

Ryegrass Purity: New Technologies to Solve Old Problems

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The ryegrasses are important worldwide for forage and turf use. Those of highest economic value are taxonomically classified as subspecies of perennial ryegrass (*Lolium perenne* L.). Perennial ryegrass used for turf in the U.S. is classified as *L. perenne* L. ssp. *perenne*. There are two short-lived subspecies, often called annuals, classified as *L. perenne* L. ssp. *multiflorum* (Lam.) Husnot: Italian ryegrass (*L. perenne* L. ssp. *multiflorum* var. *italicum*) and the Westerwolds (*L. perenne* L. ssp. *multiflorum* var. *westerwoldicum*). These close taxonomic relationships make it difficult to separate these grasses in seed labs. In areas such as Oregon where intensive seed production occurs, the “annual-types” often contaminate the more economically important “perennial-types” through seed mixture, pollen flow, or both. Seedling root fluorescence (SRF) has been used to distinguish “annual-types” from perennial ryegrass since the 1930s, but at times the test has been unreliable and overestimates the amount of “annual-type” contamination. The test is based on a loose genetic linkage among the gene(s) responsible for SRF and those responsible for other “annual-like” characteristics. We examined genes involved in flowering control and vernalization responses more closely associated with growth type, and found two genes were effective in predicting growth type. DNA samples were extracted from leaf tissue harvested from SRF-tested seedlings and were analyzed by real-time PCR using Allelic Discrimination (AD) to differentiate between alleles (alternate forms of a gene). Twenty cultivars were examined to validate the AD protocol. Following the SRF test, all seedlings were transplanted to a growth chamber and grown under continuous, high intensity light for a grow-out test (GOT) that lasted for 84 days. Flowering rate approached a plateau at about 70 days for those plants that had SRF as seedlings. These results supported the proposal that the GOT should be longer than the suggested 42 days if it is to be effective. Further, the rate of SRF was highest in the plants that headed earliest and was lower in later heading plants. The minimum SRF level was 30% over all the plants tested, demonstrating that the SRF test lacks accuracy in predicting contamination. In contrast, the AD test based on two flowering genes, *Vrn-1* and *ID1* detected growth type differences equivalent to a 70day GOT, with less than 1% error rate. Data presented here demonstrates that the AD test is an effective and rapid method to predict growth type contamination in perennial ryegrass.