Perennial Ryegrass Breeding and Seed Production

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Introduction

It is well known that perennial ryegrass is used in maintaining turf on sports fields, overseeding golf courses and is often a significant portion of lawn seed mixes. Less known is that perennial ryegrass turfgrass seed production is a major part of the agricultural economy in northern Minnesota. Acreage encompasses over 40,000 acres in Roseau and Lake of the Woods Counties. Contrary to the name, perennial ryegrass is grown as a winter annual crop in northern Minnesota. Severe winter conditions are typically the antecedent to severe yield reductions going from the first to second year of seed production making multi-year seed production unprofitable. Consequently this system does not achieve the environmental benefits intrinsic to perennial agriculture. Using current winter hardy perennial ryegrass germplasm, several alternative management strategies were tested for prospects of maintaining multi-year seed yield.

Materials and Methods

Research trials spanned three trial years with each year testing treatments at two locations. Locations were never in the same field. Field plots were established on-farm in Roseau County using existing stands of perennial ryegrass that had already underwent one year of seed production. The experimental design was a randomized block design with four reps in a split plot treatment arrangement. Residue management was the whole plot factor and PGR was the split plot factor. The experiment consisted of four replications and two blocks each consisting of two replications. Residue management treatments were applied two weeks post harvesting the first year stand. Three residue management treatments employed were mechanical clip and removal, chemical and physical burn and a control where all residue and plant material was left. PGR treatments were applied 14 days post burning to allow new vegetation to grow. Treatments consisted of ethephon, IBA and Cytokinin, mefluidide, Prohexadione calcium, and a control. Data were collected on seed yield and spring green up. Seed yield was determined by harvesting 1 m by 1 m swath of ryegrass per experiential unit. Spring green up was measured using a FieldScout® CM 1000 Chlorophyll Meter, which estimates the quantity of chlorophyll in leaves.

Results

Thus far, two trial years of data have been collected and analyzed. In both years there was a significant effect of residue management on seed yield and winter survival. There was no effect of PGR on either response variable.

Seed Yield – The top yielding treatments in both trial years produced economically viable seed yields (>500 lbs./acre). Both residue management treatments consistently increased seed yield. In trial year one burning and mechanically removing residue achieved statistically similar yields, but both greater than the control. In the second trial year all treatments were significantly different with the top producing treatment being burn and control being the worst.

Spring Green-up – In both trial years mechanically removing residue achieved the fastest spring green-up. Burning typically resulted in the slowest spring green-up. There was a significant decrease in spring green-up in trial year two because of harsh winter conditions.

Discussion

Burning residue post first year harvest and using winter hardy germplasm consistently produced economically viable seed yields. Heavy winter damage was observed with this system in trial year two, however yields remained profitable. Volunteer seedling emergence was observed both years. This is a problem for maintaining seed purity and optimal plant density. Future research will include gathering a third year of data and testing methods of controlling volunteer seedlings post harvest.