# INHERITANCE OF RESISTANCE TO THE STALK-EYED FLY (*Diopsis longicornis*) IN RICE IN UGANDA

**BY**

**CHARLES GANTEH WEELAR**

**B.Sc. AGRIC (UL)**

**REG.NO. 2013/HD02/2106X**

**A THESIS SUBMITTED TO THE DIRECTORATE OF RESEARCH AND GRADUATE TRAINING IN PARTIAL FULFILLMENT OF THE**

**REQUIREMENTS FOR THE AWARD OF THE DEGREE OF**

**MASTER OF SCIENCE IN PLANT BREEDING AND**

**SEED SYSTEMS OF MAKERERE UNIVERSITY**

**JANUARY, 2017**

## ABSTRACT

Rice is an important staple food for more than half of the world's population. Globally, rice production is limited by abiotic and biotic factors. Of the insect pests attacking rice, the stalk-eyed fly is the most abundant. Major Rice growing districts in Uganda are affected, and varieties grown by farmers are susceptible. The objective of this study was to contribute towards improved understanding of the response of rice genotypes to infestation and damage from stalk-eyed flies for development of resistant varieties. Fifty genotypes from the Africa Rice Centre, IRRI, South Korea and the National Crops Resources Research Institute (NaCRRI) in Uganda were screened under cage and field conditions at NaCRRI. Trials were laid out in an alpha lattice design, with 3 replications. Natural infestation (*D. longicornis or D. apicalis*) was used in the field while cage trials utilized artificial infestation with *D. longicornis*. Data on deadhearts were collected from seedling to tillering stages, at 7, 14, 21 and 28 days. Analyses of variance were performed using restricted maximum likelihood. Infestation levels for 31 (62%) rice genotypes were the same under both field and cage conditions, 4 (8%) genotypes showed higher susceptibility in the cage than in the field and 15 (30%) were more resistant in the cage than in the field. Genotypes NERICA4, TXD306, NM7-22-11-B-P-1-1 and K85 along with six advanced materials were identified as resistant. Eight parental lines were selected on the basis of their response to the stalk-eyed fly high yield and early maturity. These genotypes included: NERICA4, TXD306, K85, NM7-22-11-B-P-1-1, NERICA1, NERICA6, NAMCHE2 and PAKISTAN. Of these, four genotypes [NERICA4, TXD306, and NM7-22-11-B-P-1-1 and K85] which exhibited less infestation (between 4.44% to 6.03% deadhearts) were selected. Four susceptible genotypes [NERICA1 and NERICA6, PAKISTAN and NAMCHE2] that supported the highest infestation levels (between 34.38% to 38.25% deadhearts) were used for crossing using the North Carolina II mating design. Studies on combining abilities were conducted on 16 $F_1$ hybrids along with the eight parents to establish the mode of inheritance of resistance to *the D. longicornis*. (NSCGD) was moderate (0.30) and (BSCGD) was high (0.87) for percentage of deadhearts. Both GCA and SCA effects were significant for percentage of deadhearts. However, value of Baker's ratio was less than 0.5 (0.37) for deadhearts, indicating that both additive and non-additive gene effects were involved in resistance to the stalk-eyed fly. The parental lines NERICA4 (GCA -3.40) and K85 (-3.35) were found to be good general combiners for increasing resistance. The crosses Pakistan x TXD306 and NERICA1 x NM7-22-11-B-P-1-1 are the promising lines for advancement.