

## Heterosis of agronomic traits in novel orchardgrass germplasm

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The use of population hybrids is a potential method to overcome stagnation of breeding gains in orchardgrass (*Dactylis glomerata* L.). Our orchardgrass breeding program has as one of its objectives the development of population hybrids and the characterization of these hybrids for agronomic value. Population hybrids for this study were from the diallel cross of IADG102, IADG103, IADG104, IADG105, UTDG101, UTDG102, Latar, Paiute, and Potomac. We then evaluated the population hybrids under competitive space-plant conditions at an irrigated Logan, UT field site from 2008 to 2010. Data collected included dry matter yield, crude protein, in vitro true digestibility, neutral detergent fiber, and water-soluble carbohydrates from three harvests in each year. Data analysis included phenotypic mean and heterotic values for each population hybrid based on the individual reciprocals and combined across reciprocals from each cross.

There were some reciprocal effects for the forage quality traits, and population IADG105 showed consistent reciprocal effects for in vitro true digestibility, neutral detergent fiber, and water-soluble carbohydrates. Despite these reciprocal effects we combined the analyses across both reciprocals from each cross because this would be the method of an applied population hybrid improvement program. There was no variation for the entry x year interaction, thus we combined results across the three years of the study. Differences ( $P < 0.0002$ ) among the hybrids occurred for each trait at each harvest period. Additionally, there were population hybrids that possessed equivalent or better phenotypic values for each trait than the included commercial cultivars. The mean phenotypic value of the population hybrids was higher for crude protein, in vitro true digestibility, and water-soluble carbohydrates, and lower for neutral detergent fiber than the mean of the commercial cultivars for at least one harvest period.

Of the 36 PHs, seven did not express heterosis for any phenotype and harvest combination. Thus, heterosis, including high parent heterosis was common among the population hybrids. There were also relationships between the genetic distances of the population hybrids and the corresponding phenotypes. Thus, within this source of orchardgrass germplasm there is potential for the development of viable population hybrids.