Winter Dormancy and Spring Growth in Winter Wheat

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Abstract

Cold tolerance is of paramount importance for the survival of winter wheat, as failure to withstand low winter temperatures necessitates costly replanting during the spring season. Initial observations indicate that higher cold tolerance is associated with increased winter dormancy, resulting in slower spring growth and potentially lower grain yields. Understanding how quickly the plants grow during this critical period can provide insights into their overall health and yield potential. This study investigates the interaction between cold tolerance, winter dormancy, rate of spring growth, and final grain yield to develop cultivars with high cold tolerance and early spring growth. The plant material consists of 480 diverse soft white winter wheat varieties collected from Pacific Northwest (PNW) breeding programs. The population was cultivated for three years (2016, 2017, and 2018) at two PNW locations (Pullman, WA and Pendelton, OR). RGB and NIR images were captured weekly to generate growth curves and calculate NDVI values for each genotype. Additional data on tiller count, heading date, plant height, grain volume weight, and grain yield were collected. Modeling NDVI regression curves enabled us to quantitatively define plant growth attributes including spring growth rate, time of peak greenness, dry-down rate, time of total dry-down, time from heading to total dry-down. These data, correlated with final grain yield, will enable a better understanding of winter wheat growth patterns. This information is crucial for breeding regionally specialized winter wheat varieties that can maximize spring growth and yield potential while minimizing the risk of cold damage.

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