Developing a Maturity Rating Index for Cool-Season Forage Grasses

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Stage of maturity is the single most important factor influencing the nutritional quality of coolseason forage grasses. Therefore, knowledge of expected heading dates of forage grasses is critical when planning management of compatible mixtures of grasses and legumes. There is no industry-standard rating system for cool-season grass maturity even though grass breeders actively select for genotypes that are earlier or later than the species norm and maturity is a major factor in marketing of forage grass varieties. A standardized maturity rating index would greatly enhance both grass breeding efforts and producer purchase decisions. In 2016 the Forage Grass Maturity Working Group was formed as a committee of the American Forage & Grassland Council in response to the challenge. Our objective is to develop a standardized grass maturity rating system that can be used to characterize relative heading dates in cool-season forage grass varieties. This will be based on standard reference varieties identified through our research, which can then be used to inform breeding decisions and assign relative maturity ratings to new grass releases as an optional part of the release process. Since 2017, our group has established spaced-plant grass nurseries in Oregon (3 sites), Kentucky (1 site), Iowa (1 site) and Michigan (2 sites), each containing up to 70 grass varieties selected for a range of expected heading dates. All grass seed was sent to University of Kentucky for distribution to cooperating researchers from this single central source and variety identities were blinded until the end of the study to avoid rating bias. Each nursery was planted in a randomized complete block design (n=3) with split plot arrangement. Grass species was the main plot: orchardgrass (*Dactylis glomerata*), timothy (*Phleum pratense*), tall fescue (*Festuca arundinacea*), bromegrass (*Bromus* spp.), Kentucky bluegrass (*Poa pratensis*), perennial ryegrass (*Lolium perenne*), annual ryegrass (*Lolium multifolium*), and hybrid ryegrass (*Lolium* hybrid). Variety was the subplot. Each variety subplot contained 10 to 25 individual plants depending on site size constraints. Seedling plugs were started in greenhouses and planted out into nurseries approximately 6-8 weeks after seeding on 61-cm centers in rows 91 cm apart. Nurseries were managed for optimal fertility and pest control according to local conditions. Heading dates were evaluated for two (4 sites) or three (1 site) years after the establishment year. Two sites have only finished the first measurement year, and one site will begin measurements in 2022. During spring growth, plants were visually examined by trained raters three times per week and heading date was recorded when a plant had heads completely emerged from the flag leaf on at least three tillers. To date, we have evaluated heading dates for 11 site-years. Over 11 site-years of data collected to date, calendar dates of heading varied across site-years, and time from first to last heading date across species within a site-year was variable, ranging from 29 to 65 days. Nevertheless, out of 55 possible site-year pair comparisons, 50 pairs gave positive Spearman rank correlations (P<0.05) for heading date among all varieties and all non-correlated (P>0.05) pairs involved a single site under drought conditions. These initial results support our hypothesis that we will be able to identify reference varieties that display consistent heading dates relative to each other across a range of typical environments. After two more growing seasons, final conclusions will be drawn and reference varieties selected to move the project into implementation phase.