Fall Dormancy Evaluation and Optimization

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For the past 15 years, a set of twelve standard check varieties have been used to classify fall dormancy of alfalfa new varieties. At the University of California, Davis, a linear relationship between fall dormancy class and natural plant height (square root of plant height in increments of 5 centimeters after a determined cutback date) has been described using regression equations over multiple locations. This relationship has been characterized in the current standard test for Fall Dormancy (www.naaic.org/stdtests/Dormancy2.html). Long term data (over 16 years) for the twelve standard checks were reviewed for 7 locations: Davis, CA, El Centro, CA, Tulelake, CA, Nampa, ID, Connell, WA, Arlington, WI, and Johnston, IA.

Regression equations were determined both for single years at multiple locations and for single locations over multiple years to evaluate the consistency of the linear relationship between the standard dormancy checks for increasing levels of years and locations. Large correlation coefficients indicate a consistently linear relationship for increasing levels of years and locations. This relationship suggests that the use of a regression equation to determine fall dormancy class of a new variety may be more robust than the prediction provided by the use of two standard checks that flank the new variety's anticipated dormancy class.

For single years over multiple locations, the performance of the twelve dormancy checks was studied using an analysis of variance. The standard error for the fall dormancy scores decreases with each additional location up to a total of twelve years. This indicates that predictions of fall dormancy class for new varieties increases in precision for increasing locations of evaluation. Similar effects on the fall dormancy class predictions were found for increasing years of evaluation. The decrease in the standard error for additional number of years and locations to be equal, indicating the addition of either years and/or locations will have an equal effect of improving the precision of prediction from the dormancy regression equation. Optimum allocation of years and locations to can be based on the desired precision of the Fall Dormancy Class of the individual standard check varieties. This is accomplished by reviewing varying levels of years and locations along with the effect on the standard error of the standard check varieties, based on the calculated variance components from the long term fall dormancy data from this study.

A long term regression equation for the twelve check varieties was established using the natural plant height scores over twelve years of data from the University of California, Davis. The effects of adding data in successive years were studied by comparing the slope and intercepts of the dormancy regression equations for each year by taking data from years that were sampled pseudo-randomly. After six years of data, the intercept and slope of the long term regression equations stay within ±0.5 units of the twelve-year regression equation. While the relationship between the twelve standard dormancy checks should continue to be monitored, it is clear that the checks maintain a linear relationship over years of evaluation. When determining fall dormancy class based on regression, current year and long term regressions would be compared before assigning dormancy class. The advantage of this approach is that it will account for abnormal performance of checks without compromising the accuracy of the assigned dormancy class.