Net tunnels reduce degeneration of sweetpotato planting material in smallholder farm conditions in Tanzania

Background

Sweetpotato production in the Lake Zone, Tanzania, is hampered by high virus pressure. Sweet potato virus disease (SPVD) due to synergistic interaction between Sweetpotato feathery mottle virus (SPFMV) and Sweet potato chlorotic stunt virus (SPCSV) can cause up to 98% yield losses. Vegetative propagation in sweetpotato through vine cuttings leads to a build up of virus infection over generations. Multiplication of virus-free planting material sourced from virus-indexed tissue culture (TC) plantlets may contribute to improving farm-level seed health. However, farmers face a challenge in maintaining healthy material after disease-free plantlets have left the tissue culture laboratory. Low cost, insect-proof net tunnels can be used to protect the vines from attack by white flies and aphids which are the main vectors of sweetpotato viruses. However, the number of generations net tunnels can be relied on to produce healthy planting material under farmer-management is unknown. Thus, an experiment was conducted to compare sweetpotato planting material production under net tunnels and open field conditions. Variables analyzed included number of vines per plant and yield per plant in grams.

Photo 1: A farmer-multiplier counting the number of vines harvested from a net tunnel in Mwanza, Tanzania. Photo credit: K. Ogero

Methods

This research was conducted at two locations: Mwasonge (high virus pressure area) and Nyasenga (low virus pressure area) villages, Lake Zone, Tanzania. Two net tunnels and two open-field nursery beds were established in each area in farmer multipliers' fields. Then virus-indexed TC derived planting material of two sweetpotato varieties, Kabode and Polista, were planted at a spacing of 10cm by 20cm. Vine harvesting was done after every 60–80 days and vine yields determined.

Results

a) Effect of location on sweetpotato seed degeneration

The average number of vines harvested per plant declined of successive generations at Mwasonge but changed marginally at Nyasenga in both net tunnels and open-field nurseries (Fig. 1).

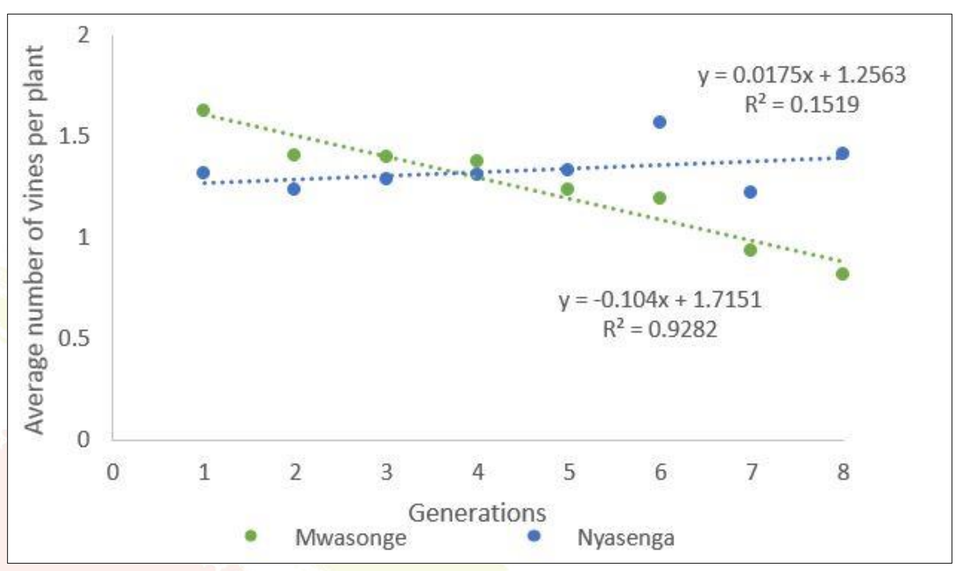

Fig. 1: Effect of location on degeneration of sweetpotato planting material in Mwanza, Tanzania.

b) Vine production in net tunnels and open fields in high sweetpotato virus pressure

There was considerable decline in vine yield in open-field nurseries at Mwasonge (Fig. 2). At the same location, vine yield tended to increase, albeit marginally with successive vine harvesting generations (Fig.2).

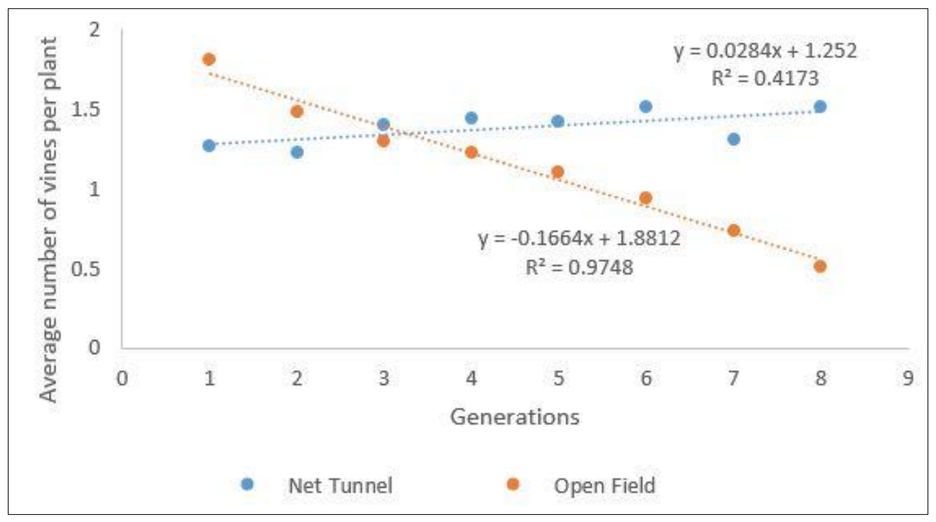

Fig. 2: Number of vines produced in net tunnels and open fields over eight generations and Mwasonge, Mwanza, Tanzania.

The weight of vines harvested per plant displayed a different pattern from one shown by the number of harvested vines. Average vine weight harvested per plant from both open fields and net tunnels at Mwasonge declined with successive generations (Fig. 3). However, the rate of decline still was higher in open field nurseries than in net tunnels (Fig. 3).

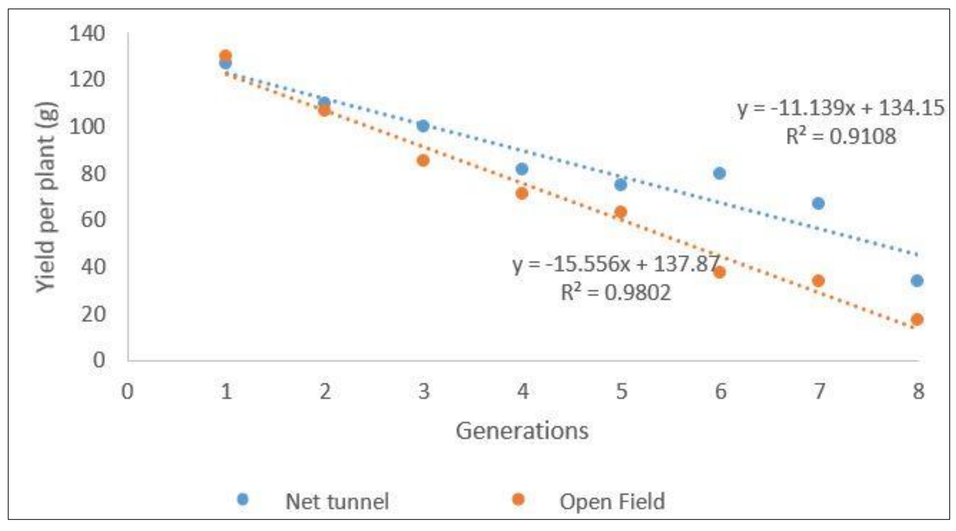

Fig. 3: Mean vine yield (g/plant) from sweetpotato in grown in net tunnels and open fields over eight generations in Mwasonge, Mwanza, Tanzania.

Discussion

- This research has demonstrated rapid decline in vine production in sweetpotato in open-field nurseries.
- It has shown the importance of net tunnels to reduce sweetpotato seed degeneration in areas with high sweetpotato virus infection pressure.
- The stability of vine production in net tunnels than open fields confirms the need to promote this technology particularly in high virus infection pressure areas.
- Besides preventing attack of virus vectors, net tunnels seem to provide a better microenvironment that promotes sweetpotato vine production than in open fields.
- However, there is need to better understand apparent degeneration of sweetpotato planting material grown in net tunnels considering loss in weight and vigor in absence of latent virus infection.

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