

THE ADAPTATION OF SOME PERENNIAL RYEGRASS CULTIVARS USED AS TURFGRASS UNDER ANKARA AND ISPARTA CONDITIONS

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Abstract

The efficient use of turf for establishing lawns requires field evaluation of the existing cultivars, especially in the central part of Anatolia with dry climate. Our research was aimed at evaluating the adaptability of the newly introduced and popular perennial ryegrass cultivars in central part of Turkey (Ankara) and in transitional zone of Anatolia to Mediterranean (Isparta). Six perennial ryegrass cultivars (Lucius, Libranco, Lifrance, Eterlou, Taya and Sakini) were seeded with 3 replications in randomized block design in both sites in 2007. Emergency power, establishment potential, winter resistance, cover ratio, leaf texture, leaf color, regrowth potential, tiller number, general appearance, weed invasion and density of each cultivar were evaluated by using a visual score. At the result, there were no really much differences among the cultivars in both sides even that they showed some differences on some parameters in Ankara. All cultivars performed better in summer and autumn than during winter and spring in Ankara. However they were better in spring, summer and autumn in Isparta than during winter period. All of these perennial ryegrass cultivars showed excellent growing, covering, colour, and regrowth after cutting and density in both locations. They were found recommendable for Central Anatolia and transitional zone of Anatolia.

Key words: Perennial ryegrass, *Lolium perenne*, Ankara, Isparta, turfgrass, adaptation.

Introduction

Perennial ryegrass has a fine to medium leaf texture and tends to be dark green. It is a very competitive cool-season grass, best adapted to coastal regions that have moderate temperatures throughout the year. Grasses vary in tolerance of soil moisture, pH, fertility and temperature ranges. Perennial ryegrass germinates rapidly possesses dark green color, and maintains desirable turfgrass quality during winter months (Allen et al. 1993; Horgan and Yelverton 2001). Perennial ryegrass is often utilized for winter over seeding on golf course fairways and tee boxes, athletic fields, and high profile home lawns. Ryegrass is best adapted to moist, cool environments where temperatures are not extreme in the winter or summer. In Turkey, inland areas are the best adapted for ryegrass. In the transition zone, perennial ryegrass may provide a permanent turfgrass (Avcı et al., 2012). Ankara is in the central Anatolia of Turkey with hot dry summer and with cold rainy winter; however Isparta is in transition zone with milder climate than Ankara. Because of that our objective in this experiment was to test adaptability of newly introduced and popular cultivars of perennial ryegrass (*Lolium perenne* L) under these two different environmental conditions for adaptation.

Materials and Methods

Perennial ryegrass cultivars (Lucius, Libronco, Lifrance, Taya, Sakini and Eterlou) were used as materials for adaptability testing under Ankara and Isparta conditions. Field experiments were conducted on Ankara University, Agricultural Faculty, Field Crops Department in Ankara, and Süleyman Demirel University, Agricultural Faculty, Field Crops Department in Isparta experimental sites in 2007 and 2008. In Ankara, these cultivars were seeded in a clay loam, classified slightly alkaline (pH 7.8), rich in potassium (1170 kg/ha), poor in phosphorus (69 kg ha⁻¹) and containing 1.15% organic matter. In Isparta soil was sandy-loam, slightly alkaline (pH 7.7), rich in potassium (1400 kg ha⁻¹), poor in phosphorus (65 kg ha⁻¹), and containing 1.10% organic matter and low total salt (0.030 %). According to State Meteorology Department, long-term observations (1975-2010) in Ankara showed that average precipitation, mean temperature and relative humidity were 403 mm year⁻¹, 12.1°C and 53.1%, respectively. Corresponding values in 2007 were 310.1 mm, 13.3°C and 59% , however they were 436 mm, 13.7°C and 54.6% in 2008. Isparta showed that average precipitation, mean temperature and relative humidity were 485 mm year⁻¹, 12.5°C and 55.7% (1975-2010), respectively. Corresponding values in 2007 were 363.3 mm, 12.68°C and 57% , however they were 463 mm, 13.5°C and 55.8% in 2008.

In Ankara, seeding was done in 12th September in 2007, however it was in 3rd July in Isparta in 2007 with 50 g m² seeds. Randomized block design were used with four replications. Each plot was 2 m². Nitrogen fertilizer as ammonium sulfate was applied as 100 kg ha⁻¹ with seeding and again in spring of 2008 at both locations. Springer irrigation system was done every day during the summer.

Some observations were done after emergence in both locations by using a visual score (Anonymous, 1991). They are; Emergency power: The number of days between seeding (planting) days and when 50 % emergence was occurred in plots. Covering potential: The number of days between seeding (planting) date and when 75% plants were seen in the plot. Winter resistance (1-9): Observations were done at the beginning of spring growth which was at the end of February (1=very bad (dead of all plants), 3=bad (50% plants died), 5=medium (all plants of the plot were yellowish), 7=good (less than 50% was yellowish) and 9=well (no yellow plant in plot). Leaf texture (1-9): Leaf width on leaves was measured (1=very rough (more than 4 mm), 3=rough (3-4 mm), 5=medium (2-3 mm), 7=fine (1-2 mm) and 9=very fine (less than 1 mm). Leaf colour (1-9): Observations were done in spring, summer, autumn and winter (1=yellow, 3=light yellow-green, 5= green, 7= dark green and 9=very dark green). Regrowth potential (1-5): In spring, before second cut regrowth potential was observed (1=high regrowth, 3=medium regrowth and 5=low regrowth). General appearance (1-9): Plots were observed for general uniformity, colour, tissue, liveliness, weeds, disease and insects in each season (for spring, summer, autumn and winter) (1=very bad , 3=bad, 5=medium, 7=good and 9=well). Weed invasion (1-5): In second year, after last cut at the end of vegetation, the weed invasion on plots was observed (1=high, 3= medium and 5= no weeds in plots). Density: In second year at the end of vegetation stage, the plant density was observed in each plot (1=very rarely, 3=rarely, 5=medium, 7=dense and 9 = very dense).

The data were analyzed by GLM at the 5 and 1 % levels of significance. When a significant differences was found, a protected Duncan test was applied at the p=0.05 level for comparisons between means (SAS, 1985).

Results and discussion

The data of both experiments (in Ankara and Isparta) of perennial ryegrass cultivars used as turfgrass were analyzed and the Duncan results were given in Table 1 and 2. In Ankara, there

were significant differences among the cultivars on emergency power ($p<0.01$), leaf texture ($p<0.05$), leaf colour on winter ($p<0.05$), spring ($p<0.01$), summer ($p<0.05$) and autumn ($p<0.05$), regrowth potential ($p<0.01$), general appearance on summer ($p<0.05$) and density ($p<0.01$). However, there were no differences between cultivars on covering potential, winter resistance, and general appearance on winter, spring and autumn and weed invasion. Just the opposite, only two observations (leaf texture and density) showed the significant difference among the cultivars in Isparta. All other observations did not make any differences among the ryegrass cultivars in that area.

According to the research, some observations of turfgrass measurements were differed for each perennial ryegrass variety under Ankara conditions. Some cultivar showed better performance than others for each observation apart. In Isparta they did not show any differences in any observation (Table 1 and 2). Cultivars showed very close results and plots were similar to each other. As the result, there were no really much differences among the cultivars in both sites. Their germination, emergency and covering capacity were very fast. All cultivars performed better in summer and autumn than during winter and spring period in Ankara. However they were better in spring, summer and autumn in Isparta then during winter, because Isparta is in transitional zone of central Anatolia with more temperate climate than Ankara. According to Richardson (2004) the annual and intermediate cultivars of ryegrass all showed increased high-temperature stress under increasing temperatures comparing to the perennial cultivars, which did not show stress until air temperature exceeded 40°C. Sampaux et al. (2013) found that turf winter greenness had been marginally improved, whereas summer greenness and seed yield had not been significantly changed. Same researcher also said that turf density and fineness played a major role in the visual assessment of turf aesthetic merit and that wear tolerance was closely associated with turf density. Similar to this, all of these perennial ryegrass cultivars in our research showed excellent growing, covering, colour, and regrowth after cutting and density at both locations with high temperature during the hot and dry summer. Opposite to the our research, Kır et al. (2010) had trials in Mediterranean environment with perennial ryegrass cultivars. They performed better in winter, spring and autumn than during summer period. These results showed that environmental conditions especially climate were playing an important role in growing perennial ryegrass and its turfgrass quality.

Perennial ryegrass is generally used where rapid establishment is a necessary: for home lawns, parks, golf course fairways and roughs, airfields and -- especially -- athletic fields. It is a medium-textured turf with good shoot density and uniformity that is frequently over seeded into warm-season turfgrasses in the winter months to supply a dark green color in warmer climates (Anonymous, 1995).

Table 1. Perennial ryegrass (*Lolium perenne*) cultivars (ANKARA)

Cultivars	Emerg ncy power	Coverin g potential	Winter resistance	Leaf texture	Leaf colour				Regrowth potential	General appearance				Weed invasi on	Density
					Winter	Spring	Summer	Autumn		Winter	Spring	Summer	Autumn		
Lucius	6.25 b*	16.0	6.50	4.00a	4.50ab	5.00cd	7.00b	6.50b	3.00a	7.0	9.0	9.00a	9.0	5.0	9.00a
Libronco	6.50 b	16.0	6.00	3.00ab	4.00b	7.00ab	7.00b	9.00a	3.00a	7.0	9.0	9.00a	9.0	5.0	9.00a
Lifrance	6.50 b	16.0	6.00	3.50ab	4.50ab	6.00abc	8.00ab	8.50a	3.00a	7.0	9.0	9.00a	9.0	5.0	8.50a
Taya	9.00 a	16.0	6.50	2.00b	4.50ab	7.50a	8.50a	8.0ab	2.00b	7.0	9.0	9.00a	9.0	5.0	9.00a
Sakini	7.25 b	16.0	6.50	2.50ab	4.50ab	4.00d	7.00b	6.50b	1.50b	7.0	9.0	8.00b	9.0	5.0	7.00b
Eterlou	7.25 b	16.0	6.50	4.00a	5.00a	5.50bcd	8.00ab	8.0ab	3.00a	7.0	9.0	9.00a	9.0	5.0	9.00a
Mean	7.13	16.0	6.33	3.16	4.50	5.83	7.58	7.75	2.58	7.0	9.0	8.83	9.0	5.0	8.58
C.V.	14.9		13.31	31.2	12.39	16.95	11.03	12.97	22.71			5.33			4.75

*Means of each populations in a column followed by the same lower case letters are not significantly different (p<0.05)

Table 2. Perennial ryegrass (*Lolium perenne*) cultivars (ISPARTA)

Cultivars	Emerg ncy power	Coverin g potential	Winter resistance	Leaf texture	Leaf colour				Regrowth potential	General appearance				Weed invasi on	Density
					Winter	Spring	Summer	Autumn		Winter	Spring	Summer	Autumn		
Lucius	8.25	10.50	5.00	7.00a*	2.50	6.50	5.50	6.50	1.0	6.50	7.50	7.50	6.50	5.00	9.00a
Libronco	8.25	10.50	5.00	5.00b	2.00	6.00	6.50	7.00	1.0	6.50	8.00	8.50	7.00	5.00	8.50ab
Lifrance	8.50	11.00	5.00	6.50a	2.50	6.50	3.00	6.50	1.0	6.50	8.00	8.00	7.00	5.00	9.00a
Taya	9.00	11.25	4.50	7.00a	2.00	6.00	6.50	7.00	1.0	6.50	8.00	8.00	6.50	4.50	7.50b
Sakini	8.50	10.75	4.50	7.00a	2.00	5.50	6.50	6.50	1.0	6.50	8.00	8.00	6.50	4.50	7.50b
Eterlou	9.00	11.25	4.50	7.00a	2.00	6.50	6.50	7.00	1.0	6.00	8.00	8.00	7.00	4.50	8.00b
Mean	8.58	10.87	4.75	6.58	2.16	6.16	6.25	6.75	1.0	6.42	7.92	8.00	6.75	4.75	8.25
C.V.	9.51	7.67	14.55	6.20	25.63	10.25	20.72	8.11		14.6	12.4	13.69	11.2	14.6	11.07

*Means of each populations in a column followed by the same lower case letters are not significantly different (p<0.05).

Conclusion

Perennial ryegrass cultivars were grown in Ankara and Isparta as turfgrass to determine their adaptation during 2007 and 2008. According to the results, there were no significant differences among the cultivars in both sides even that they showed some differences in some parameters in Ankara. All cultivars performed better in summer and autumn than during winter and spring period in Ankara. However they were better in spring, summer and autumn in Isparta then during winter. All of these perennial ryegrass cultivars showed fast germination, emergency, covering potential and excellent growing, colour, regrowth after cutting and density in both locations. They were found recommendable for Central Anatolia and transitional zone of Anatolia.

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