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EVALUATION OF ENGINEERED CASSAVA GENOTYPES AND GRONOMIC  
TECHNOLOGIES FOR RESISTANCE AGAINST CASSAVA MOSAIC DISEASE IN  
WESTERN KENYA

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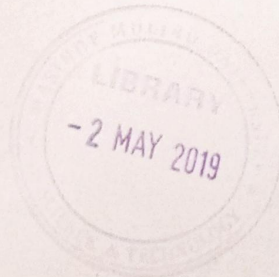
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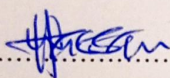
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## CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance of Masinde Muliro University of Science and Technology a thesis entitled: "**Evaluation of engineered cassava genotypes and agronomic technologies for resistance against cassava mosaic disease in western Kenya**"

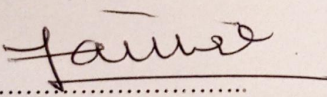
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## DEDICATION

To my late dad Mr. Wycliffe Wekesa Murende, my mamma Mrs Agnes Wekesa and other family members who have always stood by me all through my academic journey!

## **ACKNOWLEDGEMENT**

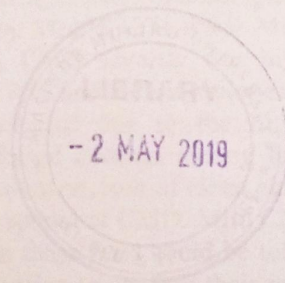
I wish to thank my supervisors, Prof. Hassan K. Were and Dr. Vitalis K. Ogema for their mentorship and advice throughout this work.

Special thanks go to the entire biological sciences department staff for their support, encouragement and technical assistance without which this work would not have been possible.

I sincerely thank Mr Obiero H. for assisting me to get funding from IITA .

The project was funded by IITA, reagents were provided by DSMZ - Germany and ETH-Zurich provided engineered cassava genotypes.

I am indebted to Mr Bernard Mukoye, Bertha Kakai and Isabela Ememwa for their technical and moral support.



## ABSTRACT

Cassava is an important staple and a food security crop for many Kenyans. Cassava production is constrained by lack of clean planting material, pests, diseases, poor agronomic practices and low soil fertility. Cassava mosaic disease (CMD) is the most important and devastating diseases of cassava in Africa. Most varieties grown are susceptible and badly degenerated. The general objective of the study was to screen engineered cassava genotypes for resistance against CMD and to evaluate the effects of agronomic technologies on CMD prevalence in western Kenya. A diagnostic survey for CMD was conducted in major cassava growing Counties of western Kenya. Symptomatic cassava leaf samples were collected and analyzed serologically for presence of CMD viruses. A questionnaire was used to establish the social economic and CMD status. Stem cuttings from CMD infected variety 'fumbachai' were collected and used to plant infectors in the Confined field trial (CFT). The genotypes were hardened in a biosafety level II screenhouse for 2 months. Eleven transformed cassava genotypes were planted in the CFT in a randomized complete block design (RCBD) with three replicates. Data on CMD incidence and severity (scale of 1 to 5), whitefly vector population (*Bemisia tabaci*) and yields were collected. The effect of agronomic technologies on CMD prevalence and whitefly vector population were investigated using three cassava varieties: Migyera (CMD-resistant), MM96/4271 (tolerant) and Merry kaluore (highly susceptible) in a RCBD. Data on incidence, severity, whitefly vector population and yields were collected. Collected data were analyzed using models of Statistical Analysis Software (SAS) version 9.1. Analysis of Variance (ANOVA) was carried out and means separated using LSD (SAS Institute, Inc., 1995 at  $P \leq 0.05$ ). Paired t-test was used to test whether yields differed between cassava varieties. The statistical significance of relations between cassava yields and management of fertility score were assessed by two tailed Pearson correlations. CMD incidences for all counties surveyed ranged from 2% to 70% with an overall, mean severity of 3. Based on antisera that were available for serological analysis, ACMV and EACMV were detected in most samples. 71.6% of varieties planted were CMD susceptible. At the CFT, CMD symptoms were observed on all genotypes. The highest severity score of 4 was recorded on lines 30 (control) while lines 145 and 129 had the lowest score of 2 at 49th week after planting (WAP). Results showed that line 129 had the highest yield (9t /ha) followed by line 145(7t /ha) and line 30 had the lowest (4t /ha). In agronomic technologies' trials CMD severity was highest in Merry kaluore followed by MM96/4271 while Migyera showed no symptom. In terms of fertilizer application, CMD severity was highest in non-fertilized trial while plants treated with NPK 17:17:17 and KCL developed no symptom. In surveyed counties, CMD was widely distributed due to the high number of susceptible varieties planted and planting of infected cuttings among farmers. At the CFT, lines 145 and 129 showed tolerance. In conclusion, lack of clean planting material and dominance of susceptible varieties fueled the spread of CMD. Mild CMD symptoms on Lines 145 and 129 across blocks indicated that these lines could be tolerant to CMD and should be grown for another season for observation to confirm their tolerance status. NPK 17:17:17 and KCL had negative effect on CMD and migyera was not affected by CMD and had the highest yield; this variety is tolerant and should be recommended for wide use by farmers. Training on disease transmission, existence of improved varieties and appropriate agronomic technologies is key to controlling the disease.

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