Abstract

The maize weevil, *Sitophilus zeamais* Motschulsky causes considerable damage to maize grain during storage in the tropics. The objectives of this study were to determine through two experiments the genetic basis of resistance to *S. zeamais* in African maize germplasm of open-pollinated cultivars, lines and hybrids. The first experiment tested for resistance of 20 maize cultivars (10 white and 10 yellow-grained) developed for lowland Africa grown in three relatively weevil-free savanna locations. The second experiment tested two sets of diallel crosses without reciprocals of 66 F_1 progeny from 12 inbred lines and 78 F_1 crosses from 13 inbred lines of subtropical and temperate origins. Variables studied for the first experiment included husk cover, grain texture, number of egg plugs, number of weevils produced, and number of grains damaged by the weevil. Results showed highly significant differences among the 20 maize cultivars tested. Significant cultivar×location interactions for egg plug and weevil production indicate the importance of environmental effects and complexity in weevil resistance. Of the 20 cultivars tested, Ikenne 83-TZSR-W-1 (open pollinated) and 8329-15 (hybrid) were the most promising for restricted weevil production and minimal grain damage. The results of genetic studies in the second experiment with 144 crosses indicated the presence of genetic differences in maize lines to weevil attack. General combining ability (GCA) and specific combining ability mean squares were highly significant, suggesting that the maize weevil resistance was controlled by both additive and non-additive gene actions and the inheritance was quantitative and polygenic. Among the lines used in the crosses, the two most weevil resistant lines with high GCA effects were TZi 30 (International Institute of Tropical Agriculture) and FLA2BT 106 (Florida).