

IMPROVING SORGHUM CULTIVARS FOR RESISTANCE TO SPOTTED STEM BORER

(*Chilo partellus*, SWINHOE) AND GRAIN YIELD

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DECLARATION

I declare that this thesis is my original work and has not been presented for any award of degree in any other University.

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Date.....5/2/2018.....

Supervisors' Approval

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ABSTRACT

The objectives of this study were to (a) determine inheritance of resistance to *Chilo partellus* and other agronomic traits in sorghum and (b) Estimate the genetic variations, heritability and expected genetic advance for agronomic traits in selected sorghum varieties. The study was carried out in two different agro-ecologies of Kenya; Kenyan Agricultural and Livestock Research Organization (KALRO) / International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), Kiboko and the University of Nairobi, College of Agriculture and Veterinary Sciences (CAVS), Kabete Field Station during the 2015 short rains season. North Carolina II mating design was used where three male parents were crossed with each of the ten females to generate 30 F₂ progenies. The 30 F₂ families together with the 13 parents and 6 checks were sown in a 7 x 7 alpha-lattice design with two replications in each location. Ten plants from the 2 middle rows were tagged and artificially infested with five first instar larvae of *C. partellus* per plant using a camel hair brush. The remaining two side-rows served as non-infested control and were used to estimate the genetic variations, heritability and associations among stem borer resistance and agronomic traits in sorghum parents. Analysis of variance was computed for the traits studied using Genstat computer programme 15th edition. The Results revealed variation for resistant parameters among the parents with; IS 1044, ICSV 700 and IS 2055 emerging as the best parents with less damage across locations. General and specific combining ability were calculated for F₂ progenies with respect to sorghum stem borer resistance and agronomic traits using PROC GLM procedures in SAS computer package, version 9.3. GCA and SCA effects were significant ($P \leq 0.05$) for deadheart, number of exit holes, stem tunnelling damages, days to 50% flowering, number of fertile tillers and grain yield suggesting that additive and non-additive gene effects controlled resistance to *C. partellus*. Female lines KARI Mtama-1, Gadam el-Hamam, Macia, Tegemeo, Hurgurtay and males IS 1044 and ICSV 700 exhibited high negative GCA effects for the damage traits indicating their good general combining abilities for resistance to *C. partellus*. Female lines Sila, IESV 23011DL, IESV 23008 DL, Gadam, Tegemeo and ICSV 700 demonstrated desirable GCA effects for grain yield. The mean sum of squares due to genotypes revealed significant differences ($P \leq 0.05$) for all the 8 traits studied in both locations. High to moderate estimates of genotypic coefficient of variance (GCV) and phenotypic coefficient of variance (PCV) were recorded for plant height, days to 50% flowering, number of tillers, panicle length, width and weight and grain yield which presents considerable variability and offers scope

for genetic improvement through selection. Number of productive tillers and 100 seed mass had high GCV estimates with high heritability.