ABSTRACT

Rice blast caused by *Magnaporthegrisea* is one of the most serious diseases of rice, causing yield losses of 50 – 100% in susceptible varieties worldwide. Durable host resistance has been hard to achieve given large pathogen diversity and capacity of pathogen to mutate. It has been suggested that silicon enhances durable resistance in partially resistant genotypes. A study was conducted to evaluate rice genotypes for their reaction to *M. grisea* under silicon amendments, detect genotypes with high silicon uptake and to understand the inheritance and combining ability of resistance to rice blast. Sixty-seven genotypes were evaluated for their reaction to *Magnaporthegrisea* under silicon amendments in a screen house. Seeds were planted in soil amended with silica gel at the rate of 0, 29, and 58 g per 180 g of soil. Genotypes were inoculated with a virulent strain of *Magnaporthegrisea* (Namulonge isolate) 21 days after planting. Data were taken on lesion size induced by blast one week after inoculation and recorded on a scale of 0 to 9. Data were also taken on leaf blast severity and used to compute area under disease progress curve (AUDPC). The sixty-seven genotypes were also screened for the capacity to absorb silicon. Twenty-day old seedlings were placed into 50 ml plastic bottles containing one-half concentration of Kimura B solution, adjusted with 0, 5, 10 and 15 mM silicon respectively. Each bottle was wrapped with an opaque plastic membrane for 12 hours after Si application. 0.9 ml of silicon uptake solution was drawn from each bottle and silicon concentration determined. Seven genotypes were selected,two genotypes having very high silicon uptake ability, two having moderate silicon ability, two having low silicon uptake ability and the last one having very low silicon ability. These genotypes were crossed in a full-dialel design. The F1 plants were selfed and F2 plants were tested for silicon uptake ability. The genetic traits of the segregating F2 populations and their parents were analyzed in order to determine the heritability. Of the sixty-seven genotypes,24 were highly resistant (HR), twenty - two were resistant (R), fourteen were moderately resistance (MR), four were moderately susceptible (MS) and three were susceptible (S). Silicon concentration significantly ($P < .001$) impacted on the reaction of genotypes to blast. The interaction of genotypes with silicon was also highly significant ($P < .001$). AUDPC was significantly influenced by silicon concentration ($P = 0.008$). Final silicon uptake ability readings were highly significant among genotypes. The leaf blast reaction of the genotypes under silicon amendment was found to be directly proportional to their silicon uptake ability which in turn increased with the increasing amount of silicon solution absorbed by the plant, from 5, through 10 to 15 Mm/L. Significant correlations of Si uptake abilities to blast disease reactions and area under disease progresses

were found in this study. A high narrow sense coefficient of genetic determination suggested that there was a considerable heritability of resistance for rice blast. The analysis of gene action revealed that additive gene effects contributed more than the non-additive effects for the inheritance of silicon uptake ability as indicated by high Baker's ratio (above 0.8 and 0.3) for both silicon uptake and water loss respectively. Genotypes, GIZA182 and E20 were found to have the most desirable GCA among the genotypes used in the study. The genotypes that consistently showed resistance to rice blast disease would be recommended for production in areas with the disease after stability studies in different agroecologies.