Clean Seed Yam for Pre-Basic Seed Production

Challenges

Unavailability of high quality seed yam of popular and released varieties is a major limitation for the production of pre-basic seed, a key input for basic and certified-seed production.

A number of tuber-borne pests (insects and nematodes) and diseases (fungi, bacteria, and viruses) have been the lead cause for this situation. Insects, nematodes, fungi, and bacteria, can be controlled by careful selection to eliminate infected tubers, followed by tuber treatment with a cocktail of fungicide and pesticide to eliminate any insects, nematodes, fungi, and bacteria. However, these methods are infective against viruses.

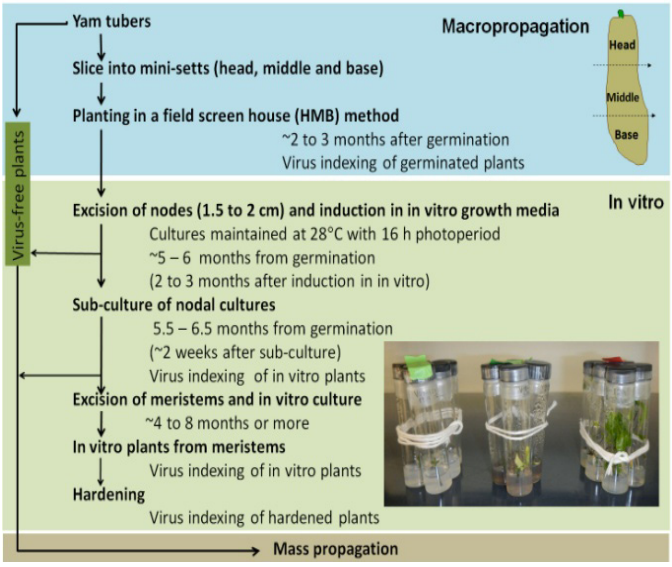
In West Africa, *Yam mosaic virus* (YMV) is the most frequently detected virus. *Yam mild mosaic virus* (YMMV) and *Cucumber mosaic virus* (CMV) are less frequent. In addition, viruses belong to the genus *Badnavirus*, termed yam badnavruses (YBVs), are also frequent in yam. The genome of YBVs is known to be integrated in the yam genome (endogenous pararetreo viruses).

Due to clonal propagation, viruses perpetuate between generations and eventually the entire clonal population becomes infected. Lack of virus-free yam has been the major hindrance to generating clean seed stocks necessary for pre-basic seed production.

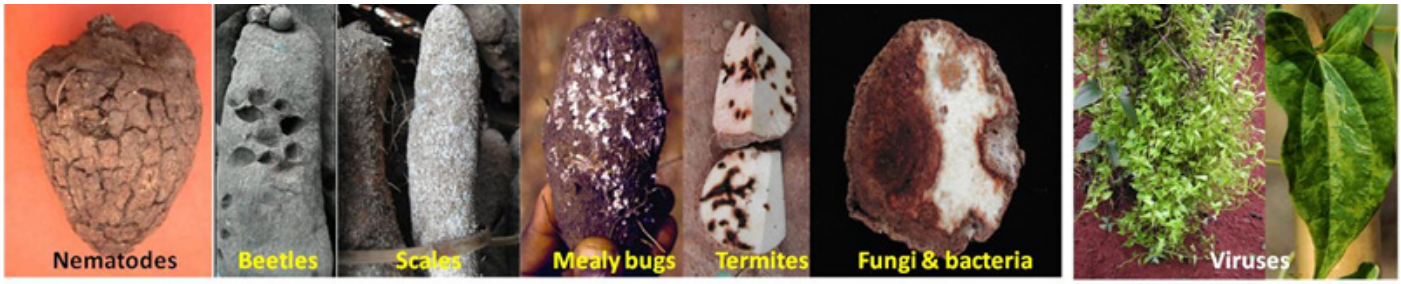
Objective

Obtaining virus-free stocks of popular and released varities is therefore a major goal of YIIFSWA.

Solution

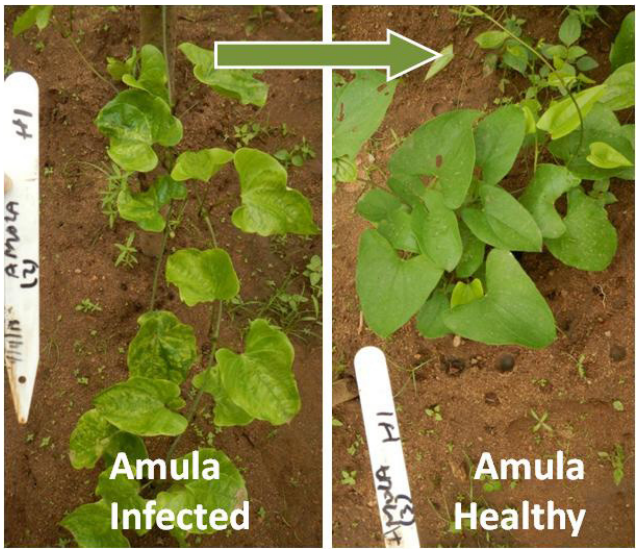


Scheme for the production of virus-free plants



Conventional sanitation techniques based on meristem and therapy procedures are not well established for the production of virus-free yam clones. Therefore, alternative techniques based on the knowledge on *virus reversion* in combination with macropropagation and tissue culture therapy (thermo and chemo) were exploited to generate virus-free plants.

Tubers of 13 popular landraces and 23 improved varieties of *D. rotundata* were subjected to these procedures. Plants were indexed at various stages of development for viruses using a multiplex RT-PCR assay to select virus-free plants.



*Virus-free (right) plant of cv. Amula (*D. rotundata*) generated in this study from infected stock (left).*

Further tests are required to ascertain freedom from episomal YBVs. During this work, recovery and reversion was also discovered in some landraces. Further work is in progress to understand these mechanisms.

Pre-nuclear seed yam stock

Virus-free (YMV, YMMV, and CMV) stocks of white yam (*D. rotundata*) clones Adaka, Alumaco, Alushi, Ame, Amula, Danachia, Gbangu, Keemi, Makakusa, Obiturugu, Ogini, Ogoja, TDr 89/02475, TDr 89/02665, TDr 96/00604, and TDr 89/02672 have been established.

Vine-propagation of virus-free stocks to increase numbers

Efforts are being continued to generate virus-free stocks of several other white yam clones. Simultaneously, virus-free seed stocks are being further propagated to increase their numbers by minisetts, vine propagation, aeroponics, and bioreactors. YIIFSWA's target is to provide 1000 minisetts of targeted varieties to national programs responsible for the production of pre-basic seed in Nigeria and Ghana for use as "nuclear" stock for the production of pre-basic seed and other seed classes as stated below.

Pre-nuclear stock (laboratory generated, disease tested stock) → Nuclear stock (researcher managed disease tested seed stock) → Pre-basic seed (seed stock for basic seed) →Basic seed (limited generation seed stock for certified seed production) → Certified seed (limited generation seed stock for ware yam production).

Conclusions

Clean seed yam stocks of popular varieties have been produced to invigorate seed yam production system in West Africa. Although, production of pre-nuclear seed stock from infected sources is a rate limiting step (11 to 24 months), the propagation rate of clean stocks can be accelerated using a combination of emerging technologies, including bioreactors and aeroponics.

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