Field Assessment of Alfalfa Populations Selected for Low Dormancy Within Winter-Hardy Cultivars

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Alfalfa is a forage species of choice due to its high nutritive value and low reliance on fertilizers. However, in northern Canada, only highly winter-hardy and dormant alfalfa cultivars can be grown due to harsh winter conditions. The onset of dormancy and the acclimation process limits late summer regrowth, which is especially important to cattle and dairy producers desiring to increase their total annual forage yield and the economic sustainability of their farms. The selection for lower fall dormancy within alfalfa is feasible due to the large genetic diversity for that trait, however selection for low dormancy under field conditions is time consuming.

To address this issue, we developed an indoor selection method to decrease alfalfa dormancy (D), which consists of submitting plants to a photoperiod of 12 h after a cut, identifying the less dormant plants (i.e. the taller plants) after a two weeks regrowth period and crossing these selected plants to produce a less dormant population. One cycle of selection was completed within two dormant and winter-hardy cultivars, Peace (P) and Yellowhead (Y) to produce the potentially less dormant populations P-D1 and Y-D1. To validate our new indoor selection method we compared the reduced-dormancy populations with their respective initial cultivars for fall dormancy, yield, and winter survival at four sites across Canada (AB, SK, and two sites in Québec). These sites represented different rates of fall photoperiod decline, various light spectra and intensity, and contrasting winter conditions.

During the establishment and the first production years, plants of the reduced dormancy populations were generally taller in the fall than their respective cultivar, which resulted in a one unit increase of their fall dormancy class. This higher fall height was not associated to an increase in total yield in P-D1, whereas, in Yellowhead an average increase in biomass yield of 40% across all sites was observed. Winter survival was similar between the reduced-dormancy populations and their respective cultivar. These results show that the indoor selection method effectively reduces fall dormancy without affecting winter survival and that indirect responses for yield were dependant on the genetic background used as selection material.