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Kentucky Bluegrass (*Poa pratensis* L.) Germplasm for Non-burn Seed Production

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An Introduction to ATINER's Conference Paper Series

ATINER started to publish this conference papers series in 2012. It includes only the papers submitted for publication after they were presented at one of the conferences organized by our Institute every year. The papers published in the series have not been refereed and are published as they were submitted by the author. The series serves two purposes. First, we want to disseminate the information as fast as possible. Second, by doing so, the authors can receive comments useful to revise their papers before they are considered for publication in one of ATINER's books, following our standard procedures of a blind review.

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Abstract

Removal of post-harvest residue with open-field burning, which maintains grass seed yield and stand longevity, has been eliminated in Washington and is restricted in Oregon and Idaho, USA. The study objective was to identify Kentucky bluegrass (*Poa pratensis* L.) germplasm that has sustainable seed yield without post-harvest field burning and still maintains acceptable turfgrass quality. The study consisted of eight PI accessions and two check cultivars ('Kenblue' and 'Midnight'). Accessions were previously selected for both seed yield without field burning and turfgrass quality. In a space-plant nursery at Pullman, WA, several agronomic yield parameters were evaluated over a 2-year period and individual plants were re-selected within each accession or check with the highest seed weight, highest seed number panicle^{-1}, highest panicle number area^{-1}, and highest seed yield. These, plus seed from the original population, were planted in a seed increase nursery at Central Ferry, WA. The nursery was harvested in 2006 and 2007 and seed were planted in turfgrass plots in 2006 and in irrigated and non-irrigated seed production plots in 2007 at Pullman, WA. The turfgrass trial was evaluated monthly from 2007 to 2010 according to National Turfgrass Evaluation Program protocol for turfgrass quality. Seed production plots were harvested 2008 to 2010. Accession PI368241 under both irrigated and non-irrigated non-burn management and the selection within Kenblue for seed panicle^{-1}(in non-irrigated plots) showed promise of being able to provide excellent seed yield over multiple years while maintaining good turfgrass quality.

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Introduction

A ban on open-field burning of post-harvest residue of grass seed production fields has been implemented in Washington, and restrictions are in place in Idaho and Oregon, USA. Our previous research showed that without post-harvest burning of residue, bluegrass seed yield decreased over time (Johnson et al., 2003). This has forced grass seed growers in the Pacific Northwest to use shorter rotations to maintain economically viable seed yields. What are needed are bluegrasses that will maintain high seed yield over several years without field burning of post-harvest residue. In a multi-year study we previously identified germplasm that had improved seed production without burning (Johnston, 2000). This germplasm needs long-term seed yield trials and turfgrass evaluations. Ultimately, bluegrasses that can be successfully grown for multiple harvests without burning will be released to grass seed growers in the Pacific Northwest, USA.

Objectives

1. Assess the variation in agronomic attributes of selected accessions and select different individual plant genotypes for high seed weight, high seed panicle^{-1}, high panicles area^{-1}, and high overall seed yield using accessions with potential value in non-burn seed production.
2. Determine the selection response for grass seed yield and yield components by testing the resulting selections in Objective 1 for seed production under a residue removed (baled) management system over several years. In addition, test the selections for turfgrass quality over several years.

Results & Discussion

During prior research in 2004, seed yield components and seed yield data were obtained on 840 space plants at Pullman, WA. For each sample [1680 samples (two harvest years)] the number of panicles plant^{-1} was recorded. Panicles were then hand threshed (belt thresher), cleaned with a seed blower, and total seed weight was recorded. The data were analyzed for 1000 seed weight, seed panicle^{-1}, panicles cm^{-2}, and yield (g cm^{-2}). There was considerable variation between and within accessions and we were able to identify the highest contributing single plant within each accession for each parameter (Johnson et al., 2010). Seed of each selected plant and remnant seed of the original PI population for each accession were germinated in vermiculite and 100 individual plants of each selection were then established in flats in a glasshouse. In 2004, the 100 greenhouse plants of each selection x parameter and remnant seed of the original population for each accession were transplanted into a seed increase nursery at the USDA research site at Central Ferry, WA. The nursery consisted of 5000 plants.

During 2006, the seed increase nursery (50 plots of 100 plants = 5000 plants) at the USDA research farm at Central Ferry, WA was evaluated for several agronomic traits and turfgrass potential (non-replicated data). In June 2006, the plots were harvested, air dried, threshed, and cleaned. Clean seed weight was obtained.

To evaluate turfgrass quality, a National Turfgrass Evaluation Program (NTEP) protocol turf trial was planted in August 2007 with the 50 entries in a RCB experimental design with three replications at the Washington State University (WSU) Turfgrass and Agronomy Research Center (TARC) at Pullman, WA. Individual plot size was 1.5 m x 1.5 m and was seeded at 11 g m^{-2}. Also, dryland and irrigated seed production plots (150 per trial) were established at the WSU TARC at Pullman, WA on 18 May and 17 Aug. 2007, respectively.

The turfgrass trial was evaluated monthly during the growing season according to NTEP protocol for establishment, turf quality, color, texture, chlorophyll index, and spring green-up (Dodson, 2008). Only turfgrass quality data will be presented. In 2008, seed production plots were evaluated for seed yield, 1000 seed weight, seed yield $plant^{-1}$, seed $panicle^{-1}$, and panicles $area^{-1}$. Selection for seed yield components had a variable response and appeared to be dependent on accession (Dodson, 2008). The best characteristics of Kentucky bluegrass germplasm for seed production under non-burn conditions are early spring green-up, medium panicle height, many panicles per area, lighter seed weight, and a high number of seed $panicle^{-1}$ (Dodson, 2008). In 2008 (harvest year 1), two accessions, PI368241 and PI371775 showed promise of being able to provide good turfgrass quality and seed yield under non-burn management (data not presented).

In 2009, non-irrigated and irrigated seed production plots planted in 2007 were harvested for the second year. Turfgrass trials were evaluated for the third year. In 2009, as in 2008, the selection for yield components had a variable response and appeared to be dependent primarily on accession. Overall, there was an increase in seed yield due to irrigation; however, regardless of non-irrigated or irrigated seed production, accession PI368241 continued to show promise of being able to provide good turfgrass quality and good seed yield under non-burn residue management (Fig. 1 and 2). Under non-irrigated seed production, selection within Kenblue for seed $head^{-1}$ had good seed yield and turfgrass quality (Fig. 1).

In 2010, non-irrigated and irrigated seed production plots planted in 2007 were harvested for the third year. Turfgrass trials were evaluated for the fourth year. Overall, there was an increase in seed yield due to irrigation; however, regardless of non-irrigated or irrigated seed production, accession PI368241 continued to show promise of being able to provide good turfgrass quality and good seed yield under non-burn residue management (Fig. 3 and 4). Under non-irrigated seed production, selection within Kenblue for seed $panicle^{-1}$ had good seed yield and turfgrass quality (Fig. 3). It is critical to follow these studies for several additional (two or more) harvests to determine if a non-burn turf-type Kentucky bluegrass can be developed for sustainable grass seed production in the Pacific Northwest, USA.

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Figure 1. *Kentucky bluegrass non-irrigated seed yield vs. turfgrass quality (rated 1-9; 9 = excellent quality) at Pullman, WA, 2009.*

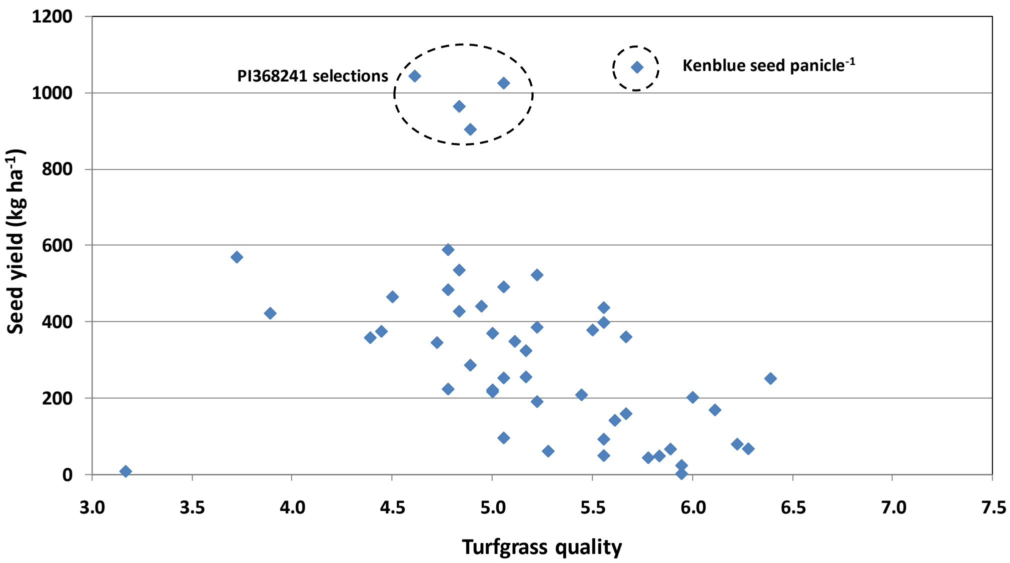

Figure 2. *Kentucky bluegrass irrigated seed yield vs. turfgrass quality (rated 1-9; 9 = excellent quality) at Pullman, WA, 2009.*

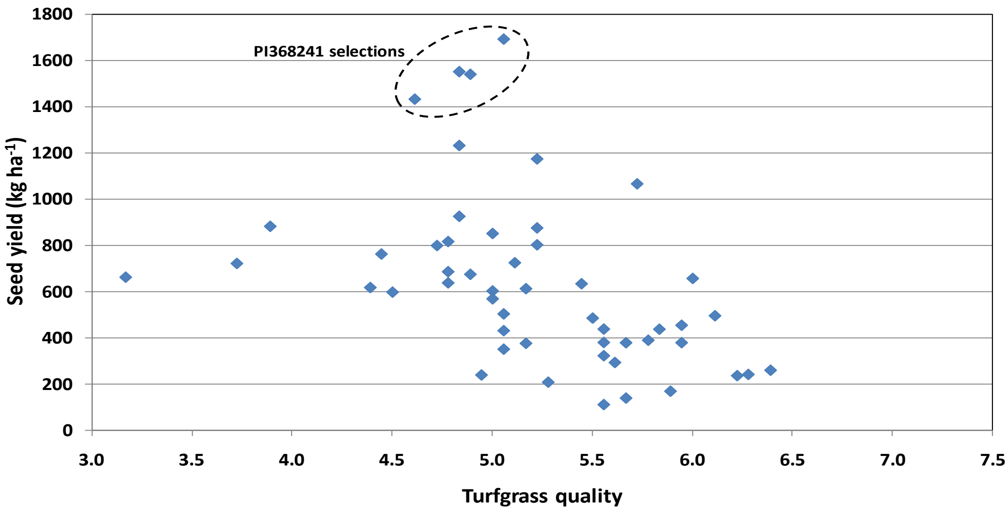

Figure 3. *Kentucky bluegrass non-irrigated seed yield vs. turfgrass quality (rated 1-9; 9 = excellent quality) at Pullman, WA, 2010. Circle is PI368241 and one selection of Kenblue.*

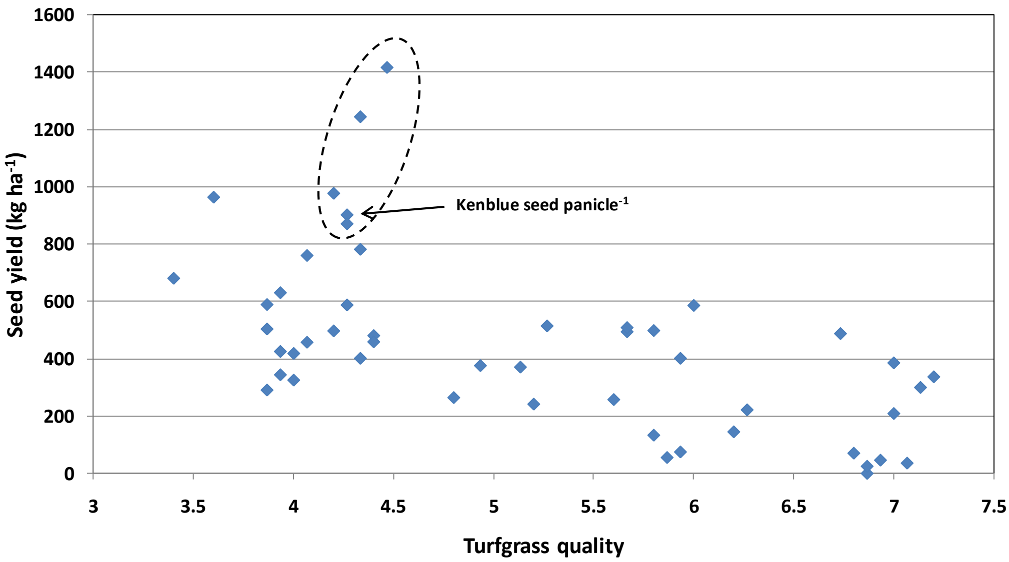

Figure 4. *Kentucky bluegrass irrigated seed yield vs. turfgrass quality (rated 1-9; 9 = excellent quality) at Pullman, WA, 2010.*