

HEALTH STATUS OF POTATO SEED AND HOST RESISTANCE AGAINST LATE BLIGHT DISEASE UNDER  
GREENHOUSE AND FIELD CONDITIONS IN KENYA

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**DECLARATION**

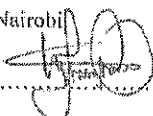
This thesis is my original work and has not been presented for award of a degree in any other university.

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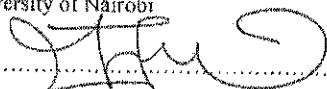
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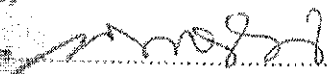
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## ABSTRACT

Importation of potato seed into Kenya has become common in light of the persistent shortage of clean seed potato in the country. The performance of imported potato varieties under Kenyan conditions and disease reaction especially to late blight caused by *Phytophthora infestans* is unknown. To fill this knowledge gap, a study was conducted on potato health status of local and imported germplasm, levels of resistance to late blight and yields under Kenyan conditions. A survey was carried out in Meru, Nyeri, Kiambu, Nakuru and Nyandarua counties to assess potato production systems and disease prevalence. The level of disease infection for imported and local potato seeds was determined. Evaluation of resistance to late blight and performance for twenty four varieties (local and imported) was conducted under greenhouse and field conditions at the University Nairobi, KALRO's Genetic Resources Research Institute at Muguga and the Njabi-ini Sub-Centre of KALRO in Nyandarua County. A randomized complete block Design with three replicates of each variety was used. Six local varieties and eighteen imported cultivars were planted. Arka variety was planted as a spreader row for late blight inoculum. The findings showed that area allocated to potato production in the surveyed counties varied with Nakuru having the highest average acreage of 0.7ha. Most of the farmers interviewed did not use certified seeds and therefore, incidences of bacterial wilt and potato leaf roll diseases were high. Nyeri County was leading with 90% bacterial wilt prevalence while Nyandarua had 91% potato leaf roll virus prevalence. Counties planting uncertified seeds had high incidence of bacterial wilt and viruses but, disease incidence was low in counties that planted certified seed indicting correlation between seed source and disease prevalence. The local (6) and imported (18) varieties showed variation in late blight susceptibility and resistance in both greenhouse and field studies. Under greenhouse conditions, all imported varieties had high late blight intensity with area under

disease progress curve (AUDPC) value ranging between 500 and 2250. Local varieties had AUDPC values between 20 and 46 with Sherekea having the lowest AUDPC value of 20 followed by Shangi, Asante, Nyayo, Kenya Mpya and Tigoni with the highest value of 46. Susceptibility and resistance to the late blight varied greatly also under field conditions. Most of the imported varieties were susceptible to late blight and the disease was more severe at Njabi-ini than at Muguga and Kabete sites. Carolus and Arnova (imported) recorded low (1.0) AUDPC values. In contrast, Kenya Mpya and Sherekea (local) showed significantly higher ( $P < 0.001$ ) resistance to the disease compared to all other varieties. The yields differed significantly ( $P < 0.001$ ) among varieties following challenge of late blight disease at both greenhouse and field conditions. Cultivar Arnova had a mean yield of between 15.9 and 18.6 t/ha the highest being at University of Nairobi trial site with low rainfall and temperatures of between 20<sup>0</sup>C and 22<sup>0</sup>C. Carolus had a mean yield of between 12.2 and 19.5 t/ha and the highest was from Njabi-ini with high rainfall and low temperature of 18<sup>0</sup>C and below. Carolus and Arnova had yields of over 36.6 t/ha at all the sites but, most of the other imported varieties had yields below average yields of 7.7 t/ha. Sherekea and Kenya Mpya yielded between 25.7 and 31.7 t/ha respectively at Njabi-ini. Mean of Sherekea and Arnova had no significant difference indicating that there was no influence of site interaction.

Potato seed from farmers 'production system are contaminated with disease and bacterial wilt is widely spread in Kenya. KALRO certified seed potato are free from *R. solanacearum* and viruses and they are produced in disease free sites. All the imported potato varieties are susceptible to late blight under greenhouse conditions and Carolus and Arnova are resistance to the disease under field conditions in Kenya. Carolus and Arnova varieties can be compared with Sherekea and Kenya Mpya in terms of resistance to late blight.