

WASHINGTON TURFGRASS SEED COMMISSION

PROGRESS REPORT FORMAT FOR 2020 PROJECTS

Project No.: WSU ACCOUNT #13C-3019-6780 and #17A-3019-9832

Title: Characterization of vernalization genes and flowering in Kentucky Bluegrass

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Reporting Period: 7/16/20 – present

Accomplishments: VRN-gene related- The KBG genome has been fully sequenced by our collaborator Dr. Shaun Bushman by using the sequencing method PacBio. An apomictic off-type, which underwent meiosis but not fertilization, from variety ‘Hampton’ was selected to sequence. Based on the comparison of vernalization genes from other monocots, 10 copies of *VRN1*, 3 copies of *VRN2*, 2 or 3 copies of *VRN3* genes in KBG. Based on this comparison, the results for sequence analysis in different KBG varieties is described below. **PGR related-** A field trial was performed on a fall 2019 planted ‘Limousine’ KBG in spring, 2020. The field is located in the Columbia Basin of central Washington with a soil type of sandy loam. The PGR RyzUp was applied at four rates: 0, 0.5, 1, and 2 oz product per acre on March 17th and/or April 9th in a randomized complete block design with 4 replications, using a bicycle wheel CO₂ boom sprayer. The results are described below. A KBG elite cultivar ‘Midnight’ was planted at our new farm on August 13th, 2020. Planting was performed by using a Hege cone seed planter. The first and second fall sprays were applied on October 2nd and October 15th, respectively using the same 4 rates of RyzUp as in the ‘Limousine’ study above. At the time of the first spray, plants had 4 – 5 tillers on average and plant height was 5 cm. Ten days after the first spray, treated plants visually had significantly elongated shoots (leaves) and leaf color changed from dark green to lighter green. One week after the second spray, plants under different rates were selected randomly and dug up to check the development of shoots and rhizomes. KBG without exogenous RyzUp had shorter plant height with more tillers whereas the double 2 oz per acre RyzUp sprayed plants had longer leaves with fewer tillers. The spring ‘Midnight’ study will begin in March/April 2021. In addition, two fall RyzUp studies, identical to the ‘Midnight’ study above, were initiated in the Columbia Basin on KBG fields of ‘Avalanche’ and ‘Diva’ planted in mid-August 2020. For all fall and spring studies seed head development, seed production and biomass will be measured next year.

Results: Based on sequence analysis, the 10 copies of *VRN1* were divided into three subgroups. Genomic DNA of four cultivars (‘Jumpstart’, ‘Midnight’, ‘Son of Kenblue’, ‘Alaska’) was used for analysis. Our results suggest that subgroup three is missing in the cultivar ‘Midnight’ which has the highest vernalization requirement in our analyzed cultivars. Since *VRN1* is considered an accelerator for floral transition, the lack of subgroup three in ‘Midnight’ might be related to its high requirement of vernalization. The 2020 PGR application on ‘Limousine’ resulted in an increase in plant biomass and decrease in seed yield with increased rates. We are now doing a fall application study in the Columbia Basin as well as at our new farm (see above) to determine if fall applied RyzUp will increase seed yield. As described above, we will also repeat our spring application analysis to generate sufficient data for publication since it is important to share these results, even if undesirable, with seed growers and the scientific community.

Publications: None at this time.