

RESPONSE OF POTATO GENOTYPES TO VIRUS INFECTION AND  
EFFECTIVENESS OF POSITIVE SELECTION IN MANAGEMENT OF SEED BORNE  
POTATO VIRUSES

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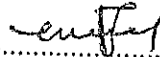
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## DECLARATION


This thesis is my original work and has not been presented for award of a degree in any other University.

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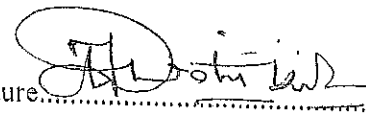
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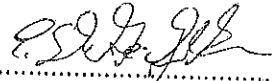
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## GENERAL ABSTRACT

Seed degeneration resulting from accumulation of seed borne viral pathogens in seed-  
is a major challenge limiting optimal yields in potato growing areas around the world  
especially in the tropics. A study was carried out at the Kabete Field Station, University of  
to determine response of potato genotypes to natural virus infection in the field and to  
effectiveness of positive selection on the health of seed potato tubers with regards to  
viruses. Sprouted seed potato tubers of twelve genotypes harvested from Field Generation  
Two (FG2) were planted and the crop was subjected to natural virus infection in the field for two  
seasons (Field Generation Three (FG3) and Field Generation Four (FG4)). These genotypes  
consist of five commercial varieties (Tigoni, Kenya Mpya, Shangi, Asante and Sherekea) and  
seven clones (398190.200, 300046.22, 393371.157, 393077.159, 392797.22, 398098.65 and  
397973.7) sourced from International Potato Center (CIP). Fungal diseases on the crop were  
controlled using appropriate fungicides with no control of insects to facilitate high vector  
movement. Ten weeks after planting of tubers from FG2, plants with no virus symptoms were  
tagged in each plot and regular checking to de-peg those with newly developed disease  
symptoms was done weekly until crop maturity. Symptomatic and asymptomatic plants were  
harvested separately; medium size (30-60 mm) and apparently healthy looking tubers were  
selected from each plot. These tubers from FG3 were stored in an insect proof diffused light  
store for two months to sprout. The sprouted tubers from positively selected plants were used as  
seed stocks for Positive Selection (PS) and tubers harvested from visually diseased plants were  
used as seed stock for Random Seed Selection (RSS) for FG4. At the end of FG4, 100 medium  
size and apparently healthy looking tubers were collected randomly from each genotype from  
both RSS and PS plots. These tubers were sprouted and tested for presence of six major potato

using DAS-ELISA. Data was collected on percent seed emergence, disease incidence, plant height, numbers of tubers and total yield for each genotype in both FG3 and FG4. The study revealed a varied percent emergence, virus incidence, plant heights, number of tubers per hill and yield (t/ha) among the twelve genotypes from FG3 to FG4. High percent emergence, low disease incidence, higher plant heights, number of tubers per hill and yields were recorded in FG3 compared to FG4. Four potato viruses; *Potato leaf roll virus* (PLRV), *Potato virus S* (PVS), *Potato virus M* (PVM) and *Potato Virus Y* (PVY) were detected infecting tested potato tubers from FG4 either as single infection or as multiple infections. *Potato Virus S* (PVS) was the most dominant virus (67%) followed by PVY (20%), PLRV (12%) and PVM (7%) while PVA and PVA were not detected in any of the tested tubers. Use of PS reduced increase in virus disease incidence by 3 to 10%, increased plant height by 1 to 14%, number of tubers by 9 to 41% and yield by 4 to 56% depending on genotypes. ELISA results revealed *Potato Virus S* (PVS) as the most predominant virus followed by *Potato Virus Y* (PVY) and *Potato Leaf Roll Virus* (PLRV) in both RSS and PS plots, while *Potato Virus M* (PVM) was only detected in samples from RSS plots. Four clones; 397073.7, 398190.200, 393371.157 and 392797.22 were found tolerant to natural virus infections compared to five commercial varieties and other three clones in FG4 based on the yields obtained. Based on the results positive selection and use of resistant and or tolerant varieties can be used to manage seed borne potato viruses to some extent by farmers who produce their own seeds.

**Key words:** Potato, Seed degeneration, Seed-borne potato viruses, Genotype, tolerance