

## **Screening oat germplasm for better adaptation to cold stress in the southern Great Plains**

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Oat is one of the most important forage crops in the southern Great Plains. However, oat is more sensitive to cold stress compared with other small grains. In this study, diverse oat germplasm was evaluated for winter survival across multiple years and locations in the southern Great Plains. Field screening started with over 1,800 diverse genotypes in the 2012 - 2013 season, followed by four seasons of replicated trials from 2013 to 2017 with selections of good winter survivors in each cycle. Winter survival was scored in a 1 - 9 scale. Data were analyzed for each year and location separately. AMMI analysis was carried out on combined data of 35 genotypes that were commonly grown in each year and location. Highly significant ( $p < 0.001$ ) variations were observed among genotypes, environments, and genotype by environment interaction (GEI). The first three interaction principal components (IPCs) were highly significant ( $p < 0.001$ ), explaining 96% of GEI. Broad sense heritability ranged from 46% to 93% while heritability for all environments combined was relatively low (24.6%). At the end of cold tolerance screening, mean winter survival was improved by more than 36% compared with mean of the base population. Winter survival improvement in oat will remain a difficult task due to high GEI and low heritability. The identified genotypes will be further evaluated for forage yield and quality as crossing parents to transfer resistance genes to other elite lines.