ABSTRACT

The obligate root hemi-parasite, *Striga hermonthica* (Del.) Benth., native to sub-Saharan Africa causes serious economic constraint to cereal production. There has been limited study to understand the genetics of *Striga* tolerance or resistance in maize in Kenya and the information on mechanisms of resistance to *Striga* in maize in very limited. The use of maize (*Zea mays* L.) genotypes that support reduced *Striga hermonthica* emergence can form an important basis for developing *Striga* resistant cultivars. The objective of this study was to contribute to the knowledge of gene action controlling *Striga* resistance and to improved yield in maize. 28 maize inbred lines sourced from IITA and Maseno University and 9 Maseno university experimental hybrids were evaluated in western Kenya in 2011 and 2012 growing seasons. A generation means analysis was performed using a resistant and a highly susceptible maize inbred line selected from inbred line screening. Highly significant differences ($P < 0.001$) were detected among the inbred lines and hybrids for grain yield, emerged *Striga* counts and *Striga* damage rating. A highly significant and negative correlation coefficient was observed between emerged *Striga* and yield as well as between *Striga* damage ratings and yield. Inbred lines MSMP1/P2, TZSTR154, TZSTR133, TZSTR139, TZSTR 166 and a resistant check 9450 were identified as the most resistant lines as they consistently performed well in *Striga*-infested environments. These inbred lines could be used for breeding *Striga* resistant maize varieties. Maseno experimental hybrids, EH14 and EH12 recorded much better grain yields and stability compared to commercial varieties under *Striga* infestation and in *Striga* free fields. National performance trials conducted by KEPHIS confirmed their high yield and yield stability and were released for commercialization. Maseno hybrids had parental lines previously selected from maize landraces from western Kenya, thus suggesting that they are potential sources of *Striga* weed tolerance genes. Generation means analysis results showed significant differences among generations for emerged *Striga*, *Striga* damage rating and maize growth including Plant and Ear height. Most of the additive, dominance, additive x additive, additive x dominance and dominance x dominance effects were significant indicating the importance of the additive, dominance and epistatic modes of gene actions in controlling emerged *Striga*, *Striga* damage rating, plant and ear height. Most components conferring *Striga* tolerance behaved in a qualitative manner. Dominance effects had higher mean values over additive effects. Significant dominant genetic effects (d) for *Striga* emergence and *Striga* damage rating suggested preponderance of non-additive genetic effects in the inheritance of *Striga* tolerance. The results also reveal the involvement of duplicate epistasis where the dominance estimate and dominance x dominance interaction had opposite signs. The presence of duplicate type of gene interaction confirms the importance of dominance gene effects. The identified maize inbred lines with good levels of resistance and different resistance mechanisms can facilitate pyramiding of several resistant alleles to obtain more durable and stable polygenic resistance to *Striga hermonthica* in maize.