

Insights on Forage Variety Testing from a Multi-Decade, Multi-Species Dataset

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Public forage variety trials are the only objective source of information for forage producers when purchasing seed. However, there are unresolved questions about how to interpret trial results from different years or regions. We have carried out a retrospective analysis of hundreds of alfalfa, red clover, tall fescue, and orchardgrass trials from across the greater northeastern U.S. In this study, individual trial results have limited value within a broader set of trials. Instead, producers should trust aggregated performance data from multiple trials. For example, alfalfa yield standard errors are 4.1%, 3.3%, and 2.9% (mean difference from trial yield) for varieties evaluated in two, three, and four trials, respectively. Location-specific (genotype-by-environment or local adaptation) effects were unexpectedly small, indicating that information can be shared among states. In alfalfa, there was clear progress for biomass yield (+0.63% per year between 1988-2017; std. err.=0.029%; $p=9.0 \times 10^{-78}$). In red clover, biomass yield improvement has been slower (0.12% per year; std. err.=0.04%; $p=0.007$). Curiously, there is no evidence of orchardgrass yield improvement (0.03% per year, std. err.=0.04%, $p=0.41$), but there has been a movement towards later flowering time (1.5 days per decade; $p=9.2 \times 10^{-6}$) and this appears to artificially reduce trial yield. Tall fescue also has limited evidence of yield progress (<0.01% per year; std. err.=0.06%; $p=0.34$), but breeding has been focused on eliminating or replacing toxic endophytes.