GENETIC ANALYSIS OF MAIZE GENOTYPES FOR RESISTANCE TO MAIZE LETHAL NECROSIS DISEASE

By

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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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ABSTRACT

Maize is a key staple food cultivated in various agro-ecological zones and also in different farming systems. The Maize Lethal Necrosis (MLN) disease has emerged as a great challenge to maize production affecting the food security situation for the majority of households in the region. The objectives of this study were: - (i) To identify maize cultivars with high levels of resistance to MLN and (ii) To determine the combining ability for MLN resistance. Forty seven (47) maize genotypes and 1 local check were screened under artificial inoculations in the greenhouse for resistance to MLN. The experiment was set up under a completely randomized design (CRD) in three replications. MLN disease severity data was collected based on the International Maize and Wheat Improvement Centre (CIMMYT) SCAle. Further characterization of these maize cultivars was done using agronomic data namely plant and ear height, days to 50% anthesis and 50% silking. The data collected was subjected to analysis of variance (ANOVA) using the PROC ANOVA procedure of Genstat program 15th Edition 2015. There was significant variation among the genotypes with reference to their responses to MLN. Five cultivars namely; MLN1, MLN16, MLN30, MLR-2 and MLR-11 showed superior levels of resistance to MLN. In addition 10 inbred lines, 25 F1, and 3 checks were used to determine combining ability for MLN resistance. For this study, five inbred lines used as males were crossed to five female lines to generate 25 F1s in a North Carolina Design II mating design. The 10 inbred lines, 25 F1 and 3 checks were evaluated for resistance to MLN under artificial inoculation at the field station of the University of Nairobi. A completely randomized design with three replications was used. Data were collected on disease severity, disease incidence, days to tasseling, and days to silking, plant height and number of ears per plant. The variance for general combining ability (GCA) was greater than the variance for SCA indicating that additive gene action was more important than the non-additive gene action in controlling the disease parameters. The results also showed that the inbred lines MUG-50, MLR-8 and

MLR-1 had the best GCA for MLN disease parameters. The hybrids MUG50/MLR-7, MUG-50/MLR-8, MLR-12/MLR-8, MLR-14/MLR-1 and MUG-50/MLR-4 had negative SCA effect for the disease parameters, suggesting that these hybrids could be exploited in a MLN disease resistance breeding programme. Strong correlations were recorded among the disease parameters namely % disease incidence, FS and AUDPC. Also there was high narrow sense heritability for the disease parameters indicating that the additive gene action was more important than dominance gene action. The study revealed the presence of potential sources of MLN resistance among the farmers' preferred varieties or landraces. Therefore, these potential parents and the hybrids could be utilized in breeding programs to develop varieties with high levels of resistance to Maize Lethal Necrosis disease.