Predictive Accuracy of Alfalfa Fall Dormancy Assessed in Field Density Sward Plots

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Fall dormancy in alfalfa is a crucial trait that growers consider when choosing a cultivar suited to their growing region; therefore, breeders assess this trait during cultivar development. The Fall Dormancy Classification (FDC) of a cultivar is an integer value between 1 and 11 which reflects the relative amount of regrowth after a mid-autumn cutting. New cultivars are classified using the NAAIC standard test procedure last updated in 1998. The standard test procedure involves growing cultivars with unknown FDC with a set of standard check cultivars with a known, assigned FDC. Plots are planted as replicated spaced plant trials, with 25 plants per rep. Three to four weeks following a mid-autumn cutting, individual plant heights are measured, and the standard checks are used to fit a regression of plant height on FDC for that location in that year. This regression is then used to predict the Fall Dormancy Rating (FDR) of new cultivars, which is then rounded to the appropriate FDC. This testing procedure is the generally accepted method for evaluating fall dormancy in alfalfa, and is used to assess the fall dormancy of new commercial alfalfa cultivars.

A drawback of this test is the need to plant a spaced plant trial that provides little other useful data. Most cultivars being evaluated for fall dormancy are advanced enough in life cycle that the breeder is growing multi-location yield trials. Previous research conducted at New Mexico State suggested that alfalfa grown in field density sward plots had very similar levels of fall dormancy expression to the generally accepted spaced plant test, however this evaluation was only conducted at one location. We hypothesized that regrowth in commercial density yield trial plots reflected fall dormancy classification as well as regrowth on spaced plants as measured in the standard test. Our objective was to test this hypothesis across five locations – Ithaca, NY; Arlington, WI; Tulelake, CA; Davis, CA; and El Centro, CA – representing major growing regions in the United States and diversity in both latitude and longitude. Each trial consisted of 20 cultivars including the 11 standard checks. At each location, two field trials were established, one in which the cultivars were planted and evaluated per the standard testing procedure, and one in which the cultivars were planted at field density in sward plots. Management practices were as similar as possible, and fall harvest, as well as evaluation of the two trials were performed on the same day. Regressing the FDR of standard checks evaluated in sward plots on the FDR rating from the standard, spaced plant trial resulted in an R2 of 0.99; similarly, for non-check cultivars, an R2 = 0.97 was observed. This suggests that fall dormancy evaluated in sward plots is as good a predictor of fall dormancy evaluated in spaced planting.

However, our data suggest that the square root transformation that is generally applied to the spaced plant data may not be necessary when evaluating results from sward plots. If the evaluation of sward plots to assign FDC were accepted as an industry standard, it would likely need a slightly modified set of guidelines for data evaluation. Evaluation at more locations and years is needed to fully establish a testing procedure for a potential standard test based on sward plot evaluation. Measuring dormancy in small-scale field density plot trials would save space and time, thereby maximizing efficiency within alfalfa breeding programs.