

18339-Feasibility of apical cuttings as an additional technique for rapid seed potato multiplication in Ethiopia

Introduction

The foundation of an effective seed potato system is anchored in efficient production and supply of tissue culture (TC) plantlets, but which are costly and scarce especially for smallholder seed potato producers. Tissue culture plantlets form an interface between laboratory produced planting materials and open-field seed bulking. The problem of expensive and scarce TC plantlets can be addressed by adopting agile, robust and cheap methods to maximize their productivity through rooted apical cuttings (RACs). Rooted apical cuttings are produced using limited quantities of TC plantlets maintained as juvenile mother plants in a rustic growth environment. The mother plants are repeatedly harvested to provide clean, simple leaf plantlets that are rooted and transplanted either in greenhouses or open fields to produce first generation (G1) tubers. In Ethiopia as in many countries in Africa, potato TC plantlets are always in short supply and most available greenhouses are not fully utilized to produce minitubers which are a foundation of open-field seed bulking. Rooted apical cuttings would reduce the need for large quantities of TC plantlets for generating adequate minitubers that would subsequently be used to produce large quantities of quality seed in subsequent open-field seed bulking stages.

To address shortage of TC planting stock and trial apical cuttings, Solargrow - a private company in Ethiopia, obtained 57 TC plantlets of variety Gudene from Amhara Regional Agricultural Research Institute (ARARI) TC laboratory in July 2020. By November of the same year the company had repeatedly harvested apical cutting from this small mother stock up to nine times and obtained more than 5,000 cuttings for direct field transplanting while 200 that had been earlier transplanted in a small net tunnel was in tuber formation. By February 2021, the company had more than 20,000 minitubers to plant approximately 0.5 ha to initiate open field bulking, thus qualifying for seed potato certification having failed to get foundation seed long before but now have it and verify it on site.



Fig. 1: Mother plants (left) for generating apical cuttings (middle) and a simple Perspex greenhouse (right) for rooting the cuttings before transplanting at Solargrow PLC farm in Bishoftu, Ethiopia.

In November 2020, the RACs technology piloting site at Solargrow was used for training 10 scientists (4 women and 6 men) from Holetta Agricultural Research Center (ARC) and ARARI. After the training, the team from ARARI attached at Adet ARC started the production of rooted apical cuttings. Starting with 70 and 80 TC plantlets of Belete and Gudene varieties, respectively in mid-November 2020 the team had

generated 13,600 rooted cuttings by February 2021. By May 2021, Adet ARC had produced 30,000 minitubers from the first crop. Each mother plant produced about 90 cuttings which is a promising start from a one-day training session. The second set of RACs is still vegetative (Fig. 2) and is expected to offer promising results. RACs have reduced need for TC plantlets at Adet ARC by 50% and this will be further improved as the technology gets refined and adapted to local conditions.



Fig. 2: Potato minituber production at Adet ARC using tissue cultured plantlets (left) and rooted apical cutting transplants (right) in February 2021

In Addis Ababa, a small private TC laboratory, Wagnos-Biotech, has started producing RACs using few TC plantlets as foundation potato planting stock for its clients than supplying them with TC plantlets which are more expensive to produce and delicate to handle by less experienced users. The laboratory envisages to link with other enterprising potato farmers in Jeldu and Wenchi districts (>3000 m above sea level) in Oromia region that intend to start early generation seed (EGS) production with support from SNV. These farmers have depended on Holetta ARC for physical seed tubers as foundation seed that is never readily available and hope to solve this problem by producing their own minitubers using RACs. However, this private startup TC company will need both technical and logistical support to adapt, adopt and promote use of RACs technology in its area of operation.

Conclusion

Rooted apical cuttings technology is a novel innovation for enhance potato seed systems in SSA. It holds a promising potential due to its low-cost, simplicity, versatility and agility. It would need more attention for its promotion for scaling out as a rapid multiplication technique in the potato EGS production. As TC plantlets, RACs can be safely used in aeroponics and hydroponics that have previously depended mainly on expensive TC plantlets. Full adaptation and adoption of RACs, which needs a few TC plantlets to get started, will greatly reduce the need for large quantities of scarce and expensive potato TC plantlets than before. This technology will bring more actors in the EGS segment by increasing minituber production and supply of quality seed potato in Ethiopia or elsewhere in SSA where it would be adopted.