RESEARCH FOCUS AREA

FOOD SCIENCE AND TECHNOLOGY

The Food Science and Technology Research (FSTR) group was founded in 2013 and is directed to the innovation of nutritious and health promoting products for household nutrition and the food industry. Main research areas within the FSTR group include: food processing, biomolecules characterisation and application in food and non-food systems as well as food safety regulator, with emphasis on mechanisms of adaptation, resistance and persistence of food-borne pathogens.

The research team has been combining indigenous knowledge and modern technology to develop nutrient-rich rural household consumption. Biomolecule research focuses on characterisation of plant protein, polysaccharides and their complexes for development of high value functional ingredients (e.g. antioxidant peptides) that will interest the food industry. Potential application of protein-polysaccharide complexes are in the field of emulsion stabilisation, formation of hydrogen and complex caocervates for encapsulation and controlled release of bioactive compounds.

The Food Science and Technology team currently focuses its research on indigenous climate smart crops for value addition. By Indigenous Climate Smart Crops (ICSC), we refer to the range of crops with good nutrient profiles that are well-adapted to the changing climate. ICSC currently experience low levels of utilisation as they are traditionally grown by local farmers, in many cases solely for subsistence. Examples of these crops include bambara groundnuts, cowpea, pigeon pea, millet and amadumbe (Colocasia esculenta). These crops may play a role in addressing agricultural and food challenges.

LEAD RESEARCHER
PROF. E. AMONSOU

Prof. Amonsou's research interests are plant protein characterisation for improved human nutrition and health, food rheology and nanotechnology. He has burning passion for product development and entrepreneurship. Prof. Amonsou's research expertise is mainly in the composition, structure and functionality of plant proteins and peptides. Although he has been researching plant proteins, Prof. Amonsou has recently expanded his research to include the characterisation of polysaccharides (including starch) and their complexation with proteins to enhance food functionality as well as forming nanomaterials, which can be applied in encapsulation. Future research will therefore focus on characterisation of bioactive peptides and the formation of protein – polysaccharides complexes with potential application in emulsion stabilisation, hydrogels and encapsulation and controlled delivery of bioactive compounds. In additional to basic research, Prof. Amonsou and his team are currently working on the development of multifunctional and healthy products for commercialisation in the Department of Biotechnology and Food Technology.

Prof. Eric Amonsou
PhD (Food Science)

NRF Rating	Y2
h-index	4
Masters students (current)	7
Doctoral students (current)	3
Masters students (complete)	1
Doctoral students (complete)	2
Collaborators	8

LEAD RESEARCHER
DR O. IJABADENIYI

Dr Ijabadeniyi is a Senior Lecturer in the Department of Biotechnology and Food Technology at the Durban University of Technology. His current research focuses on incidence of food borne pathogens that constitute a public health risk, including *Listeria monocytogenes, Salmonella* and *Aspergillus flavus*. The use of different interventions to control persistent pathogens in foods also forms a vital part of his food safety research interest. His interests also lie in studying the quality and storage stability of fermented foods, most especially African indigenous fermented foods.

Dr Oluwatosin A. Ijabadeniyi
PhD (Food Science)

h-index	3
Masters students (current)	4
Doctoral students (current)	2
Masters students (complete)	3
Doctoral students (complete)	2
Collaborators	4

EMERGING RESEARCHER
DR J. MELLEM

Dr J. Mellem completed his Doctorate entitled, "Isolation and characterisation of the leaves of *Brachylaena discolor* extract as an anti-diabetic agent" in 2013. This research focused on the screening of B. discolor extracts for their potential use as antidiabetic dietary adjuncts. Identified extracts were then subjected to an STZ-induced diabetic rat model for in vivo screening which involved a biochemical blood analysis as well as ultra structural (TEM) and histopathological analysis. Dr Mellem has been involved in the area of plant biotechnology research since 2004 with projects that have been completed using indigenous food crops for phytoremediation of heavy metals and production of wine from indigenous palms. Currently his research focuses on the characterisation of biomolecules for the development of functional foods or nutraceuticals to address diet and lifestyle diseases (viz. diabetes, cancer, CVD (cardio vascular diseases)) and malnutrition. Specific interests include: health benefits of antioxidants/phytochemicals in fruits, vegetables, grains and legumes against oxidative stress, and the development of bionanomaterials for the delivery of bioactive compounds.

NATIONAL COLLABORATIONS

Dr Abe Gerrano, Agricultural Research Council, South Africa.

Dr John Mellem
DTech (Food Technology)

h-index	2
Masters students (current)	4
Doctoral students (current)	1
Doctoral students (complete)	1

RESEARCH OUTPUTS 2015/2016

NATIONAL CONFERENCES

1. Mellem, J. Soy applications: Non-dairy ice-cream - Processing of a soybean based ice-cream. Imagine The Possibilities With Soy: Market Trends And Workshop. 27th - 31st July 2015
2. Essack, H. Odhav, B and Mellem J. Screening of traditional South African leafy vegetables for specific anti-nutritional factors before and after processing. 21st SAAFoST Biennial International Congress and Exhibition. 7th - 9th September 2015
3. Arise A.K., Ijabadeniyi O.A, Amonsou E.O. 2015. Composition, Solubility profile and thermal properties of protein isolate from bambara groundnut (*Vigna subterranea*) landraces. South African Association of Food Scientist and Technologist (SAAFOST), Durban, 6th–9th September, 2015.
4. Oyeyinka, S.A., Singh, S., Amonsou, E.O. 2015. Properties of biocomposite films made from bambara groundnut starch and stearic acid. 2nd International Conference on Composites, Biocomposites and Nanocomposites, 28-30, October, 2015, Durban, South Africa.
5. Oyeyinka, S.A., Singh, S., Amonsou, E.O. 2015. Structure, in-vitro digestibility and other functional properties of starch isolated from bambara groundnut *(Vigna subterranea)* landraces. 21st South African Association for Food Science and Technology (SAAFoST) Biennial International Congress and Exhibition, 6-9, September, 2015, Durban South Africa.
6. 57th Biannual SASM congress, 17-20 January 2016, coastlands, Umhlanga, Durban. Delegate and session chair
7. Amonsou, E.O. 2016. Traditional Food Crops Hold Great Promise for Improved Food, Nutrition Security and Health, Presented at 4th annual eThekwini-University Research Symposium, EURS 5-6 April, 2016.
8. Arise, A. K., Alashi, A. M., Nwachukwu, N.D., Sunday, M.A., Aluko, R.E., Amonsou, E.O. 2016. Inhibitory properties of bambara protein hydrolysate and its membrane fractions against angiotensin converting enzymes, renin and free radicals. Food Safety and Security 2016 Autumn Scientific Conference (FSaS), Johannesburg. South African, 16-18th May, 2016.
9. Amonsou E.O. 2016. Traditional Food Crops Hold Great Promise for Improved Food, Nutrition Security and Health, Presented at 4th annual eThekwini-University Research Symposium, EURS 5-6 April, 2016.
10. Oyeyinka, S.A., Singh, S., Amonsou, E.O. 2016. Promoting bambara groundnut starch utilisation through complexation with lipids. Food Safety and Security Conference, 15-19, May, 2016, University of Johannesburg, South Africa.

INTERNATIONAL CONFERENCES

1. Mtolo, M., Gerrano, A., Adebola, P. and Mellem, J. Effect of Simulated Gastrointestinal Digestion on the Phenol Content and in-vitro Antioxidant Capacity of Processed Cowpea (*Vigna unguiculata*) Cultivars. IUFoST 18th World Congress of Food Science and Technology in the Royal Dublin Society, Ireland from August 21st - 25th 2016
2. Sipahli, S., Mohanlall, V. and Mellem, J. IUFoST 18th World Congress of Food Science and Technology in the Royal Dublin Society, Ireland from August 21st - 25th 2016
3. Kudanga, T., Mthembu, S., Mellem, J. and Amonsou, A. Chemo-enzymatic modification of Bambara and Cowpea proteins for improved hydrogel properties. IUFoST 18th World Congress of Food Science and Technology in the Royal Dublin Society, Ireland from August 21st - 25th 2016
4. Oyeyinka, S.A., Singh, S., Amonsou, E.O. 2015. In-vitro digestibility and other functional properties of starches from bambara landraces. 29th European Federation of Food Science and Technology (EFFoST) Conference, 10-12, November, 2015, Athens, Greece.
5. Arise, A. K., Alashi, A. M., Nwachukwu, N.D., Ijabadeniyi, O.A, Aluko, R. E., Amonsou, E.O. 2016. Antioxidant activities of bambara groundnut (*Vigna subterranea*) protein hydrolysates and their membrane ultrafiltration fraction. IUFoST-world congress of Food Science and Technology, Dublin, Ireland 21st-25th August, 2016.
6. Oyeyinka, S.A., Ma, Y., Singh, S., Amonsou, E.O. 2016. Enhancing the industrial potential of bambara starch through complexation with fatty acids using high pressure homogenisation, 18th World Congress of Food Science and Technology (IUFoST) Conference, 21-25, August, 2016, Dublin, Ireland.
7. Mukurumbira A., Mellem J., & Amonsou E.O. Preparation and characterisation of amadumbe starch nanocrystals for potential application in bio-composite films 18th World Congress of Food Science and Technology (IUFoST) Conference, 21-25, August, 2016, Dublin, Ireland.

JOURNAL PUBLICATIONS

1. Odun-Ayo, F., Mellem, J. & Reddy, L. 2016. Improving The Survival Of Probiotic In Simulated Conditions And Tumor Induced Mice Model Using Modified Citrus Pectin-Alginate Microencapsulation. *African Journal of Traditional, Complementary and Alternative Medicines,* 13(2):101-09.
2. Oyeyinka, SA, S. Singh, Ma, Y. and Amonsou, E.O. 2016 Effect of high-pressure homogenisation on structural, thermal and rheological properties of bambara starch complexed with different fatty acids, *RSC Advance*s, 6, 80174-80180.
3. Oyeyinka, SA. Singh, S, Amonsou, EO (2016). Effect of high pressure homogenisation on complexation of Bambara starch with lysophosphatidylcholine. *LWT - Food Science and Technology*, 74, 120-127.
4. Siwela M., Amonsou EO (2016). Composition of Proteins Extracted from two Species of Leguminous Bauhinia Grains, *Cereal Chemistry*, Accepted, http://dx.doi.org/10.1094/CCHEM-04-16-0107
5. Oyeyinka, S.A. Singh, S., Venta S., Amonsou, E.O. (2016). Effect of lipid types on complexation and some physicochemical properties of bambara groundnut starch. *Starch* (Accepted: 04/06/2026).
6. Beswa, D., Dlamini, NR, Amonsou, E.O., Siwela M., and Derera, J. (2016). Effects of Amaranth Addition on the Pro-vitamin A Content, and Physical and Antioxidant Properties of Extruded Pro-Vitamin A-Biofortified Maize Snacks. *Journal of the Science of Food and Agriculture*, 96, 287-294.
7. Arise, A., Alashi, M.A., Nwachukwu, I, Ijabadeniyi, A.A., Rotimi E. Aluko, RE, Amonsou EO (2016). Antioxidant activities of bambara groundnut (*Vigna subterranea*) protein hydrolysates and their membrane ultrafiltration fractions. *Food and Function*, 7, 2431-2437
8. Awobusuyi T.D., Amonsou E.O., Siwela M., Kolanisi, U. (2016). Provitamin A retention and sensory acceptability of amahewu, a non-alcoholic cereal-based beverage made with provitamin A-biofortified maize. *Journal of the Science of Food and Agriculture*, 96 1356-1361
9. Oyeyinka, S.A., Singh, S., Amonsou E.O. (2016). Physicochemical properties of starches extracted from bambara groundnut landraces. *Starch* (accepted 02 may, 2016)
10. Beswa D., Siwela, M., Dlamini, N.R., Amonsou E.O., Kolanisi, U. (2016). Effect of amaranth addition on the nutritional composition and consumer acceptability of extruded Provitamin A biofortified maize snacks. *Food Science and Technology*, Campinas, 36, 30-39.
11. Abimbola K. Arise, Adeola M. Alashi, Ifeanyi D. Nwachukwu, Oluwatosin A. Ijabadeniyi, Rotimi E. Aluko and Eric O. Amonsou (2016). Antioxidant activities of bambara groundnut (*Vigna subterranea*) protein hydrolysates and their membrane ultrafiltration fractions. *Food and Function* Doi: 10.1039/C6FO00057F
12. Oladunjoye A. O, Ijabadeniyi O.A, Singh S (2016). Inactivation of Listeria monocytogenes ATCC 7644 on fresh-cut tomato using nisin in combinations with organic salts. *Brazillian Journal of Microbiology*. Doi:10.1016/j.bjm.2016.04.02
13. Oladunjoye A. O, Singh S, Ijabadeniyi O.A (2016). Biocontrol of Listeria monocytogenes ATCC 7644 using nisin combined with organic acids on fresh-cut tomato (*Lycopersicon esculentum*). *Food Science and Biotechnology* (Accepted: 15/06/2016)
14. Senapati A. K, Rosma A, Nadiah A, Ijabadeniyi O. A and Olotu O. O., (2016). Quality and Safety of Indigenous Fermented Foods In Indigenous Fermented Foods of South Asia. Edited by V. K. Joshi. CRC Press. Page 260 – 308.
15. Pandey A, Sharma A, Chamgonliu P and Ijabadeniyi O. A (2016). Industrialisation, Socioeconomic Conditions and Sustainability of Indigenous Fermented Foods In Indigenous Fermented Foods of South Asia. Edited by V. K. Joshi. CRC Press. Page 830 - 849
16. Moodley, T., Amonsou, E.O., Kumar, S. (2015) Nutritional quality and acceptability of Buddleja saligna herbal tea. *Journal of Food Science and Technology*, 52, 7519-7524.
17. Odun-Ayo, F., Mellem, J., Naicker, T. & Reddy, L. 2015. Chemoprevention of Azoxymethane-induced Colonic Carcinogenesis in Balb/c mice Using a Modified Pectin Alginate Probiotic. *Anticancer Research*, 35 (9):4765-75.
18. Mellem, J., Baijnath, H. & Odhav, B. 2015. Antidiabetic potential of *Brachylaena discolor*. *African Journal of Traditional, Complementary and Alternative Medicines*, 12, 38-44.
19. Oyeyinka, S.A, Singh, S., Adebola, P.O. Abe, S. Gerrano, A.S., Amonsou, E.O. (2015). Physicochemical properties of starches with variable amylose contents extracted from bambara groundnut genotypes. *Carbohydrate Polymers* 133, 171–178.
20. Naidoo, K., Amonsou E.O., Oyeyinka S. (2015). In vitro digestibility and some physicochemical properties of starch from wild and cultivated amadumbe corms. *Carbohydrate Polymers*, 129, 9-15.
21. Arise, A. K., Amonsou, E.O., Ijabadeniyi, O. A. (2015). Influence of extraction methods on functional properties of protein concentrates

prepared from South African bambara groundnut landraces. *International Journal of Food Science & Technology*., 50, 1095-1101.

INNOVATIONS

DEVELOPMENT OF INNOVATIVE FOOD PRODUCTS

We are collaborating with Minzhu Enterprises to develop, manufacture and market an innovative food product. The products are mini cakes filled with three flavorings that will be priced very competitively. Minzhu Enterprises has invested in a modern, hands-free production line that has several strategies that will ensure a long shelf-life of the product. The Department has formulated the product as well as conducted the nutritional analysis and consumer testing. The product has been branded as a Golf Pie® as an extension of the Golf® biscuits already being produced by Minzhu Enterprises and will carry the DUT logo. The Department and Minzhu Enterprises will enter into a profit-sharing agreement that will form the basis of continued collaboration (2015).