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Production of pathogen-free pre-basic seed yam using the temporary immersion bioreactor system

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Statement of the Problem: Yam (*Dioscorea sp.*) is a high value crop grown mainly for cash in West Africa. However, farmers use uncertified seed yam due to lack of a formal seed system and scarcity of clean planting materials. There is therefore a build-up of diseases which reduces yield and profit. The project “Yam Improvement for Income and Food Security in West Africa (YIIFSWA)”, funded by the Bill & Melinda Gates Foundation, has developed a system for using the SETIS™ Temporary Immersion Bioreactor System (TIBs) for rapid production of virus and other pathogen-free pre-basic seed yam to enhance the establishment of a formal seed system where seed regulatory procedures are functional.

Methodology & Theoretical Orientation: Meristems are excised from virus-infected plantlets previously incubated at 37 °C for 21 days and regenerated on modified Murashige and Skoog medium. Regenerated plantlets are virus-tested using multiplex polymerase chain reaction and indexed for endophytic bacteria. Non-endophytic, virus-free plantlets of *Dioscorea alata* (TDa 98/01176) and *D. rotundata* (TDr 95/19177) were introduced into TIBs at 8 and 10 hours immersion frequencies (IFs) for 3 minutes. Number of nodes per plantlet was recorded after 8 weeks. Plantlets were hardened in 50:50 carbonized rice husk/sterilized top soil mix and either potted in 10 kg top soil and harvested after 6 months as pre-basic seed tuber or planted in aeroponics for basic seed production from pre-rooted vines. The weight of tubers from potted plants was recorded. Pre-basic tubers (PBTs) of TDr 95/19177 were cut into 20 g minisets and planted on the field.

Findings: Number of nodes did not differ between IFs, with a mean of 7.92 ± 0.38 from a single node, higher than 4.19 ± 1.63 nodes recorded in agar-solidified medium for equal duration. An average of 1.77 ± 1.1 tubers weighing 39.38 ± 29.72 g was obtained per potted plant. Only PBT harvested from TDr 95/19177, weighing 20 g each, were planted on the field and yielded an average of 1.5 basic seed tubers (BTs) whose weight ranged from 14 g to 2584 g per stand with a mean of 628.75 g.

Conclusions & Significance: Two 8-week TIBs cycles per production year will give $8 \times 8 \times 8 = 512$ plantlets from 8 initial plantlets significantly higher than the 1:5 ratios using traditional miniset technology. The low weight of PBT obtained could be due to cutting of vines from the plants for basic tuber production since average of 182 vines was cut from each plant for rooting. It will also be necessary to optimize substrate fertility regime at which the plants will be grown for higher tuber yields under controlled screen house environment.

Biography

Morufat Balogun is a visiting scientist, Tissue Culture Specialist at IITA Ibadan, Nigeria. She holds a Bachelor of Technology degree in Pure & Applied Biology from Ladoke Akintola University of Technology, Nigeria, MSc and PhD in Crop Protection and Environmental Biology (Genetics) from the University of Ibadan, Nigeria, where she is currently a Senior Lecturer. She was a Fellow of United Nations University/Institute for Natural Resources in Africa (2000); Visiting Research Student, IITA, (2000-2005) and Norman Borlaug International Science and Technology Fellow (2005). Her research activities include optimization of protocols for in vitro culture of plants for genetic resource improvement and enhancement of sustainable seed systems.

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