

Kentucky Bluegrass Germplasm Evaluation for Turfgrass Quality and Grass Seed Production without Open-field Burning

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INTRODUCTION

A ban on open-field burning of Kentucky bluegrass (*Poa pratensis* L.) post-harvest residue has been implemented in Washington and restrictions are in place in Idaho and Oregon. Without post-harvest burning seed yield decreases over time (Lamb and Murray, 1999), which has forced growers to use shorter rotations to maintain yield. In a multi-year study we have identified germplasm that has improved seed production without burning (Johnson et al., 2003), reselected within that germplasm (Johnson et al., 2010), and established turfgrass and seed production trials (Dodson, 2008) that have been evaluated over several years (Johnston et al., 2012).

OBJECTIVE

Identify high yielding turf-type Kentucky bluegrass germplasm that can be grown for several years without open-field burning of post-harvest residue.

MATERIALS & METHODS

This long-term study initially evaluated 228 bluegrasses from the USDA-ARS Kentucky bluegrass collection at Pullman, WA (Fig. 1; Johnston et al., 1997). The selected eight PI accessions (plus two checks, 'Kenblue' and 'Midnight') represent germplasm that has good seed yield without field burning while maintaining turfgrass quality (Fig. 2 and 3). Yield parameters were evaluated over a 2-yr period and individual plants were selected within each accession, or check, with the highest seed weight, highest seed panicle⁻¹, highest panicles area⁻¹, and highest seed yield (Fig. 4). These 40 selections plus base population seed from the USDA-ARS collection were planted in turf plots in 2006 (Fig. 5) and non-irrigated and irrigated seed production plots in 2007 at Pullman, WA (Fig. 6). There were 150 plots in each trial (50 entries x 3 replications). Additional turf trials were established at Auburn, AL and Puyallup, WA in 2009 and 2010, respectively. Turfgrass trials were evaluated according to National Turfgrass Evaluation Program protocol. Seed production plots were harvested (2008-2011) threshed, cleaned, and seed yield was determined. The 40 selections were culled over several years and the 4-yr means of seed yield vs. turfgrass quality for the remaining selections are presented (Fig. 7 and 8). Seed increase plots were established in 2011 and harvested 2012 and 2013.



Fig. 1 USDA-ARS Kentucky bluegrass collection evaluation.



Fig. 2 Seed plot treatments: burning; baling; full residue.



Fig. 3 Turfgrass evaluation: turf quality; texture; color; etc.



Fig. 4 Space-plant nursery for individual plant characterization.



Fig. 5 Turfgrass evaluation at Pullman, WA.



Fig. 6 Seed production evaluation at Pullman, WA.

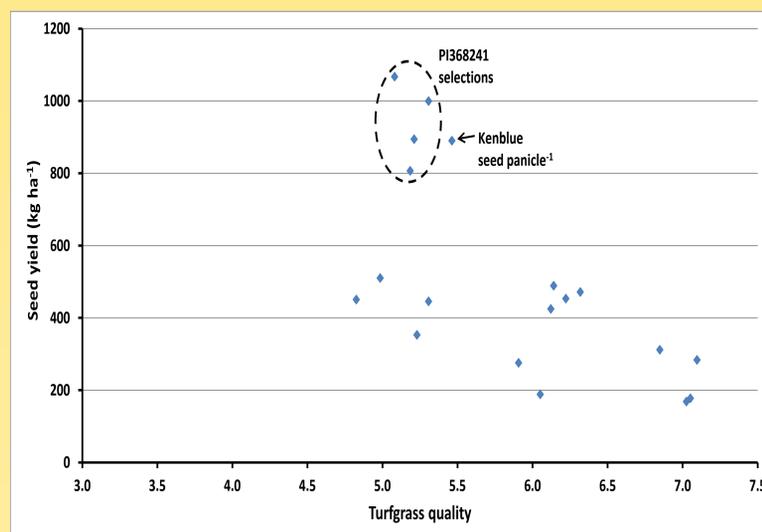


Fig. 7 Non-irrigated Kentucky bluegrass seed yield (2008-2011) vs. turf quality (2007-2010; 1 to 9; 9 = excellent quality) at Pullman, WA.

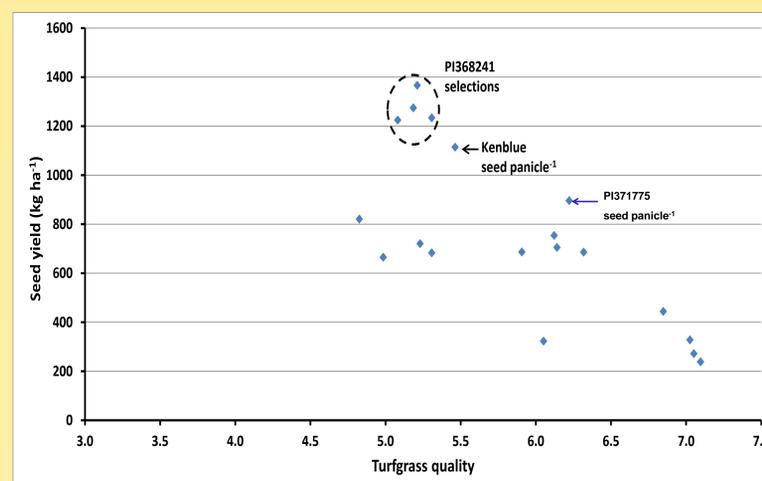


Fig. 8 Irrigated Kentucky bluegrass seed yield (2008-2011) vs. turf quality (2007-2010; 1 to 9; 9 = excellent quality) at Pullman, WA.

Table 1. Non-burn Kentucky bluegrass germplasm turfgrass quality and seed yield.

| Cultivar or PI | Selection parameter | Turfgrass quality* | | Seed yield (kg ha ⁻¹) | |
|----------------|-----------------------------|--------------------|--------------------|-----------------------------------|---------------------|
| | | 5-yr mean Pullman | 3-yr mean Puyallup | 4-yr mean Dryland | 4-yr mean Irrigated |
| Midnight | Elite-type check | 7.1 a** | 5.3 a | 152 c | 272 d |
| Kenblue | Common-type check | 5.3 c | 4.7 b | 446 b | 681 c |
| Kenblue | Seed panicle ⁻¹ | 5.4 c | 4.4 b | 890 a | 1114 ab |
| 371775 | Seed panicle ⁻¹ | 6.1 b | 5.4 a | 452 b | 896 bc |
| 368241 | Panicles area ⁻¹ | 5.1 d | 4.7 b | 1000 a | 1234 a |

*Turfgrass quality rated 1 to 9; 9 = excellent.

**Means within columns followed by the same letter are not significantly different. LSD $P = 0.05$.

RESULTS, OUTCOMES, AND CONCLUSIONS

Evaluation of the USDA-ARS Kentucky Bluegrass Collection

- Agronomic data could be used to differentiate among accessions.
- A Kentucky bluegrass core was developed (Johnston et al., 1997).

Residue Management and Turf Evaluation

- Accessions were identified that maintained good seed yield when post-harvest residue was baled and possessed good turfgrass quality (Johnson et al., 2003).

Selection for Diversity in Seed Yield Components

- Variation between and within accessions was identified (Johnson et al., 2010), so the potential exists for plant selection and enhancement.

Turfgrass and Seed Production Trials

- Selection for seed yield components had a variable response; seed yield was primarily dependent on accession (Dodson, 2008).
- PI 368241, selection panicles area⁻¹, and Kenblue, selection seed panicle⁻¹, had good seed yield both irrigated and non-irrigated and fair turfgrass quality at Pullman. PI 371775, selection seed panicle⁻¹, had good turf quality and good yield with irrigation (Table 1).
- Kentucky bluegrass is not recommended for western WA; however, PI 371775, selection seed panicle⁻¹ had acceptable quality at Puyallup. It may also possess stress tolerance, as all PI 371775 entries placed in the top 10% for turfgrass quality of the 50 entries during a 2-yr turfgrass trial at Auburn, AL.

Seed Increase and Germplasm Release

- Seed increase plots were harvested in 2012 and 2013 at Pullman, WA.
- Germplasm will be released by 2014.

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