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Combining ability among fifteen early cycle maize populations in Brazil

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ABSTRACT

Early maturity maize (*Zea mays* L.) populations are used in short growing season areas, and their use is gradually increasing in tropical areas. The objective of this study was to determine the genetic potential of 15 early maturity maize populations in a diallel crossing system. The 15 parents, 105 diallel crosses among parents, and selfed generation of parents were evaluated in a triple lattice design at 13 locations in Brazil. The combined analyses of variance for grain yield, time to tassel, and plant height indicated highly significant ($P < 0.01$) differences for entries, parents, heterosis, parent heterosis, specific heterosis and for the first-order interactions with environments. Average heterosis was highly significant for grain yield, significant ($P < 0.05$) for time to tassel, and not significant for plant height. Mean yield ranged from 3187 to 5213 kg/ha for populations, and ranged from 3041 to 6017 kg/ha for the population crosses. Population Pool 17 had the largest inbreeding depression effects, whereas population CMS 52 had the smallest inbreeding depression effects. The highest specific cross for grain yield was for Across 8528 x Pool 18. None of the population crosses was superior to the hybrid checks for the three traits. No association was found between endosperm type and heterosis. The results suggest that either the populations themselves or the synthetic composites of selected populations can be used for breeding purposes.

INTRODUCTION

Late maturing varieties of maize (*Zea mays* L.) are often grown to take advantage of the growing season because late maturity varieties have a greater yield potential (Giesbrecht, 1960). Maize production in some tropical growing areas with later maturing varieties is restricted because of the uncertainty of grain maturity at harvest due to either lack or excess of rainfall before maturity is attained. These conditions are more pronounced for tropical maize areas than for temperate maize areas and, as a result of other environment changes, a greater reduction in yield is observed in tropical maize areas. Use of earlier maturity maize varieties is gradually increasing in tropical regions to reduce the effects of variations in rainfall.

Limited information is available on performance of earlier maturity maize populations in tropical maize areas . The earlier maturity populations usually used in the tropics either include germplasm introduced from temperate areas or are segregating populations from crosses between tropical and temperate germplasm. These populations generally tend to be low yielding and have poor agronomic characteristics.

Early maturity maize varieties are widely used in short growing season areas of temperate regions where later cultivars cannot complete the grain-filling period due to insufficient heat units (Landi *et al.*, 1986 and Troyer, 1990). In a study of maize tolerance to heat and drought effects, Troyer (1983) reported that early flowering maize yielded more than late flowering maize in hot, dry seasons due to sub-soil moisture availability during the moisture-critical, stress-susceptible flower-

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