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Combining ability and heterosis of Korean sorghum varieties

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Abstract

Grain Sorghum varieties grown in Korea have low productivity and are constrained by the fact that farmers' choice of improved varieties is limited. Hybrid cultivars have been demonstrated to be more productive and food security than pure line varieties. However, There's no available hybrid cultivars and never planted before in Korea. This study was, therefore, conducted to determine combining ability of Korean landrace varieties and cultivar, the level of heterosis of experimental hybrids depending on environments. Two cytoplasmic male-sterile lines were crossed with six male-fertile lines in accordance with North Carolina II mating scheme to generate 12 experimental hybrids. The hybrids were evaluated in replicated row-column alpha designs at two sites in Texas and South Korea under on-season production conditions. For each trait, general combining ability (GCA) and specific combining ability (SCA) effects were estimated using the line-tester method of analysis. Results indicated significant differences among genotypes for both grain yield potential and secondary traits. Hybrids were predominant for grain yield, and displayed up to 127% heterosis of A03017 × Sodamchal in Korea. Positive GCA for yield was observed for Donganme, Hwanggeumchal and Jungmo4002 in Korea. Among them Jungmo4002 and Donganme had highly positive for yield (227.90 and 84.90 kg ha-1), while it showed negative GCA for yield in College station (-40.90, -189.60 kg ha-1). ATx630 × Sodamchal had the greatest SCA for yield (468.10 kg/ha) in College station but at South Korea its SCA effect was -302.40 kg/ha. A similar trend was observed, followed by A03017 × Donganme (SCA effect = 215 kg ha-1 at College station vs. -44.20 kg ha-1 at South Korea). At South Korea the greatest positive SCA effect for grain was observed in ATx630 × Jungmo4002 as 322.20 kg/ha. Both GCA and SCA effects significantly interacted with site effects demonstrating the need for region adaptation of potential cultivars and test for developing Korea suitable cultivar.

Keywords: *Sorghum bicolor* L., Hybrid, Heterosis, Combining ability

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