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Identification of Combining Ability Patterns for Pearl Millet Hybrid Breeding in West Africa

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Abstract

Pearl millet (*Pennisetum glaucum* (L) R. Br.) is being cultivated in India and Sub-Sahara Africa as a staple crop. Especially in West Africa (WA) it is important for food security for smallholder farmers in rural areas. In contrast to India, breeding of hybrid varieties is still limited in WA. An extensive diversity was shown to be present in pearl millet in WA, its centre of origin. However, one major cause is the nonexistence of natural heterotic patterns as indicated by several diversity studies. The development of heterotic groups based on combining ability patterns will help to overcome this issue and make sustainable hybrid development feasible. The objectives of this study were to evaluate combining ability, combining ability patterns and heterosis effects of WA pearl millet based on population hybrids, and to derive conclusions for developing future hybrid breeding programs. Therefore, 17 populations were intercrossed in a diallel mating design. Those population hybrids were tested together with their parents in nine environments over two years in Niger and Senegal. In addition, 21 microsatellite markers were used to evaluate genetic distances between the 17 parental populations. For obtaining a more comprehensive picture, four sets of population hybrids were tested together with their parents in 2008 at one location in Burkina Faso, Mali, Nigeria and Senegal and at three locations in Niger. Each set of hybrids was generated from a 5×5 factorial mating design. Results of the diallel mating design showed an average panmictic better-parent heterosis (PBPH) of 30 % for grain yield, ranging from -18 to 82 %. A principal coordinate analsyis (PCoA) based on genotyping results separated parental populations clearly by country of origin. However, no relationship between genetic distance among parental populations and the PBPH was observed. Nevertheless, we identified varieties with high combining ability for founding divergent pools in Niger and Senegal. While preparing the abstract, data analysis for the factorial trials was still underway. Results obtained so far indicate great potential for pearl millet hybrid breeding in WA. Our study represents a first step to identify combining ability patterns and initial heterotic groups for pearl millet hybrid breeding in WA.

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