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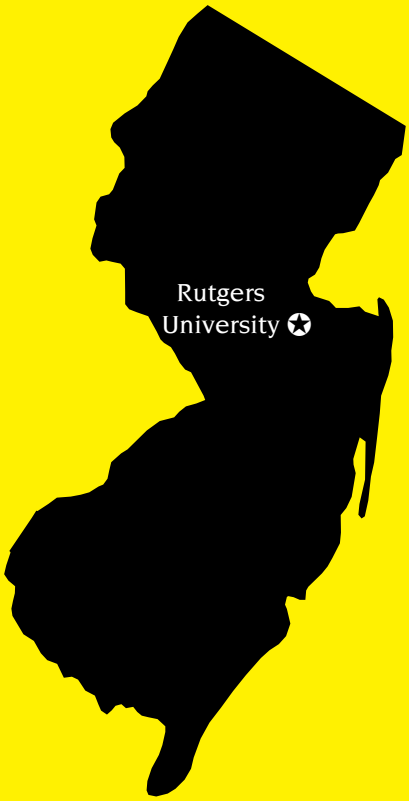

THE NEW JERSEY TURFGRASS ASSOCIATION

In Cooperation With

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This publication includes lecture notes of papers presented at the 2004 New Jersey Turfgrass Expo. Publication of these lectures provides a readily available source of information covering a wide range of topics and includes technical and popular presentations of importance to the turfgrass industry.

This proceedings also includes research papers that contain original research findings and reviews of selected subjects in turfgrass science. These papers are presented primarily to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

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PERFORMANCE OF UNITED STATES TURFGRASS CULTIVARS IN CENTRAL ASIA

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ABSTRACT

Scientists in the Republic of Uzbekistan and Kyrgyzstan received turfgrass germplasm from the United States for experimental observation and introduction. This paper shows the result of 4 years of field observations of various turfgrass species and cultivars under climate and soil conditions found in Uzbekistan. All improved cultivars of *Lolium perenne* and *Festuca arundinacea* proved to be of high turf quality and fast establishment capability and appear to have potential for use as turfgrass in the Republic of Uzbekistan.

INTRODUCTION

Within the last decade, Tashkent, one of the largest cities of the former Soviet Union, other cities of the Republic of Uzbekistan, and individuals have considered the planting of greenery as a priority; turfgrass planting has been given special attention. In addition to providing green cover for lawns, turfgrasses oxygenate the air and diminish the quantity of carbon dioxide in the atmosphere. They also protect soil from wind and water erosion, and during the summer periods help to decrease air temperature and raise humidity. These factors are important in Central Asia where the stresses of a semi-arid climate produce high temperature and low humidity during much of the summer period. Turfgrass also inhibits some pathogenic bacteria and fungi (Prilipko, 1977).

At the present time, turfgrass seed for lawn areas is imported to Uzbekistan from abroad, mainly from Europe. Summer daytime temperatures in Europe usually do not exceed 80 to 86°F, and high humidity is common. Uzbekistan is located on the Asian continent many thousands of miles from the ocean and sea and has a sharply continental climate. Winter temperatures quite often drop down to –36.4°F or lower, and summer temperatures can increase to 107.5°F and higher (Akhmedov, 1993). Furthermore, ground surface temperatures in hot summer periods can exceed 140°F. All of these factors have an adverse affect on the growth and development of lawn grasses imported from European countries. It has been frequently observed that the rich dense cover and color of most lawns in autumn or spring partially or completely disappears and leaves a fulvous color during the summer. Lawns usually need to be rejuvenated, restored, or reconstructed, which requires large expenditures (Zaurov et al., 2001). Besides climate factors, soil conditions also influence the growth and development of turfgrasses. Uzbekistan soil varies from poor (i.e., high salt content) to good (i.e., adequate in nutrition and low salt content).

The scarcity of scientific research and practical recommendations has been a hindrance in the development of lawns and other turfs in Uzbekistan. Scientific research started in Uzbekistan in 1960 by Dr. F. N. Rusanov (1960) with more recent work by Dr. M. N. Hudajberganova (1987) and Dr. I. V. Belolipov (1989) at the Tashkent Botanical Garden. They began introducing different turfgrass species from Europe, but the research eventually stopped. By the end of the 1980s, only weed control in turfgrass was receiving study in Uzbekistan (Sultanov, 1990).

The objective of this investigation was to identify turfgrass species and cultivars developed in the United States that would be useful under the climatic conditions in Uzbekistan.

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MATERIALS AND METHODS

Field experiments of turfgrass species and cultivars introduced from the United Sates were studied at the Research Experiment Station of Tashkent State Agrarian University (TSAU) from 1999 through 2002. In cooperation with Rutgers, The State University of New Jersey, a field test of 27 turfgrass cultivars including 8 species was established at the Research Experiment Station of TSAU (Table 2). Seeds for field experiments were supplied by Lofts Great Western, Lebanon Seaboard, Inc., and Jacklin Seed Company.

Climatic and Soil Conditions

The climate of the Tashkent Province is sharply continental with a long, dry and hot summer and a winter season that is short with abrupt harsh fluctuations in air temperature. As seen from Table 1, air and soil surface temperatures during the 4-year study period were higher than historical average temperatures, particularly during the 2000 and 2001 summer seasons. The maximum air temperature reached 108.5°F in 2000 and 104°F in 1999 and 2001.

The lowest temperature recorded occurred in the winter of 2001, when the nighttime temperature decreased to 3.2°F in January; 15.8°F was observed in February without snow cover, and 26.6°F was recorded in March. Ground surface temperature decreased to –5.8, -0.4, and 14°F during January, February, and March, respectively. Below zero air temperature was also observed in April.

The relative humidity measured in all four test years was also below the average annual indices, especially during the spring and summer seasons. The most substantial difference was in March 2000, when the disparity reached 23%.

The field soil was a typical medium-textured loam and, according to TSAU Soil Chemistry Department, humus content did not exceed 1.1% and total nitrogen, phosphorus, and potassium was 0.1, 0.14, and 2.2%, respectively. Available nitrogen was 2.2 mg/kg as $N\text{-}NH_4$ and 18.0 mg/kg as $N\text{-}NO_3$, available phosphorus as P_2O_5 was 29.0 mg/kg, and available potassium as K_2O was 180.0 mg/kg of soil. Except for potassium, the soil was poor in nitrogen and phosphorus content. At the beginning of May 1999, the field was ploughed, harrowed, and rolled. Large soil clumps and weed rhizomes were manually removed beyond the bounds of the test field.

The experiment was a completely randomized block design with four replications and included selected cultivars of *Lolium perenne*, *Poa pratensis*, *Festuca arundinacea*, *Festuca rubra*, *Festuca ovina*, *Festuca rubra* subsp. *commutata*, *Festuca rubra* subsp. *trichophylla*, and *Agrostis palustris*. The size of each plot was 1.1 x 1.7 m, or 1.87 m^2. The seeds were delivered to Uzbekistan at different times and the grasses were planted on 11 and 12 May 1999 (Lofts Great Western and Lebanon Seaboard, Inc.) and September 1999 (Jacklin Seed Company). Seeds were manually planted and cross-raked within each test plot.

Turfgrass management

Mineral fertilizers, such as ammonium nitrate ($NH_4\text{-}NO_3$) and ammonium phosphate ($NH_4\text{-}H_2PO_4$), were applied three times every year during the growing season. At the beginning of April and at the end of August, ammonium nitrate was applied at 12 to 15 g/m^2 and ammonium phosphate was applied in November at 10 to 12 g/m^2. Test plots were irrigated as needed from late May to early October of each year. Turfgrass was mowed 5-cm tall weekly beginning at the end of March until the end of September. From October to November the plots were mowed biweekly.

In September 2001, Granstar (United States trade name is Express) herbicide in a dose of 0.12 kg/m^2 was used against the weeds *Taraxacum officinale* and *Trifolium repens*. On the 10 to 12th day after herbicide application, weed leaves had changed color, and on the 20 to 25th day the weeds had completely disappeared. In spring 2002, weeds appeared again on the test plots but in less quantity. On 5 April 2002, Granstar herbicide at the same dose was again applied, this time with greater efficacy than the previous year. Single instances of *T. officinale* and *T. repens* were noticed again in June 2002.

Turfgrass observations

All field tests were rated through the growing season for turf cover, color, disease, and weed appearance. Our evaluation of turf was based on a 1 to 9 scale, where 9 = highest turf cover, darkest turf color, and least disease and number of weeds per plot. All data were subjected to analysis of variance, and when a significant *F*-test was obtained, means were separated using Fisher's protected LSD (Dospehov, 1985) which is similar to Steel and Torrie (1980).

RESULTS AND DISCUSSION

Emergence of *L. perenne* cultivars occurred 7 to 8 days after planting; all *Festuca* species germinated by the 9 to 10th day, and *P. pratensis* on appeared 12 to 14 days after planting. As mentioned before, the summer air and soil temperatures had been higher than average during the study period, and this influenced the growth and development of the turfgrasses, especially during the year after planting. In addition, ground surface temperature was occasionally more than and 150.8°F. The roots of turfgrass species are unable to withstand soil temperatures greater than 122°F for more than 2 to 3 hours, and 140°F is the highest critical temperature (Carrol, 1943).

During 1999, all cultivars of *L. perenne* emerged much faster than other species resulting in the best plot cover (Table 2); cultivars of *F. arundinacea* germinated after the perennial ryegrass. Turf cover ratings for *P. pratensis* cultivars ranged from 2 to 4; because performance was poor, these cultivars were overseeded with 15 g seed per plot on September 20, 1999. By November 1999, turf cover dramatically increased to a rating of 6.5 to 8.0 (data not shown).

All cultivars of *L. perenne* and *F. arundinacea* had high ratings for cover and color (7.0 to 9.0) through 2002. Cultivars of these species had more complete cover compared to cultivars of *F. ovina*, *F. rubra* subsp. *trichophylla*, and *A. palustris*. Among the cultivars of *P. pratensis*, LTP–1135, Champagne, and Washington had good ratings for cover from 2000 through 2002; however, Lebanon 9 and Lebanon 629 had completely disappeared from the plots by 2002.

During all test years, particularly in June and July, fungal diseases caused by *Puccinia dactyligina*, *Puccinia festucae*, and *Uromyces poae* (all rusts) and *Drechslera dictyoides* (net blotch) were observed. Fungicides were not used during the experiment, which resulted in disease symptoms within all of the plots.

Experimental observations during all test years showed that the most prominent weeds were *Cyperus rotundus*, *T. officinale*, *T. repens*, *Cynodon dactylon*, *Setaria glauca*, as well as *Portulaca oleracea*, which disappeared after the first year. As seen from Table 2, there was a strong relationship between the quantity of weeds and density of plot cover with *Lolium perenne* and of all *Festuca* species, i.e. the more cover, the fewer weeds and vice versa. By 2002, some *P. pratensis* cultivars such as Lebanon 9 and Lebanon 629 had the highest number of weeds while LTP-1135 had the least number of weeds.

CONCLUSIONS

1. All improved cultivars of *L. perenne* and *F. arundinacea* proved to be of high turf quality because of their fast establishment capability, persistence of cover, and low number of weeds.

2. Cultivars of *P. pratensis* such as LTP-1135, Champagne, Washington, and Midnight took a longer time to become established, yet once established, resulted in a pleasant green color, attractive narrow leaves, and a moderate degree of disease incidence.

3. Cultivars of *F. ovina*, *F. rubra* subsp. *commutata*, *F. rubra* subsp. *trichophylla*, and *A. palustris* took a long time to become established and exhibited moderate to poor persistence of turf cover; this in turn allowed a moderate level of weeds to invade.

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Table 1. Meterological conditions at the TSAU Experiment Station.

	Air temperature (°C)					Soil Temperature (°C)					Precipitation (mm)					Relative Air Humidity (%)				
Month	Avg. Ann.[z]	1999	2000	2001	2002	Avg. Ann.	1999	2000	2001	2002	Avg. Ann.	1999	2000	2001	2002	Avg. Ann.	1999	2000	2001	2002
Jan.	-3.1	2.6	3.9	0.2	4.5	-2.0	-1.0	4.0	-2.3	1.0	52.0	83.0	68.7	21.7	57.0	83.0	80.0	67.0	73.0	68.0
Feb.	0.0	8.6	3.6	5.5	5.5	1.0	6.0	2.3	3.3	3.0	48.0	69.3	24.1	61.0	95.4	80.0	70.0	60.0	66.0	69.0
March	7.4	7.6	9.6	11.8	11.5	8.0	8.0	9.7	11.7	11.0	71.0	63.5	42.1	56.6	117.8	73.0	67.0	50.0	55.0	60.0
April	14.6	13.8	18.4	17.2	14.5	17.0	16.0	20.7	20.3	16.0	59.0	44.6	35.4	32.1	123.5	67.0	57.0	52.0	53.0	71.0
May	20.3	21.0	22.3	24.8	19.0	25.0	25.3	27.7	30.3	42.0	32.0	53.5	3.0	2.2	72.9	54.0	52.0	45.0	40.0	60.0
June	25.0	24.8	25.9	29.2	24.7	32.0	31.3	33.0	36.0	30.0	12.0	52.3	14.8	0.0	10.3	46.0	40.0	38.0	30.0	46.0
July	26.5	26.2	28.4	27.2	27.2	35.0	33.0	36.0	35.7	33.0	5.0	12.2	1.0	0.6	1.6	48.0	49.0	38.0	34.0	38.0
Aug.	24.6	27.7	27.9	25.9	27.2	32.0	33.7	34.0	32.0	35.0	4.0	5.1	0.0	4.5	6.0	53.0	45.0	38.0	39.0	38.0
Sept.	18.5	21.1	21.4	19.7	21.6	23.0	25.0	25.7	23.7	25.0	5.0	10.6	9.6	0.4	0	54.0	52.0	43.0	39.0	43.0
Oct.	11.9	15.8	11.7	12.9	17.0	13.0	16.0	11.3	13.0	18.0	25.0	10.7	60.7	65.6	0	63.0	55.0	68.0	62.0	51.0
Nov.	5.0	6.8	7.0	10.6	10.4	5.0	5.0	5.0	8.0	8.0	40.0	84.9	37.3	32.0	7.9	77.0	77.0	69.0	68.0	64.0
Dec.	-0.3	5.7	4.9	2.0	-1.0	0.2	1.3	2.7	4.7	-4.0	52.0	14.2	53.0	88.6	98.2	95.0	81.0	76.0	69.0	77.0

[z] Historical average temperature.

Table 2. Performance of turfgrass species and cultivars at the TSAU Experiment Station.

	Turf Cover (Avg.)				Turf Color (Avg.)				Diseases (Rust)				Number of Weeds/Plot			
Cultivar	1999	2000	2001	2002	1999	2000	2001	2002	1999	2000	2001	2002	1999	2000	2001	2002
Lolium perenne																
Palmer III	6.0	9.0	9.0	8.0	8.0	7.0	7.0	7.0	9.0	9.0	7.0	7.0	4.0	1.0	4.0	3.0
Churchill	7.0	9.0	9.0	8.0	8.0	8.0	7.0	7.0	9.0	9.0	7.0	7.0	4.0	1.0	4.0	3.0
Exacta	7.0	9.0	9.0	8.0	8.0	8.0	7.0	7.0	9.0	9.0	6.0	7.0	3.0	2.0	3.0	3.0
Gettysburg	6.0	7.0	7.0	8.0	8.0	8.0	8.0	8.0	9.0	9.0	7.0	7.0	4.0	1.0	3.0	3.0
Affirmed	7.0	8.0	9.0	8.0	8.0	8.0	8.0	8.0	9.0	8.0	7.0	7.0	3.0	1.0	2.0	4.0
Brightstar	5.0	8.0	9.0	8.0	8.0	8.0	8.0	7.0	9.0	9.0	6.0	7.0	4.0	1.0	2.0	3.0
Poa pratensis																
LTP–1135	4.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	9.0	9.0	6.0	3.0	4.0	1.0	3.0	3.0
Champagne	4.0	8.0	8.0	7.0	7.0	7.0	8.0	8.0	9.0	9.0	7.0	4.0	4.0	3.0	4.0	4.0
Washington	3.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	9.0	5.0	6.0	4.0	4.0	3.0	4.0	4.0
Midnight	4.0	8.0	8.0	4.0	7.0	7.0	7.0	7.0	9.0	5.0	4.0	5.0	4.0	3.0	4.0	6.0
Lebanon 9	2.0	8.0	3.0	-	7.0	6.0	6.0	-	9.0	9.0	3.0	-	5.0	2.0	5.0	8.0
Lebanon 629	2.0	3.0	2.0	-	7.0	6.0	6.0	-	9.0	7.0	3.0	-	4.0	4.0	5.0	8.0
Festuca arundinacea																
Rebell TR	6.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	9.0	7.0	6.0	7.0	5.0	4.0	2.0	2.0
Masterpise	4.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	9.0	9.0	6.0	8.0	5.0	2.0	2.0	2.0
Rembrandt	7.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	9.0	9.0	6.0	8.0	4.0	3.0	1.0	1.0
Tarheel	6.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	9.0	9.0	5.0	7.0	4.0	3.0	2.0	2.0
Festuca rubra																
Flyer II Pst-4BN	7.0	4.0	5.0	5.0	8.0	8.0	7.0	7.0	9.0	5.0	5.0	6.0	4.0	1.0	4.0	6.0
Seabreeze	6.0	6.0	5.0	5.0	8.0	8.0	7.0	7.0	9.0	8.0	5.0	6.0	5.0	8.0	6.0	5.0
Festuca ovina																
Reliant II	6.0	4.0	5.0	5.0	7.0	7.0	6.0	5.0	9.0	5.0	7.0	4.0	5.0	8.0	5.0	5.0
Oxford	6.0	5.0	5.0	5.0	7.0	7.0	7.0	7.0	9.0	5.0	3.0	4.0	5.0	8.0	6.0	7.0
Festuca rubra subsp. *commutata*																
Jamestown II	4.0	4.0	6.0	5.0	8.0	7.0	8.0	7.0	9.0	3.0	5.0	7.0	5.0	6.0	3.0	4.0
Ambassador	4.0	6.0	7.0	5.0	8.0	8.0	7.0	7.0	9.0	7.0	6.0	6.0	5.0	7.0	5.0	6.0
LTP – 5001	5.0	3.0	2.0	6.0	7.0	7.0	7.0	7.0	9.0	3.0	6.0	6.0	4.0	5.0	5.0	5.0

(Continued)

Table 2 (continued).

Cultivar	Turf Cover (Avg.)				Turf Color (Avg.)				Diseases (Rust)				Number of Weeds/Plot			
	1999	2000	2001	2002	1999	2000	2001	2002	1999	2000	2001	2002	1999	2000	2001	2002
Festuca rubra subsp. *trichophylla*																
Path Finder	4.0	4.0	5.0	6.0	8.0	8.0	8.0	7.0	9.0	8.0	5.0	4.0	5.0	6.0	7.0	5.0
LTP – 3951	3.0	4.0	4.0	7.0	8.0	8.0	8.0	7.0	9.0	4.0	5.0	4.0	6.0	9.0	7.0	5.0
LTP – 4731	4.0	7.0	7.0	6.0	8.0	8.0	7.0	7.0	9.0	9.0	6.0	3.0	6.0	6.0	7.0	6.0
Agrostis palustris																
Southshore	5.0	7.0	7.0	5.0	7.0	6.0	6.0	6.0	9.0	9.0	7.0	4.0	5.0	6.0	5.0	3.0
LSD at 5% =	0.89	1.12	0.69	1.33	0.98	0.75	0.71	1.05	-	1.07	1.09	0.86	0.94	1.08	0.48	1.34
CV % =	10.8	15.6	16.6	9.93	12.6	9.36	19.6	14.2	-	16	17.2	13	21.4	14.2	7.75	8.96