

Elimination of cassava mosaic geminiviruses from infected stem cuttings using salicylic acid, hydrogen peroxide and hot water treatment

Abstract

Cassava mosaic disease (CMD) is caused by whitefly-transmitted geminiviruses, which results in significant loss in cassava production in Africa. The disease is spread through the use of infected plant materials. Once infected, the plants remain infected throughout their life as the disease cannot be controlled by standard plant protection measures, and therefore the propagation of healthy vegetative plant material is important. Phytosanitation measures have been put in place to eliminate viruses from stem cuttings prior to planting these in the field. This study aimed at eliminating the geminiviruses (CMGs) from infected cassava stem cuttings by use of salicylic acid (SA), hydrogen peroxide (H₂O₂) and hot water treatments. CMD-infected stem cuttings of eight cassava varieties were collected from the fields and confirmed to be infected by polymerase chain reaction amplification using virus-specific primers targeting African cassava mosaic virus (ACMV) and East African cassava mosaic virus (EACMV). The CMD-infected stem cuttings were pretreated with SA (1.25 mM, 2.5 mM and 5 mM), H₂O₂ (0.5%, 1% and 1.5%) or hot water (50 °C, 55 °C and 60 °C) at different exposure times. The treated stem cuttings were established in the glasshouse for evaluation of subsequent plant growth from the stem nodes, and geminivirus detection. Treatment of cassava stem cuttings with 1% H₂O₂ for 12 hours and hot water treatment of CMD-infected cuttings at 50 °C for 5 minutes were the most effective in eliminating CMGs with an efficiency of 71.43% to 83.33% and 71.43% to 87.5%, respectively, depending on the cassava variety. Salicylic acid at a concentration of 5 mM for 6 hours eliminated the viruses in 57.14% to 71.43% of the infected cassava stem cuttings. All asymptomatic plants from the treatments that were established in the glass house tested negative for CMGs based on PCR

amplification. The methods tested in this study have the potential for producing virus-free planting materials for the cassava industry to meet their increasing demand. It could also contribute to the global exchange of virus-free germplasm for conservation and breeding programs.

Key words: Cassava mosaic virus disease, hydrogen peroxide, hot water thermotherapy, salicylic acid, stem cuttings, virus elimination.