pollen of maize was suitable for T. aripo in completing oogenesis and hence allowing the predator to increase in abundance during shortages of M. tanajoa. The implications of our findings for the persistence of the acarine predator-prey system on cassava, and for the success of biological control of M. tanajoa in Africa are discussed.
Keywords: Cassava; Typhlodromalus aripo; Typhlodromalus manihoti; Neoseiulus idaeus; Zea mays; Leucaena leucocephala; Ricinus communis; Pollen; Life table

Albert Linton Charles, Klanarong Sriroth, Tzou-chi Huang, Proximate composition, mineral contents, hydrogen cyanide and phytic acid of 5 cassava genotypes, Food Chemistry, Volume 92, Issue 4, October 2005, Pages 615-620, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2004.08.024.
(http://www.sciencedirect.com/science/article/B6T6R-4DTBV2F-C/2/f9cc8692ff3efb49ef0985446cbfb4b9)
Abstract:
Five cassava genotypes Rayong 5, Kaesetsart 50 (KU50), Rayong 2, Hanatee and KMUL 36-YOO2 (YOO2), were used in this study. Investigations showed that cassava contained 9.2-12.3% moisture, 1.2-1.8% crude protein, 0.1-0.8% crude lipid, 1.5-3.5% crude fibre, 1.3-2.8% ash, 80.1-86.3% carbohydrate, 1406-1465 kJ 100 g-1 DM and 95-135 mg g-1 of phytic acid. Mineral contents were 10.9-39.9, 15.2-32.3 and 9.3-54.1 mg g-1 for Ca, Mg and P, respectively, and 221-328, 4.7-25.8, 1.41-4.25, 0.29-1.73 and 1.2-4.44 mg g-1 for K, Na, Zn, Mn, Cu, and Fe, respectively. HCN content ranged from 8.33 to 28.8 mg HCN/kg dry weight basis. A linear relationship between Ca and P and carbohydrate and energy existed with correlation coefficients of 0.99 and 0.82, respectively. Phytate: total p ranged from 77% to 88% and a linear relationship existed between phytate and total p with a correlation coefficient of 0.975.
Keywords: Cassava genotypes; Mineral composition; Mineral; Proximate composition; Cyanidric acid; Phytic

Sithichoke Tangphatsornruang, Maliwan Naconsie, Chinae Thammarongtham, Jarunya Narangajavana, Isolation and characterization of an [alpha]-amylase gene in cassava (Manihot esculenta), Plant Physiology and Biochemistry, Volume 43, Issue 9, September 2005, Pages 821-827, ISSN 0981-9428, DOI: 10.1016/j.plaphy.2005.07.014.
(http://www.sciencedirect.com/science/article/B6VRD-4H80S9D-2/2/a5c75eee20796e488f9045061a5e7d59)
Abstract:
The roots of cassava plants (Manihot esculenta Crantz) accumulate starch as their major form of carbohydrate reserve. Starch accumulation and properties are determined by a balance between starch biosynthesis and degradation processes. [alpha]-Amylases (EC 3.2.1.1) are [alpha]-1,4 endoglycolytic enzymes, responsible for the mobilization of stored carbohydrate reserves by initiating the degradation process. [alpha]-Amylase genes have been shown to be differentially expressed at various developmental stages and environmental conditions through the action of plant hormones such as abscisic acid (ABA) and gibberellic acid (GA). In this study, we isolated an [alpha]-amylase gene from cassava tuberous roots (designated as MEamy2, GenBank accession number DQ011041). The deduced product of MEamy2 is 407 amino acid residues in length, with a calculated molecular mass of 46.7 kDa and an isoelectric point of 8.66. Southern blot analysis showed that the MEamy2 is present as a single copy in cassava genome. It shares the highest homology with AMY8 from apple fruit. The predicted structural model of MEamy2 contains three domains, active sites and starch-binding domain that are common with other plant [alpha]-amylases. RT-PCR analysis showed that the MEamy2 gene expression was induced in cassava roots within 2 hours after treatment with GA, but not ABA.
Keywords: [alpha]-Amylase; Cassava; Starch degradation; Phytohormones

Pham Van Hung, Naofumi Morita, Physicochemical properties and enzymatic digestibility of starch from edible canna (Canna edulis) grown in Vietnam, Carbohydrate Polymers, Volume 61, Issue 3, 29 August 2005, Pages 314-321, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2005.04.021.
(http://www.sciencedirect.com/science/article/B6TFD-4GHSGMV-1/2/1c0133faf6bd2a3d2acfe0093fb6a79d)
Abstract:
Edible canna starch and other root starches (cassava, potato and sweet potato) extracted from raw roots grown in Vietnam were used to determine physicochemical properties and enzymatic digestibility. The edible canna starch exhibited significantly higher blue value and amylose content than the other root starches. It also had a wide range of gelatinization temperature and a high transition enthalpy. The viscosity of hot paste from edible canna starch was quite low and stable, whereas the cool paste had high viscosity and weak resistance against retrogradation. The paste clarity of edible canna starch was also significantly higher than that of the others. During refrigeration and frozen storage, the paste of edible canna starch released so much expelled and absorbed water, which showed low stability during storage with high net syneresis. In this study, native edible canna starch was also found like potato starch to be highly resistant to hydrolysis by [alpha]-amylase.
Keywords: Edible canna; Potato; Cassava; Sweet potato; Resistant starch

E. Wina, B. Tangendjaja, I.W.R. Susana, Effects of chopping, and soaking in water, hydrochloric acidic and calcium hydroxide solutions on the nutritional value of Acacia villosa for goats, Animal Feed Science and Technology, Volume 122, Issues 1-2, Predicting and Improving the Safety and Efficiency of Feeding Ruminants on Tanniniferous Tree Foliage, 19 August 2005, Pages 79-92, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2005.04.003.
(http://www.sciencedirect.com/science/article/B6T42-4G65C6R-1/2/dca01c4a4fca16f780abac92b0995331)
Abstract:
Acacia villosa, a thornless shrub legume, has potential as a feed supplement for ruminants if anti-nutritional factors, especially tannins, can be overcome. The effects of chopping and soaking the leaves on the amounts of tannin in the extracting solution and that left in the recovered leaves were studied. The tannin and non-tannin phenolics were solubilized in the extracting solution and the amount was increased with the soaking time. Soaking in calcium hydroxide solution, hydrochloric acid or water removed 41-76% of tannin and total phenolics removed from the recovered leaves. Soaking of the leaves also removed fermentable materials and reduced the gas production. In the first of two digestibility experiments, three groups of goats received one of these diets, those were: (1) sugar cane tops: unsoaked Acacia leaves (7:3), (2) sugar cane tops: water soaked Acacia leaves (7:3) and (3) sugar cane tops: water soaked Acacia leaves (7:3) + 100 g/day of cassava flour. Live weight of goats was measured every 2 weeks and a large increase in average daily gain was obtained for goats fed diet containing water soaked leaves and cassava flour (71 g/day) compared to those fed diet containing unsoaked leaves and water soaked leaves (38.9 and 44.7 g/day, respectively) ($P < 0.05$). In the second digestibility experiment, the three diets were: (1) sugar cane tops: unsoaked Acacia (7:3), (2) sugar cane tops water soaked Acacia (7:3), (3) sugar cane tops: calcium hydroxide soaked Acacia (7:3). A supplement of 100 g/day of cassava flour was added to each of these three diets. In both digestibility experiments, soaking improved intake and digestibility of Acacia leaves, and cassava flour increased the intake, but when all the diets contained cassava flour, there was no significant difference ($P > 0.05$) found in intake or digestibility between unsoaked and soaked leaves. In conclusion, soaking reduced tannin in Acacia leaves, improved digestibility and intake of Acacia leaves. In the presence of cassava flour, soaking improved average daily gain. Diets supplemented with water soaked Acacia leaves probably also need an energy supplement and cassava flour is one of the feed ingredients that is satisfactory.

Keywords: Acacia villosa; Tannin; Soaking; Digestibility; Daily gain

A. Paula Cardoso, Estevao Mirione, Mario Ernesto, Fernando Massaza, Julie Cliff, M. Rezaul Haque, J. Howard Bradbury, Processing of cassava roots to remove cyanogens, Journal of Food Composition and Analysis, Volume 18, Issue 5, August 2005, Pages 451-460, ISSN 0889-1575, DOI: 10.1016/j.jfca.2004.04.002.
(http://www.sciencedirect.com/science/article/B6WJH-4DFT2RT-1/2/afcdaad0a7bfbf9e7c1ae73e9cf2df0f)
Abstract:
A simple equation is developed between the total cyanide contents of cassava root parenchyma and the processed product with the % retention of cyanide on processing. This equation is applied to different methods of processing used worldwide. Thus to produce cassava flour of 10 mg HCN equivalents/kg flour (ppm), the WHO safe level, by sun drying or heap fermentation requires starting with sweet cassava containing 12-32 ppm total cyanide. In an average year only 14% of flour samples in our study areas in Nampula Province of Mozambique had total cyanide contents of <10 ppm. Distribution curves of flour total cyanide show that the percentage of samples exceeding 100 ppm total cyanide increased from 6% in an average year to 43-65% in a low rainfall year, when cases of konzo also occurred.
Processing methods used to produce farinha in Brazil and gari in West Africa reduce the total cyanide content to less than one eighth of that using heap fermentation and less than one sixteenth of that using sun drying. Heap fermentation and sun drying, commonly used in eastern and southern Africa, do not adequately remove cyanide in a normal year and are hopelessly inadequate when used on cassava grown during drought. New and greatly improved processing methods are urgently needed. The high levels of cyanide intake in central, eastern and southern Africa from high cyanide flour are the most likely cause of konzo in young people and the very long term consumption of gari of lower cyanide content in West Africa is the most likely cause of TAN in older people.
Keywords: Cassava processing; Sun drying; Heap fermentation; Cyanide; Linamarin; Safe levels of cyanogens; Flour; Gari

Melanie Kostinek, Ingrid Specht, Vinodh A. Edward, Ulrich Schillinger, Christian Hertel, Wilhelm H. Holzapfel, Charles M.A.P. Franz, Diversity and technological properties of predominant lactic acid bacteria from fermented cassava used for the preparation of Gari, a traditional African food, Systematic and Applied Microbiology, Volume 28, Issue 6, 1 August 2005, Pages 527-540, ISSN 0723-2020, DOI: 10.1016/j.syapm.2005.03.001.
(http://www.sciencedirect.com/science/article/B7GVX-4FXNRG3-1/2/1b68137f7c78fdd28c167f086f3cb847)
Abstract:
Traditional fermentation of cassava is dominated by a lactic acid bacteria (LAB) population. Fermentation is important for improving product flavour and aroma as well as safety, especially by reduction of its toxic cyanogenic glucosides. The production of Gari from cassava in Benin typically occurs on a household or small industrial scale, and consequently suffers from inconsistent product quality and may not always be safe for consumption. Therefore, the diversity of LAB from a typical cassava fermentation for the preparation of Gari, and their technologically relevant characteristics were investigated with a view towards selection of appropriate starter cultures. A total of 139 predominant strains isolated from fermenting cassava were identified using phenotypic tests and genotypic methods such as rep-PCR and RAPD-PCR. DNA-DNA hybridisation and sequencing of the 16S rRNA genes were done for selected strains. Lactobacillus plantarum was the most abundantly isolated species (54.6% of isolates), followed by Leuconostoc fallax (22.3%) and Lactobacillus fermentum (18.0%). Lactobacillus brevis, Leuconostoc pseudomesenteroides and Weissella paramesenteroides were sporadically isolated. The L. plantarum strains were

shown to be better acid producers and capable of faster acid production than the L. fallax or L. fermentum strains. The incidence of [beta]-glucosidase (linamarase) activity was also highest among strains of this species. Production of antagonistic substances such as H2O2 and bacteriocins, however, was more common among L. fallax and L. fermentum strains. Strains of all three species were capable of utilising the indigestible sugars raffinose and stachyose. Therefore, a starter culture containing a mixture of strains from all three species was recommended.
Keywords: Fermented food; Cassava; Linamarase; Gari; Lactic acid bacteria; Genotyping

N. Vatanasuchart, O. Naivikul, S. Charoenrein, K. Sriroth, Molecular properties of cassava starch modified with different UV irradiations to enhance baking expansion, Carbohydrate Polymers, Volume 61, Issue 1, 4 July 2005, Pages 80-87, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2005.02.012.
(http://www.sciencedirect.com/science/article/B6TFD-4FSX6BB-1/2/6748ec1de4b4d26582ca061638efd431)
Abstract:
Commercial cassava starch was modified with 1% (w/w) lactic acid solution and irradiated with ultraviolet radiation: UVBA (280-420 nm), UVB (310-330 nm) and UVC (254 nm) for 7-15 h. Thermal properties and molecular size distributions of the cassava starch molecules were investigated to explain structural changes responsible for baking expansion ability. The acidified starches irradiated with UVB or UVC for 7 and 9 h achieved the desired baking expansion ability and showed a significant increase in the peak temperatures determined with the differential scanning calorimeter (DSC). The results indicated formation of stable network structures suitable for the expansion. However, the transition enthalpy of these starches did not significantly decrease from that of the commercial starch. Using high performance size exclusion chromatography (HPSEC), it was found that the amylose content of the commercial starch (DPn 2173+/-163) was decreased to DPn 1551+/-62 and 1427+/-54 by UVB, and to DPn 1216+/-28 and 1096+/-30 by UVC irradiated for 7 and 9 h, respectively. Profiles of the molecular distributions showed that it was mainly amylose molecules that was degraded by UVB whereas both amylose and amylopectin molecules were degraded by UVC in the amorphous regions.
Keywords: Cassava starch; Baking expansion; UV irradiation; Thermal properties; Molecular size distributions

A. Carabali, A.C. Bellotti, J. Montoya-Lerma, M.E. Cuellar, Adaptation of Bemisia tabaci biotype B (Gennadius) to cassava, Manihot esculenta (Crantz), Crop Protection, Volume 24, Issue 7, July 2005, Pages 643-649, ISSN 0261-2194, DOI: 10.1016/j.cropro.2004.11.008.
(http://www.sciencedirect.com/science/article/B6T5T-4FJXN1H-1/2/6cb4e497182cebe839fb3ace6e8e80a6)
Abstract:
Bemisia tabaci is a recognized pest in cassava (Manihot esculenta) crops in Asia and Africa, where it transmits the cassava mosaic geminiviruses (CMGs) (family: Geminiviridae, genus: Begomovirus). A general consensus exists that B. tabaci is a complex of morphologically indistinguishable populations with different biological biotypes. In the Americas, though the polyphagous B. tabaci biotype B appears to feed on cassava, it is postulated that the absence of CMGs is related to the inability of this biotype to colonize this crop effectively. However, its potential adaptation is considered a threat for cassava production in the Neotropics. This study was initiated to verify whether B. tabaci can become gradually adapted to M. esculenta. Trials in rearing chambers were carried out measuring population development of whitefly individuals passed through a series of intermediate hosts, previously selected and based on phylogenetic closeness to Manihot. The capacity of biotype B to adapt gradually to cassava, started on a legume (Phaseolus vulgaris), followed on two Euphorbiaceae (Euphorbia pulcherrima and Jatropha gossypiifolia) until, finally reaching a commercial cassava variety. B. tabaci female mean

longevity on cassava, coming from P. vulgaris, E. pulcherrima and J. gossypiifolia was 3.1, 5.6 and 3.3 days, respectively. The highest oviposition rate (2.6 eggs/female/2 days), the shortest development time (44.4 days) and the highest value of rm (0.48 day-1) were for populations coming from J. gossypiifolia, where 27.5% of the individuals coming from this host survived and reproduced on cassava. The importance and potential impact of phylogenetically close plants as intermediate hosts faciliting the adaptation of B. tabaci biotype B to cassava is discussed.
Keywords: Bemisia tabaci; Biotype B; Manihot esculenta; Adaptation; Hosts

Thi Mui Nguyen, Dinh Van Binh, E.R. Orskov, Effect of foliages containing condensed tannins and on gastrointestinal parasites, Animal Feed Science and Technology, Volume 121, Issues 1-2, Phytochemicals in Livestock Production Systems, 9 June 2005, Pages 77-87, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2005.02.013.
(http://www.sciencedirect.com/science/article/B6T42-4FNCVX4-4/2/38815e02381dee53bfa93c74c258ca54)
Abstract:
Many different commercial products are available to remove internal parasites from small ruminants in which the drugs are available and produced in several different physical forms, and sold under various brand names. It is increasingly evident that gastrointestinal parasite (GIP) control programs based on dewormers are failing because of increased dewormer resistance; thus, alternative GIP control strategies are necessary.
Leaves from multipurpose trees are often rich in N and minerals, and especially important for animal production during critical periods of the year when both the quantity and quality of pasture is limited. However, leaves or foliage of multipurpose tree species often contain high amounts of secondary compounds, especially tannins, which may have a limited impact on increasing the productivity of the animals.
Tannins play a significant role in the nutrition of animals, causing either adverse or beneficial effects on nutrient utilization, health and production. The ideal concentration of CT in forage legumes generally ranges from 20-40 g/kg DM, at which level they may bind with the dietary proteins during mastication and protect the protein from microbial attack in the rumen. CT have biological effects on the control of GIP; possible direct effects could be mediated through CT-nematode interactions, which reduce nematode viability.
Recent studies in Vietnam have reported that anti-parasitic agents extracted from plant materials for the control of parasites in goats were successful and have been introduced in practice as Citrullus vulgaris for tapeworms, Gliricida sepium and Artocarpus heterophilus for common intestinal worms, and Areca catechu for liver fluke. Alternative forages of Mimosa, Papaya, Leucaena leucocephala, Goava leave Mimisa spp. and Flemingia macrophylla have effects on larvae of Haemonchus in vitro. Research on the effects of Cassava, Jackfruit and Leucaena leaves, Guinea grass and Ruzi grass or cutting height of guinea grass in diets on infection rates of intestinal nematodes and live weight gain of goats has been undetaken. The strongyle egg counts and coccidial oocyt counts were much lower with goats fed foliage of Leucaena, Jackfruit and Cassava in comparison with goats fed Guinea grass and Ruzi grass. This indicates a reduced need for anthelmintic drugs to control GIP in grazing goats fed CT-containing foliage.
The results showed that differences in parasite infection between forages were probably due to differences in their CT concentration, although further research into the effect of feeding forage legumes containing CT on parasite infections is required.
Keywords: Legume; Foliages; Anti-nutritional factors; Condensed tannin; Anthelmintics; Gastrointestinal parasites

E. Herman-Lara, M.A. Salgado-Cervantes, M.A. Garcia-Alvarado, Mathematical simulation of convection food batch drying with assumptions of plug flow and complete mixing of air, Journal of

Food Engineering, Volume 68, Issue 3, June 2005, Pages 321-327, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2004.06.006.
(http://www.sciencedirect.com/science/article/B6T8J-4D98XD0-1/2/ea9d44a5a4381b36514eb845861d32ee)
Abstract:
Simulations of fixed bed batch drying of foods with air plug flow and air complete mixing assumptions were developed in order to evaluate the effect of ideal behavior deviations. A general mathematical model for drying that takes into account heat and mass transfer in air, product and interface along with water thermodynamic equilibrium was implemented. Experimental drying of fixed bed of cassava slabs with 1 cm thickness was carried out at 60 and 63 [degree sign]C input air for model validation. The results show that there is no significant difference between plug flow and complete mixing assumptions, when the drying is controlled by internal diffusion. Instead, some differences exist when the process is not controlled by internal diffusion. Simulation results showed that air outlet temperature measurement is a way of showing deviations from air plug flow behavior.
Keywords: Batch drying; Simulation; Plug flow; Complete mixed

Christian Thierfelder, Edgar Amezquita C., Karl Stahr, Effects of intensifying organic manuring and tillage practices on penetration resistance and infiltration rate, Soil and Tillage Research, Volume 82, Issue 2, June 2005, Pages 211-226, ISSN 0167-1987, DOI: 10.1016/j.still.2004.07.018.
(http://www.sciencedirect.com/science/article/B6TC6-4DN1HXM-1/2/b7bc020a822ce20808f1e6d2260347d9)
Abstract:
Soil erosion, along with the contributing factors of soil crusting and sealing, have received minimal scientific attention to date in Latin America. This study was conducted in an Andean hillside environment to determine how the local organic manuring and tillage practices influence the development of soil crusting and sealing, and the extent to which these practices influence soil water infiltration. The aim of this study was to identify treatments that prevented superficial soil structural constraints, i.e. treatments which maintain infiltration and therefore reduce potential soil erosion and run-off.
Treatment results were measured with a pocket penetrometer and a mini-rain simulator on nine different cropping systems, mainly based on cassava (Manihot esculenta Crantz), from February to November 2000 and 2001. The cropping systems were laid out on a Ferrallic Cambisol, an acid, vulcanically influenced soil of the Andean region.
In both cropping cycles, treatments with chicken manure application developed superficial soil crusts during the dry season. For a treatment manured with 8 t ha-1 chicken manure, this crust meant an increase in penetration resistance from 2.3 kg cm-2 in April 2000 to 16.2 kg cm-2 in July 2000. The change in superficial soil structure created a notable reduction in final infiltration from 92 to 42.2 mm h-1. A minimum tillage treatment which displayed the highest penetration resistance during the dry periods of up to 46.4 kg cm-2 presented no restricting effects on soil water intake (76.2 mm h-1 final infiltration in 2000) due to an optimal aggregate development during 10 years of consecutive conservation practice.
Measurements of penetration resistance and infiltration showed that soil conserving treatments, such as minimum tillage and crop rotations, improved the physical soil status and prevented soil crusting developing along with its negative effects on infiltration. These methods can therefore be strongly recommended to farmers.
Keywords: Soil crusting; Sealing; Structural degradation; Minimum tillage; Andean cropping systems

S. Mali, L.S. Sakanaka, F. Yamashita, M.V.E. Grossmann, Water sorption and mechanical properties of cassava starch films and their relation to plasticizing effect, Carbohydrate Polymers,

Volume 60, Issue 3, 25 May 2005, Pages 283-289, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2005.01.003.
(http://www.sciencedirect.com/science/article/B6TFD-4FWKMBW-2/2/b290865250062de7e7aa6224d293f97e)
Abstract:
Effects of plasticizers (glycerol, sorbitol, and 1:1 mixture of glycerol and sorbitol) on moisture sorption characteristics of cassava starch films were investigated at three levels of plasticizer concentration (0, 20, and 40 g/100 g starch). The combined effects of relative humidity and plasticizer on mechanical properties of starch films were also examined. Water affinities of cassava starch films were affected by hydrophilicity of the plasticizer and its concentration. Films plasticized with glycerol, under all RH conditions, adsorbed more moisture with higher initial adsorption rate, and films with higher plasticizers contents exhibited higher equilibrium moisture contents. Mechanical properties were affected by plasticizing effect, including the water adsorbed, resulting in higher strain and Young's modulus values for starch films and, in all cases, glycerol exerted a more effective plasticization.
Keywords: Biodegradable films; Glycerol and sorbitol

Alexis Onzo, Rachid Hanna, Koffi Negloh, Muaka Toko, Maurice W. Sabelis, Biological control of cassava green mite with exotic and indigenous phytoseiid predators--Effects of intraguild predation and supplementary food, Biological Control, Volume 33, Issue 2, May 2005, Pages 143-152, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2005.02.006.
(http://www.sciencedirect.com/science/article/B6WBP-4FNP2HP-2/2/e3a0888e6b0a87430d4b572ac5ef3b3b)
Abstract:
Intraguild predation, one aspect of predator-predator interaction, has received in recent years increasingly greater attention because of mounting evidence of the impact of predator-predator interactions on the structure of ecological communities and biological pest control. In laboratory experiments, we determined if intraguild predation occurs between Typhlodromalus manihoti and Euseius fustis, two phytoseiid mite predators of the cassava green mite Mononychellus tanajoa on cassava in Africa, and if the level of intraguild predation is affected by the availability of the primary prey, M. tanajoa, and maize pollen as alternative non-prey food. In the laboratory, the two predators attacked and killed heterospecific larvae but they did so only when prey mites and alternative food (maize pollen) were absent or scarce. On a diet of intraguild prey alone, the two predator species survived for several days but failed to reproduce. Addition of abundant levels of M. tanajoa and maize pollen increased survival and reproduction of the two predator species and reduced intraguild predation to very low levels. We then determined, on whole plants in pot experiments in a screenhouse, the effect of maize pollen (an alternative food) on the interactions between the two predator species and the impact of predator-predator interactions on suppression of M. tanajoa population densities. In single predator species treatments, both E. fustis and T. manihoti significantly reduced M. tanajoa densities; but surprisingly, E. fustis appeared to be superior to T. manihoti. The co-presence of the two predators on the same cassava plant resulted in similar suppression of M. tanajoa population densities, but greater suppression of M. tanajoa compared with T. manihoti alone, regardless of presence or absence of maize pollen. The presence of the two predator species together reduced their respective abundance compared with single predator species treatments. Addition of maize pollen, however, significantly increased densities of the generalist predator E. fustis, in both single and two predator species treatments; and tilted the balance of the interactions between the two predator species in favour of E. fustis. The findings of our research underscore the role of generalist predators like E. fustis in the suppression of M. tanajoa populations on cassava, and the potential role of alternative non-prey food in altering the interactions between co-occurring predators sharing the same primary prey (by

favouring the generalist predators), and the effect of these interactions on suppression of population densities of the shared primary prey.
Keywords: Alternative food; Euseius fustis; Typhlodromalus manihoti; Mononychellus tanajoa; Generalist predators; Interspecific competition; Maize pollen; Predator-predator interactions

Anida M.M. Gomes, Claudio E. Mendes da Silva, Nagila M.P.S. Ricardo, Effects of annealing on the physicochemical properties of fermented cassava starch (polvilho azedo), Carbohydrate Polymers, Volume 60, Issue 1, 7 April 2005, Pages 1-6, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2004.11.016.
(http://www.sciencedirect.com/science/article/B6TFD-4FHJYCD-1/2/8e21c387120a2206adb49e9af6088577)
Abstract:
The fermented cassava starch (polvilho azedo) in 1:5 starch to water ratio (w/v), was subject to annealing treatment at 50 [degree sign]C for 72, 96, 144 and 240 h. The annealing treatment changed the internal structure of polvilho azedo when the time was increased. Peak viscosities decreased significantly, denoting that there was a decreasing in leaching of amylose from the granules. The pasting temperature was increased, while hold, final viscosities, and breakdown were reduced showing an enlargement on the stability of the paste. The swelling power and the solubilities underwent reductions in all temperatures. The DSC data showed that there was an increased on To, Tp, Tc and [Delta]H in all samples annealed. The X-ray diffraction pattern did not change but crystallinity increased (all samples annealed), denoting increase in organization of double helical of amylopectin. The polvilho azedo samples submitted to annealing treatment acquired some characteristics of cereal starches (waxy starches).
Keywords: Annealing of starch; Relative crystallinity; Fermented cassava starch

Ngo Tien Dung, Nguyen Thi Mui, Inger Ledin, Effect of replacing a commercial concentrate with cassava hay (Manihot esculenta Crantz) on the performance of growing goats, Animal Feed Science and Technology, Volume 119, Issues 3-4, 4 April 2005, Pages 271-281, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2004.11.015.
(http://www.sciencedirect.com/science/article/B6T42-4FD79R3-1/2/61e436a6681ac7a8dc4186d9da898cec)
Abstract:
Twenty male and 20 female goats of the F1 Bachthao x Barbary, or Jamnapary, breed with an initial body weight of 13.6 +/- 0.46 kg and 108 +/- 7.3 days of age were used to compare cassava hay with a commercial grain and protein meal based concentrate in diets based on guinea grass and dried cassava root. The experimental period was 90 days. Concentrate was replaced by cassava hay at five levels: 0, 250, 500, 750 and 1000 g/kg on a dry matter (DM) basis. Growth rates at the five levels of inclusion were 53, 69, 62, 49 and 39 g/d and feed conversion ratios were 10.2, 7.6, 8.6, 10.2 and 13.0 kg DM/kg body weight gain. Increasing the level of cassava hay reduced DM intake, but the crude protein intake was similar for all treatments. The intake of cassava hay optimal for growth rates, feed conversion ratio and feed cost ranged from 0 to 220 g/kg of total DM intake. Increasing levels of cassava hay in the diets decreased the number of Nematoda eggs and Coccidia oocysts in the faeces, but had no effect on the number of Cestoda eggs.
Keywords: Goats; Growth; Replacement; Cassava hay; Parasites

G.C. Daellenbach, P.C. Kerridge, M.S. Wolfe, E. Frossard, M.R. Finckh, Plant productivity in cassava-based mixed cropping systems in Colombian hillside farms, Agriculture, Ecosystems & Environment, Volume 105, Issue 4, 5 March 2005, Pages 595-614, ISSN 0167-8809, DOI: 10.1016/j.agee.2004.08.009.

(http://www.sciencedirect.com/science/article/B6T3Y-4DTBVJR-1/2/8b11d2a8f827ff6aa2ecdb0646897892)

Abstract:
In the Colombian hillsides cassava (Manihot esculenta Crantz) is cultivated because of its ability to produce high yields on acidic soils poor in nutrients. Farmers often plant mixtures of cassava cultivars, while bush-beans or maize are traditionally grown as cassava-intercrops. The objectives of this study were: (a) to determine if cassava or overall production can be improved by planting cassava cultivar mixtures or intercropping, (b) to assess the influence of soil properties on the dry matter production of cassava production systems, (c) to verify if soil cover can be increased by growing cultivar or species mixtures. On-farm trials were conducted at four locations in typical hillside environments with slopes up to 55% in the Southwest of Colombia from 1996 to 1998. Two cassava varieties contrasting in plant architecture (early branching variety, rich in apices versus erect, late branching variety, poor in apices) were grown as pure stands, as a variety mixture and each intercropped independently with upland rice or Canavalia brasiliensis. Rainfall during the trial period was only 76% of the long term average due to the `El nino' phenomenon. The cassava cultivars produced tuber yields of 9.0 and 7.5 t ha-1 DM when planted in cultivar pure stands. Cassava growth and biomass production increased with increasing size of water stable aggregates and soil N content and decreased with increasing soil bulk density. In the cassava cultivar mixture, competition changed the pattern of biomass allocation, leading to a significantly lower harvest index compared to the mean of the pure stands (-6%). Intercropped C. brasiliensis significantly reduced cassava harvest index (-13%; mean of cassava/C. brasiliensis mixtures compared to mean of pure stands) as well as cassava (-53%) and total biomass production (-24%), while differences were not statistically significant in the cassava-rice systems probably because of the poor performance of rice. The strong reduction in cassava tuber yield in the cassava/C. brasiliensis systems was due to competition for water between cassava and the intercrop, aggravated by the lack of rain. The percentage of soil cover was slightly higher in all mixed cropping systems compared to the pure stands. In contrast to the mixture concept which seeks to increase productivity and soil cover compared to monocropping, the mixed cropping systems used in the studies in Rio Cabuyal reduced cassava tuber yield and total biomass production of the cropping systems compared to the cassava cultivar monocrops. When total soil cover was improved compared to the cassava cultivar pure stands it was paralleled by reductions in terms of cassava tuber yield.

Keywords: Cassava; C. brasiliensis; Upland rice; Cultivar mixture; Intercropping; Soil structure stability; Bulk density; Diameter of aggregates in air-dried soil; Soil cover

P. Veiga-Santos, L.M. Oliveira, M.P. Cereda, A.J. Alves, A.R.P. Scamparini, Mechanical properties, hydrophilicity and water activity of starch-gum films: effect of additives and deacetylated xanthan gum, Food Hydrocolloids, Volume 19, Issue 2, March 2005, Pages 341-349, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2004.07.006.

(http://www.sciencedirect.com/science/article/B6VP9-4DBKJYX-2/2/3d64b80a2cfc77e6443137376d1a1689)

Abstract:
The effect of deacetylated xanthan gum, additives (sucrose, soybean oil, sodium phosphate and propylene glycol) and pH modifications on mechanical properties, hydrophilicity and water activity of cassava starch-xanthan gum films has been studied. Sucrose addition resulted in the highest effect observed on cassava starch films elongation at break. The deacetylated xanthan gum had higher effect on elongation at break when comparing to the acetylated gum, although both gums presented an inferior effect in relation to the obtained with sucrose. However, when comparing to the control and PVC films, lower tensile strength resistance values were observed when adding sucrose. Increased water activity was observed for films added with sucrose, thus, increasing the

material biodegradation. Sucrose and deacetylated xanthan gum addition resulted in a slight hydrophilicity increase.
Keywords: Biofilms; Mechanical properties; Water activity; Hydrophilicity

Wilfrid Padonou, Christian Mestres, Mathurin Coffi Nago, The quality of boiled cassava roots: instrumental characterization and relationship with physicochemical properties and sensorial properties, Food Chemistry, Volume 89, Issue 2, February 2005, Pages 261-270, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2004.02.033.
(http://www.sciencedirect.com/science/article/B6T6R-4CB0J92-2/2/c20c701acbf22e90b1356e7014ab9f59)
Abstract:
The physicochemical properties of twenty promising new improved cassava cultivars (13 sweet and 7 bitter), harvested at maturity in Benin, were assessed. In parallel, instrumental measurements and sensorial tests were performed to assess boiled cassava quality. These properties and physicochemical properties were tentatively correlated. The colour score of boiled cassava tuber was closely correlated with [Delta]E measured on fresh pulp, while mealiness (or friability) could be assessed by resistance to penetration, measured on cooked tuber slices. Mealiness could also be predicted from starch functional properties (such as apparent viscosity after pasting), cyanide potential and the water content of fresh tubers. The cassava tubers had a narrow amylose content range (18.2%-22.6% starch basis). In addition, bitter cultivars appeared to be quite homogeneous with, in particular, high sugar and protein contents but low fibre contents. They also had original starch functional properties, with high solubility and low paste viscosity.
Keywords: Cassava; Colour; Texture; Functional properties; Sensory properties

Seung-Yong Shin, Haeng-Soon Lee, Suk-Yoon Kwon, Soon-Tae Kwon, Sang-Soo Kwak, Molecular characterization of a cDNA encoding copper/zinc superoxide dismutase from cultured cells of Manihot esculenta, Plant Physiology and Biochemistry, Volume 43, Issue 1, January 2005, Pages 55-60, ISSN 0981-9428, DOI: 10.1016/j.plaphy.2004.12.005.
(http://www.sciencedirect.com/science/article/B6VRD-4F7DJ0R-1/2/1d3ad53cdc5ed36b932ecc4e77a75fc6)
Abstract:
Superoxide dismutase (SOD) cDNA, mSOD2, encoding cytosolic copper/zinc SOD (CuZnSOD) cDNA was isolated from suspension-cultured cells of cassava (Manihot esculenta Crantz) by cDNA library screening, and its expression was investigated in relation to environmental stress. mSOD2 is 774 bp in length with an open reading frame (ORF) of 152 amino acids, corresponding to a protein of predicted molecular mass 15 kDa and a pI of 5.22. One copy of the mSOD2 gene was found to be present in the cassava genome by Southern analysis using an mSOD2 cDNA-specific probe. Reverse transcriptase-polymerase chain reaction (RT-PCR) analysis revealed diverse expression patterns for the mSOD2 gene in various tissues of intact cassava plants, at various stages of the growth in suspension cultures, and in the leaf tissues exposed to different stresses. The mSOD2 gene was highly expressed in suspension-cultured cells and in the stems of intact plants. However, it was expressed at low levels in leaves and roots. During suspension cell growth, the mSOD2 transcript progressively increased during culture. Moreover, the mSOD2 gene in excised cassava leaves responded to various stresses in different ways. In particular, it was highly induced in leaf tissue by several abiotic stresses, including high temperature (37 [degree sign]C), chilling (4 [degree sign]C), methyl viologen (MV) exposure, and wounding treatment. These results indicate that the mSOD2 gene is involved in the antioxidative process triggered by oxidative stress induced by environmental change.
Keywords: Cultured cells; Environmental stress; Manihot esculenta; Oxidative stress; Superoxide dismutase

Napaporn Atichokudomchai, Saiyavit Varavinit, Pavinee Chinachoti, A study of ordered structure in acid-modified tapioca starch by 13C CP/MAS solid-state NMR, Carbohydrate Polymers, Volume 58, Issue 4, 7 December 2004, Pages 383-389, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2004.07.017.
(http://www.sciencedirect.com/science/article/B6TFD-4DDXRW2-2/2/c8c6aba898bb0792616121915d3f6110)
Abstract:
Acid modification of tapioca starch earlier reported to increase the mechanical strength of tablets. The development of ordered structure (double helices) of these starches was monitored after equilibrating at 0.90 aw (25 [degree sign]C) using 13C CP/MAS NMR and X-ray diffraction. As the hydrolysis time increased, the intensity of the resonance for C1 and C4 amorphous fractions decreased while that for C1 and C4 double helix fractions increased. Relative crystallinity (%) obtained from 13C CP/MAS NMR and X-ray diffraction methods both increased sharply initially and then levelled off with hydrolysis time. The initial increase in relative double helix content and crystallinity was due to a hydrolytic destruction in the amorphous domain, retrogradation of the partially hydrolyzed amylose and crystallization of free amylopectin double helices. After 192 h, these two parameters were not significantly different ([alpha]=0.05) indicating that the double helices that were not arranged into crystalline regions either had been hydrolyzed or crystallized.
Keywords: Acid-modified; Tapioca; Cassava; Starch; NMR; Ordered structure; Crystallinity; 13C CP/MAS; X-ray diffraction

D.F. Parra, C.C. Tadini, P. Ponce, A.B. Lugao, Mechanical properties and water vapor transmission in some blends of cassava starch edible films, Carbohydrate Polymers, Volume 58, Issue 4, 7 December 2004, Pages 475-481, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2004.08.021.
(http://www.sciencedirect.com/science/article/B6TFD-4DDR772-1/2/1546915f490e5128d4144faddc553e79)
Abstract:
The continuous increase of consumer interest in quality, convenience and food quality has encouraged further research into edible films and coatings from natural polymers, such as polysaccharides. Ecoefficient products are the new generation of biobased products prepared with sustainable materials, that agree with ecological and economic requirements including environmentally acceptable disposal of post-user waste. The numerous potential applications of natural polymers such as polysaccharides stimulated the study with edible films based on cassava starch. Blends of glycerol (GLY) and polyethylene glycol (PEG) as plasticizers, and glutaraldehyde (GLU) as crosslinking agent were prepared in order to determine the mechanical properties and water vapor transmission of those films. A response surface methodology was applied on the results to identify the blend with the best mechanical properties and lowest water vapor transmission. The crosslinking effect of glutaraldehyde in the films can be observed. The plasticizing action of polyethylene glycol was restrained by more than 0.5 g of glutataraldehyde. The use of glycerol was less evident for this property even after 284 h of contact time with water vapor.
Keywords: Cassava starch; Edible films; Mechanical properties; Water vapor transmission

Manabu Ishitani, Idupulapati Rao, Peter Wenzl, Steve Beebe, Joe Tohme, Integration of genomics approach with traditional breeding towards improving abiotic stress adaptation: drought and aluminum toxicity as case studies, Field Crops Research, Volume 90, Issue 1, Linking Functional Genomics with Physiology for Global Change Research, 8 November 2004, Pages 35-45, ISSN 0378-4290, DOI: 10.1016/j.fcr.2004.07.004.
(http://www.sciencedirect.com/science/article/B6T6M-4D2684G-1/2/ff6c250938309777c1a8b30f0767ed36)

Abstract:
Traditional breeding efforts are expected to be greatly enhanced through collaborative approaches incorporating functional, comparative and structural genomics. Potential benefits of combining genomic tools with traditional breeding have been a source of widespread interest and resulted in numerous efforts to achieve the desired synergy among disciplines. The International Center for Tropical Agriculture (CIAT) is applying functional genomics by focusing on characterizing genetic diversity for crop improvement in common bean (Phaseolus vulgaris L.), cassava (Manihot esculenta Crantz), tropical grasses, and upland rice (Oriza sativa L.). This article reviews how CIAT combines genomic approaches, plant breeding, and physiology to understand and exploit underlying genetic mechanisms of abiotic stress adaptation for crop improvement. The overall CIAT strategy combines both bottom-up (gene to phenotype) and top-down (phenotype to gene) approaches by using gene pools as sources for breeding tools. The strategy offers broad benefits by combining not only in-house crop knowledge, but publicly available knowledge from well-studied model plants such as arabidopsis [Arabidopsis thaliana (L.) Heynh.]. Successfully applying functional genomics in trait gene discovery requires diverse genetic resources, crop phenotyping, genomics tools integrated with bioinformatics and proof of gene function in planta (proof of concept). In applying genomic approaches to crop improvement, two major gaps remain. The first gap lies in understanding the desired phenotypic trait of crops in the field and enhancing that knowledge through genomics. The second gap concerns mechanisms for applying genomic information to obtain improved crop phenotypes. A further challenge is to effectively combine different genomic approaches, integrating information to maximize crop improvement efforts. Research at CIAT on drought tolerance in common bean and aluminum resistance in tropical forage grasses (Brachiaria spp.) is used to illustrate the opportunities and constraints in breeding for adaptation to abiotic stresses.
Keywords: Abiotic stress; Functional genomics; Phenotyping; Crop improvement; Root growth

Friday Ekeleme, David Chikoye, I. Okezie Akobundu, Impact of natural, planted (Pueraria phaseoloides, Leucaena leucocephala) fallow and landuse intensity on weed seedling emergence pattern and density in cassava intercropped with maize, Agriculture, Ecosystems & Environment, Volume 103, Issue 3, August 2004, Pages 581-593, ISSN 0167-8809, DOI: 10.1016/j.agee.2003.11.001.
(http://www.sciencedirect.com/science/article/B6T3Y-4BBVW4J-1/2/7eedbd40f8ebddbc02ef3dd60d1f9e20)
Abstract:
Knowledge of magnitude and timing of weed seedling flushes is crucial in managing weeds adequately. Such knowledge is especially important for small-scale farmers in West Africa who spend a greater percentage of family labour in controlling weeds. This study assessed the composition, pattern and magnitude of seedling emergence of weed communities of a maize/cassava association in three types of fallow and four landuse intensities (continuous cropping or zero-fallow, 1 year of cropping followed by 1, 2, and 3 years fallow) over a 6-year period in Ibadan, Nigeria, West Africa. The study was carried out on a sandy loam (oxic paleustaff and psammentic ustorthent), <2% organic matter, and pH 6.2. Rainfall pattern at the study site is bimodal with average annual precipitation of 1250 mm. Weed seedling composition in the bush fallow treatment differed with year (e.g. seedling composition increased from 30 species in 1990 to 41 species in 1995) and was different from Leucaena leucocephala and Pueraria phaseoloides fallow treatments where volunteer seedlings of the respective fallow types were also present. At the initiation of the study, 1990, the seedling community was dominated by perennial weeds (60%). After 6 years, 84% of the weed seedlings were broadleaf (53% annuals and 31% perennials). Weed seedling emergence differed with type of fallow, landuse intensity and year ($P<0.01$). Weed seedlings emerged throughout the sampling period of 3-15 weeks after planting (WAP) crops. The highest number of weed seedlings emerged early in the season (3-5 WAP)

followed by a second but smaller peak flush at 8-9 WAP and a decline over the rest of the sampling period in all types of fallow, landuse intensity, and years except in 1994. Natural bush and L. leucocephala fallow had more weed seedlings than P. phaseoloides fallow in all years except 1993 and 1995. Continuously cropped plots and plots cropped every other year had more emerged weed seedlings than plots that were cropped once followed by 2-3 years of uncropped fallow.
Keywords: Shifting cultivation; Planted fallow; Small-scale farming; Seedling emergence; Weed density

Italo Delalibera Jr., Ann E. Hajek, Pathogenicity and specificity of Neozygites tanajoae and Neozygites floridana (Zygomycetes: Entomophthorales) isolates pathogenic to the cassava green mite, Biological Control, Volume 30, Issue 3, July 2004, Pages 608-616, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2004.02.008.
(http://www.sciencedirect.com/science/article/B6WBP-4C2R1SV-3/2/961aafd7fb8ebe5efbe5886d69db4a54)
Abstract:
The cassava green mite (CGM), Mononychellus tanajoa, a native of South America was accidentally introduced into Africa where it causes serious crop losses. The possibility of introducing classical biological agents from the native home of CGM into Africa was investigated. Thus, we conducted a series of laboratory assays of the native fungal pathogens, Neozygites tanajoae from Brazil and Neozygites floridana from Colombia and Brazil, and compared them with N. tanajoae isolates from Benin. Infectivity of both fungal species, was assayed against the twospotted spider mite, Tetranychus urticae, and against the red mite, Oligonychus gossypii. Pathogenicity against CGM and host range studies were conducted by transferring adult females of each mite species to leaf discs containing sporulated cadavers with a halo of conidia of each fungal isolate. All isolates caused some degree of infectivity to CGM. None of the isolates of N. floridana and N. tanajoae tested were pathogenic to O. gossypii, and only two isolates infected T. urticae. Most isolates from Brazil were highly virulent and infected only CGM. Sixteen N. tanajoae isolates caused more than 89% mortality and more than 62% of the CGM became mummified. A mummified CGM is characteristically a swollen, brown fungus-killed mite that has great potential to produce conidia. However, high mortality was not always associated with high mummification. The median mummification time ranged from 4.4 to 6.7 days. Five Brazilian isolates caused >75% mummification with a median mummification time <5 days. Isolates that cause high mummification in a short period of time would be more likely to cause epizootics and to establish in the new environment. Therefore, these isolates would be the best candidates for introduction to Africa.
Keywords: Mononychellus tanajoa; Tetranychus urticae; Oligonychus gossypii; Classical biological control; Mite pathogenic fungi; Mummification; Entomophthorales

Kota Watanabe, Takashi Yamamoto, Takashi Yamada, Tetsuo Sakuratani, Eiji Nawata, Chairat Noichana, Akadet Sributta, Hirokazu Higuchi, Changes in seasonal evapotranspiration, soil water content, and crop coefficients in sugarcane, cassava, and maize fields in Northeast Thailand, Agricultural Water Management, Volume 67, Issue 2, 15 June 2004, Pages 133-143, ISSN 0378-3774, DOI: 10.1016/j.agwat.2004.02.004.
(http://www.sciencedirect.com/science/article/B6T3X-4C53PYC-3/2/22232eb5e8e2c38b23fe2a9b649574f8)
Abstract:
This study was performed to examine seasonal changes in evapotranspiration (ET), soil water content, and crop coefficients (Kc) for sugarcane, cassava, and maize fields in Northeast Thailand. ET rates during the rainy season varied between 2 and 6 mm per day but remained around 1 mm per day in the dry season. The normal dry season ET was much greater than the water loss from the top 0.5 m of soil, suggesting that capillary rise from deeper soil layers provides significant

amounts of water to the upper soil layer. The Kc for sugarcane and cassava reached growing season peaks of approximately 1.10 and 1.20, respectively, in June. The maximum Kc for the maize field was approximately 1.20. Although the ET estimated by the Hargreaves equation exceeded the FAO reference ET value for this region, the values had a high correlation when the Hargreaves ET was calculated using solar radiation measurements.
Keywords: Bowen ratio energy balance method; Capillary rise; Hargreaves equation; Penman-Monteith equation; Time-domain reflectometry

Alfredo A. C. Alves, Tim L. Setter, Abscisic acid accumulation and osmotic adjustment in cassava under water deficit, Environmental and Experimental Botany, Volume 51, Issue 3, June 2004, Pages 259-271, ISSN 0098-8472, DOI: 10.1016/j.envexpbot.2003.11.005.
(http://www.sciencedirect.com/science/article/B6T66-4BBMSGM-1/2/6f6c88eeac93ce8ff851d8a89e7ce639)
Abstract:
Three cassava (Manihot esculenta) genotypes were grown in greenhouse conditions and subjected to water deficit treatments to: (a) assess the extent to which abscisic acid (ABA) and osmotically active solutes accumulate in cassava leaves during water deficit and solute contributions to osmotic adjustment (OA), and (b) determine whether cassava leaves substantially increase their content of dehydrin-like polypeptides during water deficit. The concentration of ABA, sugars (sucrose, glucose, and fructose), proline, and potassium salts (K-salts) were determined in mature and expanding leaves. ABA content increased under water deficit, consistent with a putative role in regulating solute accumulation, and thus OA. The extent of osmotic adjustment, although modest, was higher in young folded leaves than in mature leaves. K-salts were the major contributors to total osmolyte concentration in both mature and expanding leaves, accounting for approximately 60% of osmotic potential. The concentration of K-salts increased in response to water stress and was positively correlated with the extent of OA. In contrast, total sugars (sucrose + glucose + fructose) decreased during water deficit, showing a negative correlation with OA. Although the concentration of proline in mature leaves increased in response to water stress its contribution to the total change in osmotic potential was insignificant. Thus, in the current study, cassava used K-salts as its primary osmolyte, and did not substantially adjust its osmotic solute concentration during the 6-day water deficit. Expression of dehydrins was not found in any of the genotypes or leaf stages.
Keywords: Manihot esculenta; Osmolyte concentration; Potassium; Proline; Sugar concentration

Attanda Mouinou Igue, Thomas Gaiser, Karl Stahr, A soil and terrain digital database (SOTER) for improved land use planning in Central Benin, European Journal of Agronomy, Volume 21, Issue 1, June 2004, Pages 41-52, ISSN 1161-0301, DOI: 10.1016/S1161-0301(03)00062-5.
(http://www.sciencedirect.com/science/article/B6T67-49CS184-4/2/877710a5c83ee3fbe18d7ecf361d2769)
Abstract:
The soil is a natural resource, non-renewable in the short term and expensive either to reclaim or to improve following erosion or degradation. In the Republic of Benin (West Africa) the increasing pressure on land caused by steady population growth induces soil degradation. The reduced site productivity calls for an information system on soil resources, which allows the analysis of land suitability, potential food production, environmental impact of land use and the identification of conservation measures. On the basis of such a system, sound policy formulation and development planning at all levels can be carried out, utilizing both internal and external resources efficiently. For the central part of Benin, the development of a soil information system has been initiated. The data structure for the description of the land resources was established according to the Soil and Terrain Digital Database (SOTER) manual (Global and National Soils and Terrain Digital Databases (SOTER). Procedures Manual. International Soil Reference and Information Centre,

Wageningen, The Netherlands, 1993) with slight modifications (Mitteilg. Dtsch. Bodenkdl. Ges. 76 (1995) 1221). Based on field observations and data analysis, land areas have been delineated showing similar response to management practices. On the uppermost level, seven so called `terrain units' could be distinguished. The main differentiating criteria were landscape morphology, geology and hydromorphy. The terrain units are subdivided at a second level into 25 terrain components according to the soil parent material and landform. The FAO/ITC land suitability procedure was used to identify crop specific constraints to the production of sorghum, cowpea, maize, cotton, groundnuts and cassava. With regard to the soil induced limitations to crop production, unfavorable textural properties prevail, except for terrain components on gabbro or basaltic parent material. Unfavorable climatic conditions determine the suitability of this region for cotton, maize and cassava production. The ranking of the physical suitability of the six crops for Central Benin was in the order sorghum>groundnut>cowpea, cassava>maize>cotton. The problem of interannual variability of precipitation and its effects on the climatic suitability is discussed.
Keywords: Benin; Soil data base; Land suitability classification; Soil and climate variability

Geni R. Sampaio, C.M.N.Claudia M. N. Castellucci, Maria Elisabeth M. Pinto e Silva, Elizabeth A. F. S. Torres, Effect of fat replacers on the nutritive value and acceptability of beef frankfurters, Journal of Food Composition and Analysis, Volume 17, Issues 3-4, Papers from the Joint Meeting of the 5th International Food Data Conference and the 27th US National Nutrient Databank Conference, June-August 2004, Pages 469-474, ISSN 0889-1575, DOI: 10.1016/j.jfca.2004.03.016.
(http://www.sciencedirect.com/science/article/B6WJH-4CG7FR0-N/2/4cc58c0d3821be4c2ce34e8eb5d2f16d)
Abstract:
This study determined the effect of fat replacers on the nutritive value and consumer acceptability of beef frankfurters. Four fat replacers, carrageen gum, modified cassava starch, microparticulated whey protein, and oat bran, were used to replace pork back fat (control). Use of whey protein resulted in a 71.7% decrease in total lipids, followed by oat bran, carrageen, and cassava starch with decrease of 70.6%, 70.0%, and 69.49%, respectively. The cholesterol and energy of frankfurters with carrageen were decreased by 32.0% and 29.0%, respectively. The panelists indicated that the formulation with cassava starch was similar to the control in terms of acceptability, thus suggesting that the lipid content was not the main deciding factor. Further work in this area is necessary to identify the ideal fat-replacer.
Keywords: Fat replacers; Lipid reduction; Fat; Frankfurter

Calvin Onyango, Thomas Henle, Thea Hofmann, Thomas Bley, Production of high energy density fermented uji using a commercial alpha-amylase or by single-screw extrusion, Lebensmittel-Wissenschaft und-Technologie, Volume 37, Issue 4, June 2004, Pages 401-407, ISSN 0023-6438, DOI: 10.1016/j.lwt.2003.10.010.
(http://www.sciencedirect.com/science/article/B6WMV-4BG3MD7-1/2/28917ac35f672b952bec478f013a870c)
Abstract:
The effects of alpha-amylase and extrusion on the viscosity and energy density of uji, a spontaneously fermented thin porridge from different combinations of maize, finger millet, sorghum and cassava, were investigated. Fermentation alone was not able to reduce the viscosity of uji, but addition of 0.1-2.1 ml/100 ml alpha-amylase to the fermented slurry or extrusion of the fermented and dried flour at 150-180[degree sign]C and a screw speed of 200 rpm reduced the viscosity of 20 g/100 ml uji from 6000-7000 to 1000-2000 cP, measured at 40[degree sign]C and a shear rate of 50 s-1. The amount of flour required to make uji could thus be increased by a factor of 2.0-2.5

and consequently it was possible to produce uji with acceptable energy densities (0.6-0.8 kcal/g) for child feeding.
Keywords: Fermentation; Viscosity; Energy density; Extrusion; Weaning foods

Eric Mantey Obilie, Kwaku Tano-Debrah, Wisdom Kofi Amoa-Awua, Souring and breakdown of cyanogenic glucosides during the processing of cassava into akyeke, International Journal of Food Microbiology, Volume 93, Issue 1, 15 May 2004, Pages 115-121, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2003.11.006.
(http://www.sciencedirect.com/science/article/B6T7K-4BVNY8W-2/2/b82d43da027129c9221823203d8788d4)
Abstract:
The population and composition of the lactic acid bacteria microbiota as well as the content of cyanogenic glucosides occurring at various stages of fermentation and subsequent processing of cassava roots into akyeke, a steamed sour cassava meal, were investigated. The number of lactic acid bacteria and percentage titratable acidity increased during 5 days of fermentation, but decreases were observed in the subsequent operations of `washing' the dough with water followed by partial drying and steaming. In field and laboratory samples, Lactobacillus plantarum accounted for 59.3% and 52.3%, Lactobacillus brevis 23.3% and 22.8% and Leuconostoc mesenteroides subsp. cremoris 14.5% and 15.8%, respectively, of all lactic acid bacteria isolated at various stages of fermentation and processing. A reduction of about 98% occurred in the total cyanogens (CN) content of cassava roots during processing, from 69.3 to 1.4 and 110.3 to 2.8 mg CN equivalent/kg dry weight for laboratory and field samples of akyeke, respectively.
Keywords: Akyeke; Cassava; Fermentation; Lactic acid bacteria; Cyanogenic glucosides

Le Van An, Tran Thi Thu Hong, Jan Erik Lindberg, Ileal and total tract digestibility in growing pigs fed cassava root meal diets with inclusion of fresh, dry and ensiled sweet potato (Ipomoea batatas L. (Lam.)) leaves, Animal Feed Science and Technology, Volume 114, Issues 1-4, 3 May 2004, Pages 127-139, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2003.12.007.
(http://www.sciencedirect.com/science/article/B6T42-4BT7FRY-1/2/7b1d177d4041fbcb072a0cb2d251329f)
Abstract:
Ileal and total tract digestibility in growing pigs fed cassava root meal (CRM) based diets with inclusion of fresh, dry and ensiled sweet potato leaves was studied in a 4x4 Latin square design. Four diets were formulated with CRM and casein (CAS), fresh sweet potato leaves (FSP), dry sweet potato leaves (DSP) and ensiled sweet potato leaves (ESP). The control diet (CAS) contained 100 g casein per kg DM. The experimental diets FSP, DSP, and ESP contained 350, 350 and 400 g DM of fresh, dry and ensiled sweet potato leaves per kg DM diet, respectively. Leaves were separated manually from stems and only the leaf part was used.
The daily feed intakes of dry matter (DM) and dietary components were significantly different between diets ($P<0.05$). There was no difference in ileal apparent digestibility of OM between diets ($P>0.05$), while the total tract apparent digestibility of OM and crude protein (CP) was higher on diet CAS than on diets FSP, DSP and ESP ($P<0.05$). The ileal apparent digestibility of CP and essential amino acids (EAA), except for arginine, threonine and tyrosine, were higher for diet CAS than for diets FSP, DSP and ESP ($P<0.05$). The ileal digestibility of NDF and the total tract digestibility of crude fibre (CF) were lower for diet CAS than for diets FSP, DSP and ESP ($P<0.05$). There were no differences ($P>0.05$) in digestibility of OM, CP, CF, NDF, ADF and most EAA among sweet potato leaf diets. However, there was a tendency ($P=0.064$) of a lower ileal apparent digestibility of lysine in the dried and ensiled sweet potato leaves.
It was concluded that, sweet potato leaves have the potential to improve dietary protein and amino acid supply in low fibre diets for pigs. Further, the optimum strategy for preserving sweet potato

leaves can be decided on from consideration of the prevailing climatic conditions, as the general nutritional properties were similar for fresh, sun-dried and ensiled sweet potato leaves.
Keywords: Amino acids; Fibre; Digestibility; Sweet potato leaves; Pigs

Keith O. Fuglie, Challenging Bennet's law: the new economics of starchy staples in Asia, Food Policy, Volume 29, Issue 2, April 2004, Pages 187-202, ISSN 0306-9192, DOI: 10.1016/j.foodpol.2004.03.003.
(http://www.sciencedirect.com/science/article/B6VCB-4C59SYW-2/2/254a458bc0c178bca8265c7afa8dddec)
Abstract:
In Asia, the role of tropical root and tuber crops is changing from being food staples to sources of raw materials for processed food products and animal feed. The growing utilization of root and tuber crops in these expanding markets depends critically on their price competitiveness relative to other commodities, especially maize. In this paper, price relationships among commodities in Asia are examined to assess the potential of cassava and sweet potato in starch and feed markets. For starch, cassava is currently competitive in Southeast Asia. Sweet potato is only competitive in markets that require the special starch traits found in this crop. Plant breeding to increase starch yield from cassava and sweet potato would improve their competitiveness in Asian markets. In the manufacture of least-cost animal feed mixes, the results of a linear-programming model show that most millers are likely to prefer maize over root and tuber crops due in part to the higher cost of protein supplements when using starchy roots and tubers. However, a cassava-soybean compound feed appears to be currently economically viable in Thailand. Sweet potato and cassava are also viable feed options for many small farmers who grow their own feed so long as the protein-rich foliage can be effectively incorporated along with starchy roots in feed rations.
Keywords: Animal feed; Cassava; Food processing; Maize; Linear programming; Starch; Sweet potato

Benjamin P. Kemp, Jennifer Horne, Alan Bryant, Richard M. Cooper, Xanthomonas axonopodis pv. manihotis gumD gene is essential for EPS production and pathogenicity and enhances epiphytic survival on cassava (Manihot esculenta), Physiological and Molecular Plant Pathology, Volume 64, Issue 4, April 2004, Pages 209-218, ISSN 0885-5765, DOI: 10.1016/j.pmpp.2004.08.007.
(http://www.sciencedirect.com/science/article/B6WPC-4DS4646-1/2/cc8c0fcc03a83bee8684939bdb6f5546)
Abstract:
Extracellular polysaccharide-defective (EPS-) mutants of the cassava blight pathogen, Xanthomonas axonopodis pv. manihotis, were created by targeted disruption of the biosynthetic gene gumD. Pathogenicity of mutants was severely attenuated. Two EPS- mutants infiltrated into the leaf apoplast, caused initial water-soaking and chlorosis but symptoms were confined to inoculated zones, whereas those of wild type I56 rapidly extended and developed into flaccidity. This pattern reflected failure of EPS- mutants to spread. In entire lobes the wild-type population exceeded by 200-fold that of EPS- mutants. Petioles injected with EPS- mutants remained symptomless, in contrast to severe wilting with I56. EPS conferred significant resistance to H_2O_2, known to be produced by cassava cells during the oxidative burst. At 1 h exposure to 1 mM peroxide, only 3% EPS- compared with 48% wild type cells survived. Also, EPS- mutants were more vulnerable to UV irradiation. These phenomena correlated with reduced epiphytic survival of EPS- following spray application. The requirement for EPS in pathogenicity and epiphytic fitness is considered.
Keywords: Manihot esculenta; Cassava; Xanthomonas axonopodis pv. manihotis; EPS; Pathogenicity; GumD; Gene replacement

Sarno, Morio Iijima, Jamalam Lumbanraja, Sunyoto, Erwin Yuliadi, Yasuhiro Izumi, Akira Watanabe, Soil chemical properties of an Indonesian red acid soil as affected by land use and crop management, Soil and Tillage Research, Volume 76, Issue 2, April 2004, Pages 115-124, ISSN 0167-1987, DOI: 10.1016/j.still.2003.09.001.
(http://www.sciencedirect.com/science/article/B6TC6-49WMXMB-9/2/0629e2a25ef5417ebe35ce45d5240c57)
Abstract:
In the middle terrace area of south Sumatra, Indonesia, where red acid soils poor in crop productivity are widely distributed, the effects of cropping pattern and cultivation techniques on physico-chemical properties of soil were investigated. Five patterns for cassava cropping, including monoculture, a rotation with annual food crops, and three intercroppings with differences in the combination with annual crops and in the planting density, were evaluated in Experiment I. In Experiment II, eight plots composed of the combinations of two tillage methods (no-tillage or conventional tillage), the presence or absence of surface mulch from crop residues, and two rates of chemical fertilizers were established for a maize-soybean-cowpea sequential cropping pattern. At the end of 3 years, there was no difference in total C and total N concentrations among the plots in Experiment I irrespective of the mulch treatment using crop residues. Soil organic matter (SOM) concentration was not affected even in the no-tillage plot where the maximum crop residues (20 t ha-1) was given as surface mulch with the increased root residues due to higher rates of fertilizers (Experiment II). In Experiment I, available P concentration was highest in an intercropping with higher fertilizer rates and lowest cassava planting density. In Experiment II, an increase in available P was attained by mulching and the higher rate of fertilizers, and a minor positive effect of fertilizer was also observed in exchangeable Mg and K concentrations. Surface mulch resulted in less clay fraction compared with the non-mulch plots in both the experiments, suggesting its effect on the maintenance of soil particle distribution. An additional finding suggested no prominent influence of cassava monoculture on the level of SOM in this area based on the comparison with other major land uses, including secondary forest, rubber plantation, and mixed cultivation of fruits with crops. Nevertheless, the introduction of crop residue mulch and higher rates of fertilizers are recommended for sustaining soil quality and achieving higher crop yields.
Keywords: Cassava; Land use; Mulch; Soil organic matter level; Sustainability; Tropics

M. Rezaul Haque, J. Howard Bradbury, Preparation of linamarin from cassava leaves for use in a cassava cyanide kit, Food Chemistry, Volume 85, Issue 1, March 2004, Pages 27-29, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2003.06.001.
(http://www.sciencedirect.com/science/article/B6T6R-49WMWV4-1/2/e09ff56b3e9c98e719ed9b5447db9d9b)
Abstract:
A simple method is described for the preparation, from very young cassava leaves, of a dilute hydrochloric acid solution of linamarin. Linamarin extraction from the leaves is virtually quantitative. The linamarin solution is used in the preparation of standard linamarin filter paper discs that are needed to monitor the performance of picrate kits for determination of the total cyanide content of cassava roots and cassava products. These standard discs are stable indefinitely if stored in the refrigerator, but very slowly lose linamarin activity if stored for more than one month at room temperature.
Keywords: Linamarin; Cassava leaves; Cyanide kit; Linamarase

J. A. Hernandez-Perez, M. A. Garcia-Alvarado, G. Trystram, B. Heyd, Neural networks for the heat and mass transfer prediction during drying of cassava and mango, Innovative Food Science & Emerging Technologies, Volume 5, Issue 1, March 2004, Pages 57-64, ISSN 1466-8564, DOI: 10.1016/j.ifset.2003.10.004.

(http://www.sciencedirect.com/science/article/B6W6D-4BVNK0B-4/2/6684304bfa85f41b3874a05df8b3bd83)
Abstract:
A predictive model for heat and mass transfer using artificial neural network is proposed in order to obtain on-line predictions of temperature and moisture kinetics during the drying of cassava and mango. The model takes into account shrinkage of the product as a function of moisture content. Two separate feedforward networks with one hidden layer were used (for cassava and mango, respectively). The best fitting with the training data set was obtained with three neurons in the hidden layer, which made possible to predict heat and mass transfer with accuracy, at least as good as the experimental error, over the whole experimental range. On the validation data set, simulations and experimental kinetics test were in good agreement. The developed model can be used for on-line state estimation and control of drying processes.
Keywords: Shrinkage; Heat and mass transfer; Drying; Neural networks

K. N. Matsui, F. D. S. Larotonda, S. S. Paes, D. B. Luiz, A. T. N. Pires, J. B. Laurindo, Cassava bagasse-Kraft paper composites: analysis of influence of impregnation with starch acetate on tensile strength and water absorption properties, Carbohydrate Polymers, Volume 55, Issue 3, February 2004, Pages 237-243, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2003.07.007.
(http://www.sciencedirect.com/science/article/B6TFD-4BJ76RC-1/2/1e015862a0e0b9f6f78269d9aff86afa)
Abstract:
A fibrous residue rich in non-extracted starch (bagasse) obtained from the industrial production of cassava starch was used to obtain a composite that is similar to cardboard, through a technique used in small scale artisan production of recycled paper. A mixture of 90% cassava bagasse and 10% of Kraft paper was used for the production of these composites. Kraft paper was added as a source of long fibres, in order to improve the mechanical properties of the material. The prepared material has similar characteristics to the molded fibre packaging made using recycled paper, as used in egg boxes. However, cassava bagasse has advantages over recycled paper, in view of the fact that it is obtained from known and renewable sources. The impregnated and non-impregnated materials were submitted to tests of tensile strength and to direct contact with water by complete immersion of the samples. The cassava bagasse-Kraft paper composites obtained had a slight resistance to direct contact with water. The water mass absorbed by the materials impregnated with starch acetate was approximately half that of the materials without impregnation. However, the impregnation had little influence on the tensile strength of the tested samples. Starch acetate is therefore an attractive additive for use in the manufacture of waterproof materials, such as disposable trays.
Keywords: Composites; Cassava bagasse; Starch acetate; Water absorption; Tensile strength

Albert I. J. M. van Dijk, L. A. Sampurno Bruijnzeel, Jaap Schellekens, Micrometeorology and water use of mixed crops in upland West Java, Indonesia, Agricultural and Forest Meteorology, Volume 124, Issues 1-2, 20 July 2004, Pages 31-49, ISSN 0168-1923, DOI: 10.1016/j.agrformet.2004.01.006.
(http://www.sciencedirect.com/science/article/B6V8W-4BYR5XC-1/2/57103aa170ea0e65df4e152879604de8)
Abstract:
The scarcity of information on the micrometeorology and water use of rain-fed humid tropical crops leads to uncertainty about the effects of land cover change on streamflow and atmospheric circulation. We made micrometeorological measurements during five wet season months in a rain-fed cropping system with maize (Zea mays L.) and cassava (Manihot esculenta Crantz) on a bench-terraced hillside in upland West Java, Indonesia. Reflection coefficients varied between 0.07 for moist bare soil and 0.22 for mature cassava with surface mulching. Fluxes of heat and

vapour were estimated by the temperature variance method from wet- and dry-bulb temperature fluctuations measured with fast-responding thermocouples. Sensible heat fluxes were 24% larger when determined from Bowen ratios rather than directly, but latent heat fluxes inferred from the two estimates agreed within 10%. The difference was largely attributed to the greater effect of high-frequency losses on directly calculated fluxes. The Penman-Monteith model with optimised values for surface conductance (12.7 mm s-1), roughness length (0.03 times crop height) and displacement length (0.64 times crop height) was used to estimate dry canopy evaporation (Et) for a full year, allowing for the effect of reduced soil water availability during the dry season. Rainfall interception losses (Ei) were estimated with an adapted version of the Gash model calibrated with local measurements of throughfall and stemflow. Simulations with a soil-vegetation-atmosphere transfer model reported elsewhere demonstrated that modelled evaporation rates were consistent with soil hydrological measurements. Total water use was 1228 mm, divided between 1030 mm crop transpiration and soil evaporation and 198 mm rainfall interception losses.
Keywords: Evapotranspiration; Bowen ratio; Temperature variance method; Water balance; Crop water use; Humid tropics; Albedo

Friday Ekeleme, David Chikoye, I. Okezie Akobundu, Changes in size and composition of weed communities during planted and natural fallows, Basic and Applied Ecology, Volume 5, Issue 1, 2004, Pages 25-33, ISSN 1439-1791, DOI: 10.1078/1439-1791-00186.
(http://www.sciencedirect.com/science/article/B7GVS-4DS33KS-5J/2/fa07ad76ff88e891c665e77d78061e12)
Abstract:
The use of trees and herbaceous cover crops for weed management in smallholder farms is a promising alternative to the unsustainable traditional shifting cultivation system. The reported experiment was conducted from 1993 to 1996 in fallow plots established in 1989 to rehabilitate a degraded Alfisol after 10 years of continuous cultivation of maize/cassava. Treatments consisted of four plots each of woody legume species (Acacia auriculiformis, A. leptocarpa, Leucaena leucocephala, and Senna siamea), and a herbaceous legume cover crop (Pueraria phaseoloides). Two controls (natural bush fallow and continuous maize/cassava) were included. Each treatment was cleared and cultivated in 1993 and 1995 (after 4 and 6 year fallow). Cultivation was repeated in 1994 for plots cleared in 1993 and in 1996 for subplots cleared in 1995. In all the years, weed density and dry weight was lower in planted fallows than in the controls. Per capita weed population growth rate decreased in all the fallow treatments most notably in A. auriculiformis and S. siamea fallow. All fallow species except A. auriculiformis would require more than 6 years of fallow to prevent growth of the weed population over the long term. The weed seed bank was 75% lower in A. auriculiformis and P. phaseoloides fallow than the control plots. Canonical correspondence and redundancy analysis indicated differences in species composition between treatments in the aboveground weed flora and in the weed seed bank. Cynodon dactylon and Digitaria horizontalis dominated continuously cultivated maize/cassava plots. Chromolaena odorata occurred more in natural bush fallow. In contrast, annual broadleaf weeds dominated the planted fallow treatments.
Die Einsatz von stickstoffbindenden Baumen und Bodenbedeckungspflanzen zur Unkrautbekampfung in kleinbauerlichen Anbausystemen ist eine vielversprechende Alternative zum traditionellen Wanderfeldbau. Zwischen 1993 und 1996 wurde auf einem degradierten Alfisol ein Feldversuch durchgefuhrt, mit dem Ziel, den Einfluss von verschiedenen Brachesystemen auf den Unkrautbefall zu ermitteln. Die Versuchsflache hatte seit 1989 brachgelegen, zwischen 1979 und 1989 wurde die Flache alljahrlich zum Anbau von Mais und Maniok genutzt. Der Versuch beinhaltete funf Behandlungen mit verbesserter Brache: Acacia auriculiformis, A. leptocarpa, Leucaena leucocephala und Senna siamea als Baumleguminosen and Pueraria phaseoloides als stickstoffbinden Bodenbedecker. Als Kontrollbehandlungen dienten Naturbrache und jahrlicher Anbau von Mais/Maniok. Alle Parzellen wurden nach 4- und 6-jahriger Brache in 1993 and 1995

kultiviert, die Bodenbearbeitung auf diesen Parzellen wurde jeweils im folgenden Jahr wiederholt. In allen Jahren waren die Unkrautdichte und Unkrauttrockenmasseertrage in den Baum- und P. phaseoloides Parzellen geringer als in den Kontrollparzellen. Die Abnahme war deutlich niedriger in A. auriculiformis und in S. siamea. Mit Ausnahme von A. auriculiformis, wurden alle verbesserten Brachesysteme mehr als 6 Jahre benotigen, um die Wachstumrate der Unkrautpopulation zu hemmen. Die Unkrautsaatgutdichte im Boden war 75% niedriger in A. auriculiformis und in P. phaseoloides Parzellen als in der Kontrolle. Canonical Korrespondenz- und Redundanzanalysen zeigten, dass die Behandlungen die Zusammensetzung der Unkrautarten sowie die Unkrautsaatgutdichte beeinflussten. Cynodon dactylon und Digitaria horizontalis waren die dominanten Arten in den Parzellen, auf denen jahrlich Mais/Maniok angebaut wurde. Chromolaena odorata war die dominante Art in Parzellen mit Naturbrache wahrend einjahrige, zweikeimblattrige Unkrautarten in den verbesserten Bracheparzellen vorherrschend waren.
Keywords: weed density; seed bank; shifting cultivation; canonical correspondence analysis; redundancy analysis

R. A. Freitas, R. C. Paula, J. P. A. Feitosa, S. Rocha, M. -R. Sierakowski, Amylose contents, rheological properties and gelatinization kinetics of yam (Dioscorea alata) and cassava (Manihot utilissima) starches, Carbohydrate Polymers, Volume 55, Issue 1, 1 January 2004, Pages 3-8, ISSN 0144-8617, DOI: 10.1016/S0144-8617(03)00142-5.
(http://www.sciencedirect.com/science/article/B6TFD-49WPKMK-1/2/22d5769bd27e0a5540242a2a0b907ca5)
Abstract:
After defatting yam and cassava starches have amylose contents of 36.2 and 24.2%, respectively. Suspensions of these starches in water were analysed, in an oscillatory rheometer, using a heating rate of 4.0 [degree sign]C min-1, deformation of 1% and a frequency of 1 Hz, the initial temperatures of gelatinization being 71 and 62 [degree sign]C for yam and cassava, respectively. A gelatinization study was also carried out by differential scanning calorimetry with different heating rates (2.5, 3.0, 4.0 and 5.0 [degree sign]C min-1), to give, by the Arrhenius equation, the activation Energy (Ea) of the process. Yam starch showed a more energetic gelatinization process of when compared to cassava starch and also had a lower rate constant (s-1), indicating a relatively slow gelatinization process of at higher temperatures. Yam gels formed by autoclaving a suspension (50 g l-1) showed after 24 h of refrigeration, a stronger structure than for a cassava gel.
Keywords: Yam; Cassava; Gels; Activation energy; Rate constant

E. Ebregt, P.C. Struik, P.E. Abidin, B. Odongo, Farmers' information on sweet potato production and millipede infestation in north-eastern Uganda. I. Associations between spatial and temporal crop diversity and the level of pest infestation, NJAS - Wageningen Journal of Life Sciences, Volume 52, Issue 1, 2004, Pages 47-68, ISSN 1573-5214, DOI: 10.1016/S1573-5214(04)80029-0.
(http://www.sciencedirect.com/science/article/B94T2-4WFBS5H-5/2/2b428c1913ba76ee797b7d61d0b5dae9)
Abstract:
Farmers in five districts of north-eastern Uganda were interviewed to generate information on sweet potato production and constraints, with emphasis on damage by millipedes. Participatory rural appraisal methodology was used to interview 148 farmers. The peak period of planting sweet potato was from the end of May till the beginning of July in order to produce dried form food (amukeke) for storage in the dry season, which sets in around November. Vine cuttings were usually planted on mounds and weeding was mostly done only once. Osukut, Araka Red and Araka White were the most popular varieties. Many respondents obtained planting material from volunteer plants. Separation of plots over time and in space was often not practised. Sweet potato crop rotations were diverse. Millet, groundnut and maize were commonly grown after sweet potato.

Cassava, sweet potato, groundnut and maize are host crops for millipedes and were often grown in succession. Millipede incidences were not statistically different for the three agro-ecological zones of north-eastern Uganda, but depended on the frequency of millipede hosts (including sweet potato) in the crop rotations. Groundnut planted after sweet potato had high levels of millipede attack. Millipede incidence was often associated with the incidence of weevils. The results of this inventory show that most farmers consider millipedes as a pest of sweet potato and other major food and cash crops, but that many farmers lack the knowledge to control them.
Keywords: crop rotation; Diplopoda; farmer variety; host crop; Ipomoea batatas; participatory rural appraisal; planting material; spatial diversity

S. Adjei-Nsiah, C. Leeuwis, K.E. Giller, O. Sakyi-Dawson, J. Cobbina, T.W. Kuyper, M. Abekoe, W. Van Der Werf, Land tenure and differential soil fertility management practices among native and migrant farmers in Wenchi, Ghana: implications for interdisciplinary action research, NJAS - Wageningen Journal of Life Sciences, Volume 52, Issues 3-4, 2004, Pages 331-348, ISSN 1573-5214, DOI: 10.1016/S1573-5214(04)80020-4.
(http://www.sciencedirect.com/science/article/B94T2-4WFBS5G-6/2/fa115fc021c852d7a56f5fec5c7da742)
Abstract:
In the past, farmers in the forest-savannah transitional agro-ecological zone of Ghana relied on the bush fallow system for maintaining the productivity of their farmland. However, in recent years population growth-induced pressure on land has increased and farmers have developed various other strategies for improving the productivity of their farmlands. Such strategies have been identified in the context of an interdisciplinary action research project and include rotations with cassava (Manihot esculenta), pigeon pea (Cajanus cajan) and cowpea (Vigna unguiculata). Using a social science model for understanding technical farming practices, this article explains the differential adoption of these locally developed soil fertility management strategies. It transpires that native and migrant communities are captured in a social dilemma situation, which has negative consequences for soil fertility in that promising innovations are not utilized optimally. Based on this research experience, this article concludes with a discussion of the implications for co-operation between natural and social scientists in the context of interactive action research. It is argued, amongst other things, that the essence of such co-operation lies in the critical questioning and influencing of each other's key assumptions and disciplinary research agendas.
Keywords: bush fallow; cowpea; pigeon pea; cassava; maize

A. Saidou, T.W. Kuyper, D.K. Kossou, R. Tossou, P. Richards, Sustainable soil fertility management in Benin: learning from farmers, NJAS - Wageningen Journal of Life Sciences, Volume 52, Issues 3-4, 2004, Pages 349-369, ISSN 1573-5214, DOI: 10.1016/S1573-5214(04)80021-6.
(http://www.sciencedirect.com/science/article/B94T2-4WFBS5G-7/2/2ba33356d3b0493b8a2e41902037979d)
Abstract:
The perception of farmers from the Atacora and Save regions of Benin was studied about the causes and consequences of land degradation and corrective actions for sustaining soil fertility. Research methods in this diagnostic study included group discussions, using non-standardized unstructured interviews and participant observations. Farmland degradation leading to declining yields, and land tenure arrangements were identified as the main constraints on the sustainability of agriculture. In both regions the farmers stated that climatic changes (less and more irregular rainfall), run off, erosion, and overexploitation of farmlands caused land degradation. Soil fertility status was assessed on the basis of dicotyledonous weeds, soil texture and colour, and soil fauna (earthworm casting activity). Farmers have adapted their cropping systems to the local environment by developing traditional and new strategies and activities that could contribute to

maintain or enhance crop productivity. These strategies include animal manure, inorganic fertilizer, crop rotation, a five-year fallow, extensive cropping systems with cassava or egusi melon, and emigration. Land tenure arrangements between landlords and migrants affect strategies that can be applied to maintain soil fertility. The importance of building mutual trust and the need to experiment with different land tenure arrangements are indicated. A framework for interactive research where knowledge is collectively generated is proposed in order to test the effectiveness and applicability of some of these local innovations not yet well understood by conventional science.
Keywords: soil degradation; indigenous knowledge; land tenure arrangement; social dilemma