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Exploitation of promising maize (*Zea mays* L.) hybrids for nitrogen (N) stress environment by studying the *sca*, heterosis and nature of gene action at different N fertilizer doses

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SUMMARY

Twenty one hybrids obtained from seven lines x three testers crossing fashion were analysed for specific combining ability effects (*sca*), heterosis and nature of gene action at two nitrogen (N) levels. The hybrids UMI 1008 x UMI12 (L_1 x T_1), UMI 4 x UMI 564 (L_3 x T_2), UMI 1007 x UMI 564 (L_4 x T_2), UMI 54 x UMI 826 (L_5 x T_3) and UMI 919 x UMI 12 (L_7 x T_1) recorded desirable *per se* performance, specific combining ability effects (*sca)* and heterosis for yield and most of the yield components in N_1 (100 kg/ha) level as well as N_2 (200 kg/ha) level. These five hybrids hold promise for exploitation under nitrogen stress. The hybrids UMI 1008 x UMI 12, UMI 1007 x UMI 564, UMI 54 x UMI 826 and UM1 919 x UM1 12 had desirable *per se* performance, *sca* effects and heterosis for days to anthesis, days to silking and grain yield at both N_1 and N_2 levels. Hence, these hybrids also need due consideration for promotion under nitrogen stress rainfed condition. Predominance of non-additive gene action revealed by the yield and its component traits indicated the possibility of exploiting promising hybrids identified for heterosis breeding.

Key words : Hybrids, Specific combining ability effects, Nitrogen stress, Rainfed, Heterosis, Gene action.

Nitrogen is usually the most important soil nutrient for crop production. Much research has focused on nitrogen requirements of maize and high rates of nitrogen fertilizer are used for breeding and producing maize in developed countries. Less effort has been made to utilize the genetic variation for nitrogen use efficiency that exists in maize germplasm. Improving nitrogen use efficiency of maize would particularly benefit many developing countries, where yields are low and fertilizer supplies are inadequate. Hay *et al*. (1953) showed genotypic differences in translocation and partitioning of nitrogen in two maize hybrids during grain development. Heterogeneity for nitrogen use efficiency in maize inbreds and hybrids (Beauchamp *et al*., 1976; Chevalier and Schrader, 1977) was evident in maize half sib progenies and synthetic varieties.

In maize, hybrids are more responsive to fertilizers (Rao and House, 1967). Hybrids are grown as rainfed and under-nourished crop in more than 50 per cent of the area. Low nitrogen stress is a common feature in rainfed area. Under such circumstances, isolation of low nitrogen stress tolerant inbreds and exploiting them in heterosis breeding may give dividends. Line x tester model was used to analyse the specific combining ability (*sca*) variances and effects. The term specific combining ability is used to designate those cases in which certain combinations do relatively better or worse than would be expected on the basis of the average performance of the lines involved. Progress in maize improvement through hybrid breeding was propelled by a better understanding and appropriate exploitation of heterosis, the gain in vigour on crossing two inbreds.

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MATERIALS AND METHODS

The present investigation was carried out at Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore. Seven inbreds *viz*., UMI 1008 (L_1), UMI 1001(L_2), UMI 4(L_3), UMI 1007(L_4), UMI 54 (L_5), UMI 176 (L_6) and UMI 919 (L_7) were chosen as lines. Three inbreds *viz*., UMI 12 (T_1), UMI 564 (T_2) and UMI 826 (T_3) were chosen as testers. In earlier studies, it was found that UMI 1008, UMI 4, UMI 54 and UMI 919 were stable across different N levels and UMI 1001, UMI 1007 and UMI 176 were N responsive inbreds for grain yield. All the three testers were stable across different N levels. Twenty one hybrids obtained from seven lines x three testers crossing fashion and their 10 parents were evaluated along with the standard check COH(M) 4 in the following environments: soil type was red loam, possessing low soil available N (182 kg / ha), medium soil