



THE BIOTECHNOLOGY CENTRE

Departmental Report August 2020 - July 2021

Professor Helen Asemota · Director

BSc, Univ. of Benin, Nigeria, MSc, Ahmadu Bello University, Nigeria, PhD, Univ. of Benin/Frankfurt, Germany

WORK OF THE CENTRE

The Biotechnology Centre, keeping in line with its Triple A strategic plan, focused on research training, teaching, and activities geared towards producing the distinctive graduate, increasing visibility through interaction with local and international communities. The Jamaica-Mexico Bilateral Technical and Scientific Cooperation Project was renewed for the 2020-2021 period. The emphasis for this cycle is the proposed development of value-added products for the Sports Food Market. During the period the staff were also involved in various outreach programmes, participating in public lectures and seminars, and in university meetings and activities.

The Academic Staff and Programmes of the Centre are:

- a. Professor Helen Asemota, Professor of Biochemistry and Molecular Biology is the current Director of the Centre (since 2013). She serves both at the Biotechnology Centre Faculty of Science & Technology and the Faculty of Medical Sciences' Basic Medical Sciences Department's Biochemistry Section over the years. She operates two large research teams consisting of postgraduate students from both Faculties, collaborating in the UWI Yam Biotechnology & Biomedical Research Group, which she has led for over twenty-five years.

- b. Professor Paula Tennant, Professor of Molecular Plant Pathology at the Life Sciences Department of the Faculty of Science & Technology, who also has served the Biotechnology Centre leads the Molecular Virology Research Group of the centre.
- c. Prof. Marcia Roye, Professor of Molecular Virology serves as the FST Associate Dean of Graduate Studies and Research, leads the Geminivirus Research Group of the Centre.
- d. Dr. Sylvia Mitchell, FST Senior Lecturer, coordinates the FST foundation course (Foun1201) and leads the Medicinal Plants Research Group of the centre
- e. Prof. Nouredine Benkeblia, Professor of Crop Science in the Life Sciences Department of FST, leads the Tree Crops & Metabolomics Research Group of the centre.
- f. Prof. Wesley Gray has been appointed as Honorary Professor to the Biotechnology Centre (year). Prof. Gray is the Walter Dumas Endowed Professor of Environment Toxicology at the Southern University of Baton Rouge (SUBR). He has been collaborating with the centre in support of its research and academic objectives since 2016 through an MOU agreement between UWI Mona and SUBR.

The Academics collaborate with other researchers locally and globally to drive the research and MPhil & PhD programmes of the centre, and train both centre-registered MPhil & PhD students and associate students studying biotechnology from other departments. In order to fulfil teaching requirements, the centre's academics take on teaching assignments in other departments, or within the Faculty of Science and Technology Foundation programmes. An MSc (Biotechnology) programme has also been approved. The **Support Staff** of the centre in the period were: Dr. Karla Hylton (Research Assistant to Prof. Asemota), Ms. Deiondra Robinson (Research Assistant to Prof. Roye), Mr. Carlton Barrows (Senior Laboratory Technologist), Mrs. Karen Stewart (Senior Administrative Assistant II), Mr. Roy Dwyer (Handyman), and Ms. Shernette Banks-Ashman (Laboratory Attendant).

ACCESS

STUDENTS OF THE CENTRE

The following twenty two (22) post-graduate students received training at the centre in the year on PhD or MPhil in Biotechnology degree programmes. The students are attached to various research groups of the centre depending on their research supervisors.

STUDENTS OUTPUT/DEVELOPMENT

- Ms. Melisa Williams, a PhD student of Prof. Asemota, successfully defended her thesis on “Biomagnetic Therapy and the Associated Biochemical and Histological effects in Type 2 Diabetes using Animal Model.”
- Mr. Jordon Freeman, Graduate Student of the Biotechnology Centre and currently supervised by Dr. Roy Porter and Dr. Dewayne Stennett, placed first in Three Minute Thesis (3MT™) competition at the finals held on May 20, 2021. The competition is a celebration and recognition of excellence in research within The UWI community and was hosted by The UWI Mona Library in collaboration with the Office of Graduate Studies and Research.
- Mr. Keaton Logan, postgraduate student of Prof Helen Asemota received PineBIO Certificate for “LBRN Analysis of SARS-COV-2 Genomics Data”. Mr. Logan’s participation in SREP 2020 Virtual Summer Camp, Exploring Natural Products and Examination of COVID-19 DNA using Bioinformatic Tools. He also received UWI-Mona Postgraduate Research Fellowship Grant to participate as a J1 fellow in the SUBR-Mona Connect Program for 2020-2021. Dr Chenielle Delahaye-McKenzie, past student of Dr Sylvia Mitchell, was appointed as Science Programme Manager, Science Division, Ministry of Science, Energy and Technology. She gave a FST Chemistry lecture on February 4, 2021.
- Ms. Princess Bell, student of Prof. Helen Asemota presented her PhD upgrade seminar on Tuesday February 16, 2021. Ms Bell’s research topic is entitled: Investigations into the Blood Serum Lipid and Cholesterol Reducing Principles in Secondary Metabolites from the Biomaterials of Selected Accessions of Jamaican Cannabis sativa L.
- Mr. Jordon Freeman, student of Dr. Roy Porter and Dr. Dewayne Stennett presented his PhD upgrade seminar titled “Characterisation of Starch from Ackee (Blighia Sapida) Seeds and the Potential for Industrial Utilisation” on April 13, 2021.
- Ms. Adwalia Fevrier-Paul, graduate student of Prof. Mitko Voutchkov and Dr Sylvia Mitchell successfully defended her thesis on June 9, 2021.
- Mr. Antoni Comrie presented his research in the UWI postgraduate seminar series on February 11, 2021 entitled: ‘Bambusa vulgaris sterilization, initiation into in vitro culture.

PUBLICATIONS

Referred Journal Publications:

- Benkeblia, N.** 2020. Potato Glycoalkaloids: occurrence, biological activities and extraction for bio valorisation – a review. *International Journal of Food Science and Technology*, 55, 2305–2313. (IF: 2.77).
- Keaton A Logan, Helen Asemota, Chukwuemeka Nwokocha, Mark A Lawrence, Rory Thompson, Magdalene Nwokocha, Mohammed Bakir.** The Effects of Synthesized Semicarbazone Copper Complex on Blood Pressure in Normotensive and L-NAME Induced Hypertensive Rats. *Journal of Biotechnology and Biomedicine* 3 (2020): 67-77.

- iii. **Benkeblia, N.** (2020). Common pre- and post-harvest diseases of vegetable crops in Jamaica. CAB Reviews 15, No. 057, 1-7.
- iv. **Benkeblia, N.** (2020). Common pre- and post-harvest diseases of vegetable crops in Jamaica. CABI Reviews 15: 1-7. doi: 10.1079/PAVSNNR202015057.
- v. Rambaran Theresa F, J Ginigini, PA Mclenachan, CS Bowen-Forbes, **Mitchell S.A.** (2021) Morphological characterization of Wild Rubus rosifolius (Rosaceae) plants growing in Jamaica prior to agricultural pursuits. Caribbean Journal of Science 51(1): 1-13 (Feb 3, 2021).
- vi. Wallace Kenroy, **Asemota Helen**, Gray Wesley (2021) Acetone Extract of Dioscorea alata Inhibits Cell Proliferation in Cancer Cells.
- vii. Wilson M, **Mitchell SA**, Johnson H, Northover P, Esnard T. (2021) Afrodescendant Seed Infrastructures: From Dispossession to Reparatory Justice, Racial Infrastructures Workshop held online from University of Endinburgh, March 30-31, 2021. University of Endinburgh, UWI Biotechnology Centre, Bernard Lodge Farmers Association, UWI Mona SALISES, UWI St Augustine.
- viii. Fevrier-Paul, Adwalia, AK Soyibo, N De Silva, **SA Mitchell**, C Nwokocha, M Voutchkov (2021) Addressing the challenge of potentially hazardous elements in the reduction of hypertension, diabetes and chronic kidney disease in the Caribbean. Journal of Health & Pollution, 11(30): 1-; DOI 10.5696/2156-9614-11.30.210613 (June, 2021).

BOOK & BOOK CHAPTER

- i. **Benkeblia, N.** (2020). Vitamins and Minerals Biofortification of Horticultural Crops. Wiley & Sons Publisher, Chichester 256 p.
- ii. **Benkeblia, N.** (2020). Biofortification of Edible Plants: Set the Stage for Better Nutrition. In: Vitamins and Minerals Biofortification of Horticultural Crops. N. Benkeblia (Ed.). Wiley & Sons Publisher, Chichester, pp. 1-26.
- iii. **Benkeblia, N.** and Hefferon, K. L. (2020). Modern biotechnologies and mineral biofortification of edible crops. In: Vitamins and Minerals Biofortification of Horticultural Crops. N. Benkeblia (Ed.). Wiley & Sons Publisher, Chichester, pp. 45-69.
- iv. **Benkeblia, N.** and Hefferon, K. L. (2020). Modern biotechnologies and vitamins biofortification of edible crops. In: Vitamins and Minerals Biofortification of Horticultural Crops. N. Benkeblia (Ed.). Wiley & Sons Publisher, Chichester, pp. 71-86.
- v. **Benkeblia, N.**, Pinto E. M. and Vasconcelos, M. (2020). Carotenoids bio fortification of sweet potato. In: Vitamins and Minerals Biofortification of Horticultural Crops. N. Benkeblia (Ed.). Wiley & Sons Publisher, Chichester pp. 87-102.

ALIGNMENT

PAPERS PRESENTED

- i. **Mitchell, SA** (2021) Do You Know Your Tea, Article for FST recognizes International Tea Day, FST, UWI, 21st May, 2021. <https://www.mona.uwi.edu/fst/fst-recognises-international-tea-day>.
- ii. Wilson M, **SA Mitchell**, H Johnson, P Northover, T Esnard (2021) Afrodescendant Seed Infrastructures: Towards Inclusive Food Security in the Caribbean, BSA Food Studies Group Conference 2021: Food, Food Systems and Times of Insecurity, Virtual Conference, June 22-23, University of Edinburgh, June 22, 2021.
- iii. Wilson M, **SA Mitchell**, H Johnson, P Northover, T Esnard (2021) Afrodescendant Seed Infrastructures: From Dispossession to Social Justice, In Panel, Just Food? Contesting the Infrastructures of Race, Space and the Poverty of Place. ASFS 2021: Just Food, because it is Never Just Food, Virtual Conference, June 9-15, 2021. University of Edinburgh, UWI Biotechnology Centre, Bernard Lodge Farmers Association, UWI Mona SALISES, UWI St Augustine.
- iv. **Mitchell SA** (2021) A review of factors affecting successful hardening of tissue cultured plantlets including experience with tropical plants, so as to acclimatize them to ex vitro conditions. In session: Factors affecting successful transfer of in vitro plantlets to ex vitro condition. In Vitro Online Biology Meeting, June 5-9 2021. P-15, June 7, 2021.
- v. Wilson M1, **SA Mitchell**, H Johnson, P Northover, T Esnard (2021) Afrodescendant Seed Infrastructures: From Dispossession to Reparatory Justice, SRAD Online Speaker Series, University of the West Indies, June 2, 2021.
- vi. **Mitchell SA** (2021) GO, GROW & GLOW – A New Look at an Old Nutritional Mantra Integrative Health Webinar, CMEs, Presented at the Caribbean Association of Nutritionists and Dieticians (CANDi), July 24, 2021.

TECHNICAL REPORT/SCIENTIFIC REPORTS/WHITE PAPERS

The Jamaica-Mexico Bilateral Technical and Scientific Cooperation Project was renewed for the 2020-2021 period. This cycle saw the inclusion of The Universidad Panamericana, Mexico led by Dra Julieta Domínguez Soberanes. The emphasis for this cycle is the proposed development of value-added products for the Sports Food Market. It sets out to identify food sources especially those from yams that are ideal for the possible production of nutraceuticals with sporting performance enhancing effects. With this new focus the new project title was coined as "Screening, Assessment and Bioengineering of Naturally

Occurring Biomaterials/Polymers of Jamaican Tuber Crops for Functionality Enhancement and Commercial Products Innovation". The COVID 19 pandemic during 2020 had a severe impact on the execution of the project in hampering planned exchanged visits and hands on laboratory work. This gave way to workshops which were designed to effect requisite training in the absence of face-to-face engagements.

The MOU signed in 2018 for collaboration with CIAD and The Biotechnology Centre as well as the exchange visits, and networking with Universidad Panamericana, provided the ideal platform for online workshop engagements between these academic entities. The workshops fostered a comprehensive online learning experience. Knowledge was garnered as to how to impart phytochemical screening activities that are specific to the project. In addition, the results of screening carried out on project samples were reported along with other data generated by CIAD and other research groups. The project was also zeroed into through looking at the value of roots and tubers as being suitable for health products based on their biochemical composition. Through this an aim of the project to have motivated faculty and student engaged in modern biobased technology was achieved. Importantly, the objective to strengthen the capacity of the Biotechnology Centre was realized with the engagement of faculty and many students through this channel. For this cycle of the project much has been accomplished when the many limitations brought about by the COVID 19 pandemic are taken into consideration.

PUBLIC SERVICE

Prof. Helen Asemota

- Ordained Minister (Reverend) with the Holiness Christian Church of Jamaica; Chairman of Board - International Centre for Environmental and Nuclear Sciences (ICENS); Member, PSOJ Innovative Committee; Member, NHMIJ Board, JIS; Chairman and Co-Founder, Imade Asemota Foundation for Sickle Cell Research and Patients' Welfare (IAF), North Carolina, USA; Director, Biotechnology Centre (FST, Mona); Country Representative, International Measurement Convention (IMEKO) Rep. in Jamaica; STEM Women of Science Concave (SWOC), USA. Founding Member; Conveyor, the 2016 United Nations University Biotechnology Programme for Latin American and Caribbean countries (UNUBIOLAC) Activities; General Co-chair, the 2017 IMEKO TC19 International Symposium in Aguascalientes, Mexico.

Dr. Sylvia Mitchell

- Team Member Reviewing the HEART - NCVET Cannabis Units; Member, Technical Working Group, Cannabis Licensing Authority, 2016 to Present; Member, Health and Wellness Network Committee, Linkages Council, Ministry of Tourism, 2016 to Present; Member, Ginger working group, Ministry of Industry, Commerce, Agriculture and Fisheries,

2017; Member, ABS working group meeting, MEGJC; Technical Secretary, Bamboo and Indigenous Material Products Standards Technical; Committee (BIMPSTC), Bureau of Standards Jamaica, 2016-2018; Founding Member, Bamboo Industry Association of Jamaica, 2016 to Present; Bureau of Standards Jamaica, Pension Trustee, 2013 to Present; Biology (SIVB), 2009 to Present; Member, Organization for Women in Science for the Developing World (OSWD); Convenor, Working Group, Bamboo Charcoal, TC296, ISO, 2017-2018; Member, Working Group, Bamboo Terminology, TC296, ISO, 2017 to Present; Member of Organising Committee, Caribbean Bamboo Conference in November 2018. Will be presenting a paper on the work done under this project; Convenor of ISO Bamboo standard working group on bamboo charcoal for 2017. Sent document for ISO meeting in Indonesia in 2-24th August, 2017; Co-editor of in Vitro Reports (posted on their website every three months), Society of in Vitro Biology (SIVB), 2009 to Present; Member, Society of in Vitro Biology (SIVB), 2003 to Present; Member, Organization for Women in Science for the Developing World (OSWD); Convenor, Working Group, Bamboo Charcoal, TC296, ISO. Organizer first meeting of the WG1, Indonesia, held August 23, 2017; Member of Sustainable Rural and Agricultural Development research cluster (SRAD) research group coordination and advocacy team hosted by SALISES, UWI.; Member of Bamboo and Indigenous Material Products Standards Technical Committee (BIMPSTC) meeting held by the Bureau of Standards, January 25 and 28, 2021; Bamboo In Construction Standards Working Group (BICWG) meeting hosted by the Bureau of Standards, February 18, 2021; Member of the State of the African Diaspora (SOAD) Project (in planning stage); Member of Sustainable Rural and Agricultural Development Cluster (SRAD) workshop (in planning stages) – in collaboration with SALISES and overseas colleagues; Member of SRAD research group coordination and advocacy team hosted by SALISES, UWI. Meetings held February 19 and 25, 2021; SIVB member, Social Engagement Ad Hoc Committee. Meeting held Feb 17, 2021; Member of Peckham Steering Committee for bamboo development; SIVB Member; Co-Editor of In Vitro Reports; Member of the Publication Committee, Education Committee, and Ad Hoc Social Engagement Committee.

Prof. Marcia Roye

- Member of the Advisory Board of the National Compliance Regulatory Authority of the Bureau of Standards, Jamaica; Chair, National Compliance Regulatory Authority Technical Committee, Volunteer Cape Biology Teacher at Wolmer's Boys' School and St Andrew High School for Girls. Topic: Genetic engineering.

Prof. Nouredine Benkeblia

- Scientific Activities Appointed "Associate Editor", Canadian Journal of Plant Science; Member of the Canadian Society of Plant Science International Symposia; Member of the Organizing Committee of the 2nd Asian Horticultural Congress, 26-28 September, 2017,

Chengdu, China; Member of the Organizing Committee of the International Conference on Food Technology and Nutritional Science, 26-27 June, 2017, Baltimore, MD, USA.

Prof. Paula Tennant

- Professor of Molecular Plant Pathology in the Department of Life Sciences, Mona; Member, American Psychopathological Society; Member, Caribbean Academy of Sciences, Jamaica Chapter; Member, Jamaica Society of Scientists and Technologists.

Prof. Wesley Gray (Honorary Professor)

- Advisory Committee for the LSU Superfund Research Centre's (SRP) Community Engagement Core's (CEC) for 2020-2022.

AGILITY

INCOME GENERATION

SPECIAL PROJECTS

- The Biotechnology Centre Yam Project (year-year) has received US\$22,000.00 (Twenty-Two Thousand US Dollars) from National Science Foundation through SUNY Binghamton. This amount is to be used to pursue additional research with Yam farmers by Project PI, Professor Asemota, along with members of the Yam research group.
- The UWI Bamboo Project - Data Collection of Four-Year-Old Bamboo Growth

Bamboos were planted in the UWI-Biotechnology Research Plot in 2017. Data has been taken monthly in year 1, then at year 2 and year 3. Now, at year 4, data was taken on a representative quarter of the culms. Data taken for each culm included: number of nodes, total culm length, culm length to the 10th node, culm circumference at the base and at the 10th node, base width of the culm and diameter of the inner hole. The number of culms per clump were also recorded. A total of 118 culms from bamboo obtained from Clapham, Lamb's River, Harker's Hall and Peckham were measured. Four volunteers from the farming community of Harker's Hall assisted with the cutting and data collection. Data analysis is in progress. Three students worked through COVID in the lab on developing initiation protocols for the bamboo species: *Bambusa vulgaris* and *Dendrocalamus asper*. These were Dania Elliott (undergraduate student BIOC3413), Latisha Levermore (volunteer) and Antoni Comrie (MPhil student). Due to their efforts, we have a much better understanding on the physiology of bamboo in relation to its initiation into tissue culture. *Dendrocalamus asper* was obtained from the Forestry Department. Growth data was taken. Planting and initiation experiments were also carried out by Antoni Comrie. The Biotechnology Centre has obtained permission from the Jamaica Bauxite Company to plant bamboo on mined-out land in Rio Hoe Pen, Clapham as part of the national bamboo project. The land, to be

used for bamboo research, is designated by enclosure plan 069-02-003-204 (7 hectares @ Vol 1443, Fol 551) in Rio Hoe Pen, Moneague PO, St. Ann. The National Land Agency produced a lease agreement for the land to be leased to UWI for a period of 25 years at a rental of \$100,000.00 per annum with 5 yearly rent reviews. We are presently, with assistance of the other partners in this project, namely the Bureau of Standards and PIOJ seeking for a reduction of this rental due to the research nature of the request. We are in the process of importing two new species of bamboo species. NEPA approval is awaiting assignment of the Clapham land to the Biotechnology Centre, UWI.

OUTREACH

- The Agrobiotechnology short course was held August 25-28, 2020. It was held over 4 days and delivered using online modality. Course coordinator was Dr. Karla Hylton who was assisted by graduate students Ms. Trichel O'Connor and Ms. Racquel Wright. On each day, short quizzes were given to assess understanding. The feedback was great with participants encouraging us to do other courses. The aim of the course was to provide basic scientific knowledge with regards to agriculture to the wider community. The Centre earned \$80,000.00 JMD from this course.
- An online biotechnology course was provided to twelve (12) Shortwood Teachers College teachers in training and conducted by Dr Sylvia Mitchell, Senior Lecturer at the Centre. This earned the Biotechnology Centre \$60,000.00 JMD. Training was provided via five one hour long sessions on October 14, 30 and November 6, 11 and 24, 2020. The students' were instructed on how to do plant tissue culture (which is referred to as kitchen culture) using Jello as the culture media and make wine (using ripe plantain) at home. They were also instructed on how to review and critique plant tissue culture videos and PowerPoint online, describing how they would use them in the classroom. A final report included the video and PowerPoint critique, classroom activity, preparation of a PowerPoint used to teach, a lab report on their plant tissue culture and wine making activities, and an analysis of the results of a plant tissue experiment was provided to them. Each student also described how they carried out a classroom activity in this area. The students showed much innovation and were able to carry out these activities while still at home. This is very encouraging and will allow us to design other such online biotech courses. The total income for the year reported is \$22,000.00 USD and \$140,000.00 JMD.

VISITORS TO THE BIOTECHNOLOGY CENTRE

- On January 20, 2021, there was a virtual tour of the Biotechnology Centre for the BIOT3114 students. Students were introduced to the five laboratories at the centre. Graduate students assigned to each laboratories outlined both current and past research conducted in the labs.
- The Centre accepted five interns from July 5- August 13, 2021, for three days per week (Tuesday to Thursday). The students were trained in the areas of tissue culture,

molecular biology, and basic analytical chemistry. The students participating in this year's internship programme included both university and high school students, with two students from the Faculty of Science & Technology pursuing majors in microbiology and chemistry, two students attending from universities in Florida, USA, and one sixth form student from Kingston College.

The students expressed that they did not get a chance to sit in a physical lab due to the Covid-19 pandemic and as such consideration was given for them to gain this experience. All students were supervised by the Senior Laboratory Technologist along with two graduate students. They were assigned specific tasks that were completed each week concluding with a competency test. Among the list of tasks were: DNA extraction; tissue culture; phytochemical extraction and analysis; inventory; wine making; tree transplanting (seedling); and equipment management and usage. At the end of the internship the students were required to submit a laboratory report and a reflective essay on their experiences. They were also given a letter indicating that they have completed an internship with the centre. The Centre continues to engage students who wish to gain laboratory experience.

WORKSHOPS/EVENTS ATTENDED BY BIOTECH STAFF/STUDENTS:

- Prof Asemota attended the Biotechnology Panel Regional Meetings for Caribbean Examination Council from August 20-21, 2020.
- The Biotechnology Centre and Jamaica-Mexico Technical Cooperation Project collaborated with two Mexican Institutions - Centro de Investigacion en Alimentacion y Desarrollo (CIAD) & the Univasidad Panamericana (UP) - to stage a series of six webinars. Both staff and students of the centre and various members of UWI were participants. The webinars ran from June 5 to August 20, 2020 with each lasting 2 hours. The International Webinar series was funded under the Jamaica-Mexico Technical Cooperation by the AMERCID.
- Dr Sylvia Mitchell attended the following workshops: International Centre for Faith, Science and History. Collaborative Project with Association of Theological Schools (ATS), UTCWI and UWI entitled "Science, Faith and Healing in the History of Christianity and African Diasporic Religion", January 11-15, 2021; JINN webinar, Linking nutrition health and wellness to productivity, January 13, 2021; JIPO webinar, Infusing Intellectual Property into the Caurriculum, January 28, 2021; JIPO webinars, Understanding Patents, January 29, 2021; JIPO seminar: 'Introduction to Patents' by Jason Wongsam, JIPO and 'Missing the Mark: Intangible Assets' by Nigel Cooper, UTECH, February 9, 2021. Dr Mitchell also attended a virtual IUPAC Global Women's Breakfast entitled 'Connecting Caribbean Women in Science on February 9, 2021 and was a speaker at the Science in Action activities of the FST re COVID-19 August 12, 2020 Presentations. Dr Sylvia Mitchell attended the Racial Infrastructures Workshop held online from University of Endinburgh, March 30-31, 2021. Dr Mitchell attended the ASFS and was a part of the session 'Just Food? Contesting the Infrastructures of Race, Space and the Poverty of

Place' for ASFS 2021: Just Food: Because It is Never Just Food Virtual Conference held June 9-15, 2021.

- Mr. Carlton Barrows, Senior Laboratory Technologist at the Centre was one of the presenters in the recently held CAPE workshops put on by the FST Faculty in January 2021. He presented on tissue culture.

