

# Patterns of G x E in Perennial Forage Grasses

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**Background:** Genotype × environment interaction (GEI) slows genetic gains and complicates selection decisions in plant breeding programs. Forage breeding program seed sales often encompass large geographic regions to which the cultivars may not be adapted. An understanding of the extent of GEI in perennial, cool-season forage grasses will facilitate improved selection decisions and end-use in areas with harsh winters.

**Methods:** We evaluated the forage yield of nine meadow brome (*Bromus biebersteinii* Roemer & J. A. Schultes), nine orchardgrass (*Dactylis glomerata* L.), seven tall fescue (*Lolium arundinaceum* [Schreb.] Darbysh.), and ten timothy (*Phleum pratense* L.) cultivars or breeding populations at seven high latitude and/or elevation locations in Canada and the USA from 2019 to 2021.

**Results:** For each of the species, we found significant differences among the germplasms for forage yield across environments and found significant levels of GEI. Using site regression analysis and GGE biplot visualizations, we then characterized the extent of the interactions in each species. Except for tall fescue, there was little evidence for the broad adaptation of germplasms across locations.

**Conclusions:** This research adds further evidence to the limitations of perennial, forage breeding programs to develop widely adapted cultivars and the need to maintain regional breeding efforts.